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THE

JOURNAL OF THE SOCIETY OF ARTS,

AND OF THE

INSTITUTIONS IN UNION.

VOLUME XVI.

FROM NOVEMBER 22, 1867, TO NOVEMBER 20, 1868.

LONDON:

PUBLISHED FOR THE SOCIETY BY BELL AND DALDY, YORK-STREET, COVENT-GARDEN.

1868.

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THE

Journal of the Society of Arts,

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THE INSTITUTIONS IN UNION.

114th Session.] FRIDAY, NOVEMBER 22, 1867. [No. 783. Vol. XVI.

Society for the Encouragement of Arts, Manufactures, and Commerce.

FOUNDED IN 1754. INCORPORATED BY ROYAL CHARTER IN 1847.

ONE-HUNDRED-AND-FOURTEENTH SESSION, 1867-68.

COUNCIL.

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The Society of Arts was founded in 1754, and incorporated by Royal Charter in 1847, for "The Encouragement of the Arts, Manufactures, and Commerce of the Country, by bestowing rewards for such productions, inventions, or improvements as tend to the employment of the poor, to the increase of trade, and to the riches and honour of the kingdom; and for meritorious works in the various departments of the Fine Arts; for Discoveries, Inventions, and Improvements in Agriculture, Chemistry, Mechanics, Manufactures, and other useful Arts; for the application of such natural and artificial products, whether of Home, Colonial, or Foreign growth and manufacture, as may appear likely to afford fresh objects of industry, and to increase the trade of the realm by extending the sphere of British commerce; and generally to assist in the advancement, development, and practical application of every department of science in connection with the Arts, Manufactures, and Commerce of this country."

The following may serve to indicate the varied nature of the Society's operations. So early as the middle of the last century, its efforts were directed to improving Agricultural implements; raising, planting, and preserving timber; improving the culture of most kinds of corn and grass seeds, and the introduction of new root crops; also the reclamation of large tracts of land from the sea, thus extending the means of producing food for the people. In applied Chemistry and Metallurgy it collected much information relative to improvements in dyeing and tanning, the make of crucibles and retorts, the discovery of cobalt, zaffre, and smalt, and the manufacture of iron, copper, and tin; in Manufactures it has given to the world many improvements, such as the loom for weaving fishing-nets, spinning-machines, the make of Persian carpets, druggets, cambric, lace, and various kinds of paper. It erected the first saw-mill used in this country, and has in-

troduced many improvements in ship-building, the diving-bell, floating-lights, the construction of cranes and jacks, and manufacturing machines and tools in general.

In our Colonies the Society has been instrumental in establishing Botanic Gardens, thereby aiding the importation and production of the spices, fruits, and gums of Foreign Countries, and their more general introduction into Commerce. It has also been the means of introducing many new substances, such as gutta-percha, cocoa-nut oil, &c., thereby creating new sources of trade.

Among the important but less known works of the Society may be mentioned the establishment of a regular supply of Fish to the London market; upon this work the Society expended many thousands of pounds.

In the Fine Arts the Society not merely encouraged the study of Art at a period prior to the existence of the Royal Academy and Government Schools, but, by allowing artists to make collections of their works, and to exhibit them in the Society's Rooms, in 1760, it thereby established permanent Exhibitions of Art in this country, out of which grew the present Royal Academy. Among the names of those rewarded by the Society in their youth, will be found Flaxman, Bacon, Nollekens, Uwins, Landseer, Mulready, Ross, Eastlake, Millais, and other leading Artists.

Since its incorporation by Royal Charter in 1847, by holding smaller Industrial Exhibitions, the Society prepared the way for the first Great International Exhibition, held in 1851, which was originated by the Society under the presidency of His Royal Highness the Prince Consort. The Society at first entered into an agreement with contractors to carry out the undertaking, but subsequently applied to Her Majesty to issue a Royal Commission, a petition which was graciously acceded to. The more recent action of the Society, in reference to the International Exhibition of 1862, is well known. It raised a Guarantee Fund of £450,000, to meet the expenses of the undertaking, and nominated the Commissioners, who were afterwards appointed by Her Majesty.

The Artistic Copyright Act of 1862 was prepared and carried through Parliament by a committee of the Society, and the amendment of the Laws bearing upon Industry and Commerce, especially the Patent Laws, the improvement of the Dwellings of the Labouring Classes, and the education of the workman have at various times occupied its attention; but Arts, Manufactures, and Commerce—the objects which it was established to promote—afford so wide a field of investigation, that the nature of the Society's action, and its method of carrying out the objects of its founders, can only be fully known to those who take a continued interest in the Society itself.

Meetings of the Society.—The Session commences in November and ends in June. At the Wednesday Evening Meetings during the Session, papers on subjects relating to inventions, improvements, discoveries, and other matters connected with the Arts, Manufactures, and Commerce of the Country are read and discussed, full reports of them being given in the Weekly Journal published by the Society.

The following are the dates of the Meetings for the Session 1867-8:—

1867. November...	—	—	20	27		1868. March......	4	11	18	25	
„ December...	4	11	18	—		„ April......	1	—	15	22	29
1868. January....	—	—	15	22	29	„ May......	6	13	20	27	
„ February....	5	12	19	26		„ June......	—	—	—	24*	

These meetings are free to Members of the Society, who are entitled to admit *two* friends to each meeting.

Cantor Lectures.—In addition to the Wednesday Evening Meetings, courses of Lectures, entitled "Cantor Lectures," are delivered on subjects bearing upon the Arts, the Applied Sciences, Commerce, and Industry. The Courses for the Session 1867-8 will be duly announced. These Lectures are free to Members of the Society, who are entitled to admit *one* friend to each Lecture.

Journal of the Society of Arts.—This journal, which is sent free to Members, is published weekly, and contains, in addition to the Reports of the Society's Proceedings, Reports of the Institutions in Union, and a variety of Information connected with Arts, Manufactures, and Commerce.

Library and Reading Room.—The Library and Reading Room are open to Members, who are also entitled to borrow books.

Conversazioni are held, to which the Members are invited, each Member receiving a card for himself and lady.

* The Annual General Meeting: the Chair will be taken at 4 o'clock. No Visitors are admitted to this Meeting.

Membership.—The Society consists of upwards of three thousand members. Candidates for Membership must be proposed in accordance with certain regulations, which may be ascertained on application to the Secretary. The Annual Subscription is Two Guineas, or a Life Subscription of Twenty Guineas may be paid. There is no entrance fee.

The Society is at present engaged in carrying out various objects, among which are the following:—

Education.—*Union of Institutions.*—In 1852 the Society founded its "Union of Institutions," and now has about three hundred Literary, Scientific, and Mechanics' Institutions, District Unions, and Local Educational Boards, in the United Kingdom and the Colonies, in Union with it, one of the principal objects of this "Union" being the promotion of adult education, particularly by means of examinations.

During the past year the Society has examined 1,439 candidates, in 32 subjects, and has awarded 61 prizes and 1,534 certificates.

The whole of the General Prizes are offered to female candidates on the same terms as to males; and, in many of the subjects, an additional Prize is offered to females.

Special Prizes are also offered this year by the following Companies, Societies, and individuals:—Harry Chester, Esq., in Political and Social Economy; Thomas Twining, Esq., Domestic Economy; the President and Council of the Royal Geographical Society, Geography; the Council of the Royal Horticultural Society, Botany, Fruit and Vegetable Culture, and Floriculture; the Proprietors of the *Gardener's Chronicle,* Fruit and Vegetable Culture, and Floriculture. The Worshipful Company of Coach and Coach Harness Makers also contributes to the Fund for Special Prizes. Programmes of the Examination and particulars of the Union may be had on application to the Secretary of the Society.

Musical Education.—A Committee, appointed by the Council early in the year 1865, has been actively engaged in taking the evidence of most of the chief authorities in the musical profession, and has published two reports pointing out how, in their opinion, a really national Academy of Music may be established in this country.

Art-Workmanship Prizes.—The Society is directing its attention to the encouragement of Art-Workmen, by offering premiums for works in wood-carving, modelling, repoussé and hammered work in metal, chasing, ivory-carving, painting on enamel and porcelain, marquetry, glass-engraving, &c. For the present Session, the Society offers 87 prizes, particulars of which may be had on application to the Secretary. The Worshipful Company of Goldsmiths and the Worshipful Company of Salters have contributed to the Prize Fund. The articles sent in by competitors are exhibited in the Society's Rooms, for the inspection of Members and their friends.

Paris Universal Exhibition, 1867.—Believing that visits on the part of skilled workmen to the Exhibition in Paris would not only exercise a beneficial influence upon the men themselves, but also upon the progress of industry in the United Kingdom, the Council of the Society of Arts raised a fund (to which Five Hundred Pounds was added by Her Majesty's Government), to aid a limited number of workmen to proceed to Paris, for the purpose of studying and reporting upon the Exhibition. These reports will shortly be published by the Society.

Special Prizes.—The Society is now offering Special Prizes for various objects, such as the best published treatise on Jurisprudence, the best process for Preserving Fresh Meat, the best Steam Fire-engines, the production of Fuel from Peat, the best essay on the Harvesting of Corn in Wet Seasons, &c.

Food of the People.—During the past Session the Society has been actively engaged in investigating the question of increasing the supply of Food for the People, and a Committee has been formed for that purpose. This Committee has appointed Sub-committees on Meat, Fish, Milk, Cooking and Cooking Apparatus, &c.; and much valuable information has been already collected, and published in the Society's *Journal.*

P. LE NEVE FOSTER,
Secretary.

Society's House, Adelphi, London, W.C.,
November, 1867.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday Evenings at Eight o'clock:—

NOVEMBER 27.—"On the Diplomatic and other Conferences held recently in Paris with reference to International Coinage, Weights, and Measures." By LEONE LEVI, Esq., Professor of Commercial Law in King's College, London.

DECEMBER 4.—"On the Relation between Health and Wages." By J. H. STALLARD, Esq., M.D.

DECEMBER 11.—"On Industrial and Scientific Education; with Notes on the Systems pursued, and the Works produced, in Continental Schools, as exemplified in the Paris Exhibition, and Suggestions for the Establishment of Trade Schools in England." By ELLIS A. DAVIDSON, Esq.

DECEMBER 18.—"On the Principles that Govern the Future Development of the Marine Boiler, Engine, and Screw Propeller." By N. P. BURGH, Esq., C.E.

CANTOR LECTURES.

Owing to unavoidable circumstances, Dr. Crace Calvert regrets that he will be unable to give a course of lectures before Christmas, as arranged.

The first course for the present session will be "On Art, especially including the History and Theory of Sculpture," by Richard Westmacott, Esq., M.A., F.R.S., Professor of Sculpture in the Royal Academy, and will consist of three lectures, to be delivered on Friday evenings, the 6th, 13th, and 20th December.

The second course will be "On Food," by Dr. Letheby, Medical Officer of Health for the City of London. A third course will be given.

The lectures will commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture.

SUBSCRIPTIONS.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FIRST ORDINARY MEETING.

Wednesday, November 20th, 1867; WILLIAM HAWES, Esq., F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Argles, Frank, A., J.P., Eversley, Milnthorpe.
Atwood, Josiah, 2, Lyncombe-villas, New Wandsworth, S.W.
Blagrove, John Henry, Calcot-lodge, Reading.
Blanford, Thomas, 91, New Bond-street, W.
Bostock, E., Stafford.
Boulton, William, Burslem, Staffordshire.
Brown-Westhead, T. C., Cauldon-place, Staffordshire Potteries.
Champion, Alfred J., 816, Old Kent-road, S.E.
Clark, Charles, 10 Albert-road, Regent's-park, N.W.
Conder, Edward, Kingsland-bridge, N.
Corcoran, Bryan, jun., Charlton-house, Bow-road, E.
Cottenham, Earl of, Tandridge-court, Godstone, Surrey.
Curwen, Rev. John, 7, Upton-place, Forest-gate, E.
Dartmouth, Earl of, Patshull-hall, Wolverhampton, and 40, Grosvenor-square, W.
Dawson, Thomas, Mayville, near Taunton.
Dodd, George Ashley, 40, St. James's-street, S.W.
Evens, John Harry, Rose-lodge, Castle Bar-hill, Ealing, W., and 22, Moorgate-street, E.C.
Fazakerley, S. N., 17, Montagu-st., Portman-sq., W.
Frodsham, George, jun., Change-alley, Cornhill, E.C.
Giles, George, Westfield, Bonchurch, Isle of Wight.
Gover, Charles Edward, Madras, (care of A. G. Gover, 7, Grundy-street, Poplar New-town, E.).
Griffin, Daniel, Albany, W.
Healey, Thomas, Science and Art Department, South Kensington, W.
Helsham, G., St. Mary's Hall, King's Lynn.
Hippisley, Henry, Lamborne-pl., near Hungerford, Berks
Johnson, Thomas, 32, John-street, King's-road, Bedford-row, W.C.
King, William, Gas-office, Newington-street, Liverpool.
Le Cheminant, John, 39, Queen Anne-street, W.
Lent, Richard, 41, Bloomsbury-square, W.C.
Lichfield, Earl of, Shugborough-hall, Staffordshire.
Mackinlay, John, 13, Dorset-terrace, Clapham-road, S.
McLagan, Peter, M.P., Burlington Hotel, Cork-st., W.
Munbee, Major-General G. B., R.E., J.P., Highbury-villa, Weston-super-Mare.
Nelson, George H., the Lawn, Warwick.
Nicholls, Richard, 46, Aldermanbury, E.C.
Pam, Jacob, 9, Ely-place, E.C.
Peczenik, Leon, 1, Bloomsbury-square, W.C.
Peirce, Clement James, 57, New Bond-street, W.
Phillips, David, 135, Sloane-street, S.W.
Pleydell-Bouverie, Philip, 16, Hill-street, W.
Pratt, J. Tidd, 28, Abingdon-street, S.W.
Price, Lorenzo T. C., 17, Hollis-croft, Rotherham.
Procter, William, M.D., 24, Petergate, York.
Stephens, Henry, 18, St. Martin's-le-Grand, E.C.
Van Owen, Lionel, 34, York-terrace, Regent's-pk., N.W.
Ware, James, Tilford-house, Farnham, Surrey.
Woodward, H. Toze, Blakebrook, Kidderminster.
Wright, Edwin, Constitution-hill Works, Dudley.

AND AS HONORARY CORRESPONDING MEMBERS.

Salamah Bey, Chief Telegraph Engineer, Railway Station, Cairo.
Frann, Otto, Fray Bentos, Uruguay.

The CHAIRMAN delivered the following

ADDRESS.

Through the kind appreciation, by my colleagues, of my attention to the business of the Society, I have the honour to address you on the opening of the 114th Session.

Few societies can refer to so long a period of consistent exertion. In the 114 years which have elapsed since it was founded, a great variety of subjects, having a direct influence upon the progress of the Arts, Manufactures, and Commerce of the country, have been considered by the Council, and have been brought before the public in a practical and useful form. It is not necessary for me to enumerate the many important inventions and scientific discoveries which have been first publicly explained in this room, my object in referring to them being rather to stimulate the members of the Society to continue to make exertions equal to those of past times, so that we may now, as heretofore, maintain our position as the largest body associated together for the encouragement of Arts, Manufactures, and Commerce which exists, or, indeed, has ever existed.

The field for our exertions is wider than ever; the subjects which appear specially to belong to us increase in number and usefulness year by year, and a great responsibility rests upon the Council and the Society that the opportunity it now has of widening its sphere of action should not be neglected.

The progress of trade and manufactures all over the world quite precludes us from considering the best means of promoting Arts, Manufactures, and Commerce in reference to our own country alone; and it will be my duty, after explaining the operations of the Society during the past year, to suggest more extended plans for future years, in realising which I hope the Council will receive your cordial support.

But before I enter upon the business of the Society, allow me to refer to the losses we have sustained among our members during the past year. Fortunately, our obituary among distinguished members will include but few to whose scientific character and influence over the progress and prosperity of the Society it is necessary for me specially to refer.

In Science, this Society, in common with the world at large, has lost one of its most—if not its most distinguished member—Michael Faraday. In speaking of him I cannot add a word which will convey to you a higher estimate of his eminently scientific character than you all entertain. His world-wide reputation as a man of science—the purity of his private life and character — his kindness to every one seeking his advice or assistance, raised him so high in public estimation, that no words of mine can add to the lustre of his fame. But as a private friend —as my first tutor in chemistry—as one to whose lucid teaching, so far back as in 1825—to whose anxiety to convey information to his pupils, and to whose example in patient investigation and earnest inquiry after truth I owe so much, I hope you will excuse my expressing the extreme gratification it afforded me last year to place in his hands, as your representative, the gold Albert Medal of this Society, perhaps the last in the long list of honours which scientific and learned societies in all parts of the world seemed to vie with each other in showering upon him, a presentation cordially approved by our Royal President, and the award of which was, I have reason to know, a true source of pleasure to Dr. Faraday.

It is next my duty to refer to a loss which was deeply felt by every member of the Council. I allude to the death of Sir Thomas Phillips, which occurred, as you will all remember, after only a few days' illness, towards the latter end of last Session. He had for many years taken a most prominent and most useful part in all our deliberations, and in the management of our affairs, and was well known to all frequenting this room. He filled the office of Chairman of Council for three years, and after an interval of three years was again selected by his colleagues to preside over their deliberations. He was a judicious adviser and a sincere friend, and earned, by a long and consistent course, in public and in private life, the esteem and respect of all who enjoyed his friendship.

From among our musical members we have lost Sir George Smart. He died at the age of 91, having retained his faculties, and his power of enjoying music, to the last. He studied under Dr. Ayrton, in 1780, and first appeared in public as a Chapel Royal boy at the Handel Festival held in Westminster Abbey in 1784. He was the friend of Haydn, Spohr, Beethoven, Weber, and Mendelssohn, and his advice and assistance were sought by the greatest singers and performers of more recent times. He played before Napoleon I. in 1802. He was knighted in 1811, and directed the Handel Festival in Westminster Abbey in 1834, fifty years after his first appearance as a boy at the festival held in the same place in 1784. His works, not very generally known, but which are marked by judgment and taste, have been recently published by command of her Majesty, and will probably attract more attention now than they did during his lifetime.

In education we have lost the Dean of Hereford, Dr. Dawes, who was very early in the field as an advocate of popular education. He was for several years one of the Society's Examiners in Domestic Economy, and took great interest in its proceedings.

Having thus paid our tribute of respect to our deceased members, let me call your attention to the proceedings of the Society during the past year.

There have been two committees appointed which have occupied a great deal of the time and attention of your Council—the Food Committee and the committee to which was delegated the selection of working men to visit Paris.

The evidence, printed from time to time in the *Journal*, relating to the supply and quality of the food provided for the consumption of this great city, will have put the members in possession of facts collected by an extensive inquiry among those best able to afford correct information on this important subject. From a very early period the Society has devoted much attention to this subject, by inquiries conducted by committees as in the present case, and by the offer of prizes for improvements in the breed of cattle and sheep; for a more regular and increased supply of fish; for the introduction of new vegetable products from abroad; or, as very recently, by the offer of prizes for the best means of harvesting corn in wet weather, and for preserving and bringing to this country, in sound condition, and at a price that will place it within the reach of the people of this country, the meat which is now wasted both in our colonies and in foreign states. In each of these directions the Council of the Society has been much assisted from time to time by its members, several of whom have placed funds for prizes at the disposal of the Council, and at this time a prize of £70, offered by Sir Walter Trevelyan, for the best mode of preserving meat in our colonies or other countries, so as to bring it here at a price and in a state fit for the food of the people, and to which the Society will add its gold medal, is open for competition.

This Committee, reappointed this session, and presided over by the Right Hon. H. Austen Bruce, is now meeting twice a week, and will, I trust, elicit information of permanent utility to the country. One of its first acts this session has been to seek an interview with the Home Secretary, to represent the hardship to the costermongers and the injury to the working classes which will follow any approach to a rigid enforcement of some of the provisions in the Metropolitan Streets Act, 1867, especially in some branches of trade. These provisions must have been framed by some one entirely unacquainted with the manner in which food, especially perishable food, is distributed among the poor in this metropolis. To withdraw the supply by the costermonger would be to deprive thousands of their regular and legitimate livelihood, and probably tens of thousands of the market where they now obtain the cheapest and best supply of provisions. Another of the special subjects to which it is directing its atten-

tion is the food markets of London, and, when we consider how extremely inadequate these are to the wants of our constantly increasing population, I am sure that you will feel that the Committee is most usefully employed in attempting to obtain a remedy for this evil.

The other Committee to which I referred, issued a report suggesting that, following the example of the Emperor of the French in 1862, a number of English workmen should be sent to Paris to study the French Exhibition, on the condition that each workman should write a report, to be sent to the Society, on the special industry to which he belonged; but the Council, not considering that the expense of carrying such a recommendation into effect should be borne exclusively by the Society, invited a special subscription to enable them to accomplish so desirable an object. Our Royal President contributed 30 guineas, the Society 100 guineas, and the Committee of Privy Council on Education promised £500 if an equal sum was subscribed, on the condition that the names of the workmen sent should be forwarded to the Committee of Council for approval, a condition which was complied with before the money was received.

The sum subscribed amounted to £1,030, which enabled your Council to assist about eighty skilled workmen, representing the principal industries of the country, to visit and to examine the quality and cost of the work executed in their respective trades by the best workmen of foreign countries. So eager were the workmen of London and of other seats of industry to avail themselves of this assistance, that selection sometimes became difficult; and I believe I may state that not one man was so assisted (for the Committee did not pretend to pay their entire expenses) who did not bring a recommendation from his employers, or from a number of his fellow-workmen, and in some instances from both, assuring the Committee of his fitness to undertake the task assigned to him. The endeavour of the Committee was to select men whose intelligence and knowledge of their particular trades and whose position among their fellow-workmen were such that their reports on their respective branches of industry would not only be good in themselves, but would command the attention of their fellow-workmen.

The reports, nearly all of which have been received, are now in the press, and, with a few trifling literal and grammatical corrections, will be printed exactly as they have been delivered to the Society. They will be ready for publication before Christmas, and the Council believe they will form an interesting volume, and that the result of the inquiries made by these artisans will convey a great deal of useful information to their fellow workmen in this country.

The men were received in the most friendly manner by the French workmen. They had access to many workshops, and, by means of the very intelligent body of guides and interpreters provided for them, and with the assistance of several of their own body who spoke French, they were able to obtain a very good insight into the quality of French work and the habits of French workmen. I regret I cannot illustrate these remarks by extracts from the reports, but any attempt to do so would occupy too much time.

It is gratifying to find that the conduct of the men whilst in Paris, and the intelligence they displayed in their inquiries, were so appreciated by the French authorities at the Exhibition, that they have applied for permission to translate the reports for circulation among French workmen.

The Committee received valuable co-operation from the members of the Chamber of Commerce at Birmingham, who subscribed liberally to the fund, and selected twenty-five workmen and foremen to represent the various branches of trade carried on in that district. The Chambers of Commerce of Bradford and Nottingham and the Mayor of Sheffield also afforded considerable assistance.

The success of this attempt to improve the acquaintance of our artisans with the work of those engaged in the same branches of industry abroad has been so marked, and the aid afforded has been so gratefully received by the workmen themselves, that the Council hope, ere long, to submit the report of another committee, just appointed, to consider the best mode of continuing this inquiry by working men into the state of the industries of their competitors in foreign countries generally; the intention being, if funds are forthcoming for the purpose, to send annually a small number of artizans, carefully selected, to one or more of the capitals of Europe, to study the productions of their respective trades, and report upon them. The plan is not yet matured, but is one which I have every reason to hope will tend to continue to English industry the benefits which an intelligent study of the French Exhibition by our workmen of the present day must certainly have conferred upon it.

This leads me to notice the recent appointment of a Committee to inquire into the best means of encouraging what is now styled "Technical" education, with authority to convene a conference of those interested in the subject to be held in this room, to consider how the objects proposed to be accomplished can be best promoted. And here, as I have already spoken of the long and continuous action of our Society in promoting education, I may appropriately refer to a paper published by this Society in 1765, one hundred and two years ago, upon education of this character, which appears to me specially to bear upon this very important subject. The writer says, in a letter dated August 4, 1765:—

"Let the farmer's son be taught to read well, to write a good hand, and in due time also be perfected in vulgar and decimal arithmetic; let him, moreover, be taught mensuration, surveying, and gauging; let him be instructed in the rationalia of malting and brewing, and let him besides have general ideas given him of the nature and causes of the various fermentations; let him be able to draw so well as to take the representation of a living object, or describe, in due proportion, the several parts of any machine or engine. I should also approve much of his knowing something of geometry, and should be glad to add the rudiments of botany, and as much natural philosophy as might serve to give him some idea of the nature of vegetation."

He then proceeds to remark on the deficiencies of his own education. He was greatly at a loss from not having been taught drawing, and for want of a competent knowledge of geometry and mechanics, so that when he met with a plough which might differ in some respects from any he before knew, he was puzzled which to prefer for want of understanding the principles on which it was constructed, "for certain it is that a ploughwright, to be master of his business, should be a good mechanic, for no man can be sure of giving the 'share' a true direction unless he understands something of geometry."

"As to the learned or foreign languages, I do not conceive they would be of much use to him. The old writers on husbandry he may read in English, and when anything worth attention is published on the subject abroad it is soon translated........................

"Some of your readers may, possibly, imagine that such an education cannot be acquired by every farmer's son, on a supposition that the expense would be too considerable, but this is not the case, for reading, writing, and accounts, with some branches of mathematics, should be taught in every free-school, and it would cost less to educate a son in this manner than to bring him up as an exciseman."

And he goes on :—

"Will any one be absurd enough to say, that were farmers to be so educated, agriculture would still continue unimproved?"

This programme appears to me to describe most accurately what is now called "technical education," or, in other words, an education in the knowledge of the general scientific principles which govern the operations, mechanical or chemical, of the occupation in which each person is engaged; an education which is, therefore, his best preparation for obtaining a sound practical acquaintance with his particular calling.

I will also quote two more passages on the same subject, which are as applicable now as when they were written—one by a great divine, Archbishop Cranmer, 300 years ago, and the other by Adam Smith, 100 years since.

"It was proposed three centuries ago to admit to Canterbury Grammar School none but the sons of gentlemen; 'Whereunto,' as Strype in his Memorials relates, 'the Most Reverend Father the Archbishop, being of a contrary mind, said, 'That he thought it not indifferent so to order the matter; for,' said he, 'poor men's children are many times endued with more singular gifts of nature, which are also the gifts of God, as with eloquence, memory, apt pronunciation, sobriety, and such like, and also commonly more apt to apply their study, than is the gentleman's son, delicately educated.' Hereunto it was on the other part replied, 'That it was meet for the ploughman's son to go to plough, and the artificer's son to apply the trade of his parent's vocation; and the gentleman's children are meet to have the knowledge of government and rule in the Commonwealth. For we have,' said they, 'as much need of ploughmen as any other State; and all sorts of men may not go to school' 'I grant,' replied the Archbishop, 'much of your meaning herein as needful in a Commonwealth; but yet utterly to exclude the ploughman's son and the poor man's son from the benefits of learning, as though they were unworthy to have the gifts of the Holy Ghost bestowed upon them as well as upon others, is as much as to say that Almighty God should not be at liberty to bestow His great gifts of grace upon any person, nor nowhere else, but as we and other men shall appoint them to be employed, according to our fancy, and not according to His most godly will and pleasure, Who giveth His gifts both of learning, and other perfections in all sciences, unto all kinds and states of people indifferently.' . . . . The poor man's son by painstaking will for the most part be learned, when the gentleman's son will not take the pains to get it. And we are taught by the Scriptures that Almighty God raiseth up from the dunghill, and setteth him in high authority, and whensoever it pleaseth Him of His divine providence, He deposeth princes unto a right humble and poor estate. Wherefore if the gentleman's son be apt to learning, let him be admitted; if not apt, let the poor man's child that is apt enter his room."

On the same subject Adam Smith says :—

"There is scarce a common trade which does not afford some opportunities of applying to it the principles of geometry and mechanics, and which would not therefore gradually exercise and improve the common people in those principles, the necessary introduction to the most sublime as well as to the most useful sciences. The public can encourage the acquisition of those most essential parts of education by giving small premiums and little badges of distinction to the children of the common people who excel in them."

The progress of our educational proceedings in the past year has been most satisfactory. The number of candidates for examination has very much increased. This year 2,754 candidates presented themselves for elementary examination against 1,814 last year; and for final examination 1,439 offered themselves this year against 1,097 in 1866; moreover, the papers worked have increased from 1,571 to 2,050. The first-class certificates awarded have been 343 against 203; the prizes, 61 against 52; and the examiners report most favourably on the general character of the papers worked.

The number of Local Boards at which final examinations have been held has increased from 91 to 120, and in all of them there appears to be increased activity and earnestness in their work.

The results obtained from the operation of the Society's system for encouraging young men engaged in various industrial occupations, most of whom have but just passed through their apprenticeship, voluntarily to submit to examinations of a high class, may afford some useful suggestions to assist us in giving a practical direction to the demand now arising for the introduction of that new system of education to which I have just referred.

We find, from an analysis of the list of the present or proposed occupations of the 1,693 candidates from whom returns were received, that a very large proportion of them, between 700 and 800, were persons actually employed in mechanical work, having most probably learned as apprentices, or being in the course of learning, the technical methods of working the materials and using the tools required in their respective trades, but to whom the additional knowledge of drawing, chemistry, metallurgy, light heat and electricity, botany, the principles of mechanics, and practical mechanics, mensuration, geometry, algebra, arithmetic, bookkeeping, and foreign languages (one or more of these subjects, according to the intended occupation), would be of inestimable value, enabling them to understand the nature and capabilities of the materials in which they work, the principles which should govern their application to different purposes, and affording to them, by a knowledge of mechanical and free-hand drawing, the ready means of recording or of illustrating ideas which must constantly arise in the minds of intelligent working men, when executing work under the direction, or from the drawings, of others.

We also find that out of the 1,693 candidates referred to, 1,281 were under 22 years of age, who can only, in their spare time after working hours, have entered upon and continued for two or three years successively, the severe study required to pass our examinations, from a strong conviction of the necessity of possessing knowledge to ensure their future advancement, and who certainly have no time to devote to study for the purpose of acquiring other than useful and practical information. This then, being the object of their study, we find that out of 2,050 papers only 9 have been worked in Latin and Roman history, whilst 233 have been worked in French and

English history, and 1,341 in the following subjects :—Arithmetic 520, algebra 87, chemistry 76, geography 98, drawing 325, and bookkeeping 235.

The Prince Consort's Prize has again been awarded to a student of the City of London College, William Meadows, a clerk, 19 years of age, who has taken eleven first-class certificates and nine prizes in the years 1864-5-6 and 7.

With such facts before us, we can arrive at no other conclusion than that the encouragement afforded by this Society, to working men to improve themselves, is providing annually a sound industrial and scientific education to a large number of artisans—last year numbering nearly 1,700—an education which, I believe, is producing workmen in all departments of trade of the highest order, and surpassed in no foreign country ; but with all this, there is still one branch of education of the greatest importance—that of the eye and the taste—in which we are lamentably deficient, and which cannot be provided by any examination or school instruction.

In this respect alone it appears to me that there is any real and substantial superiority in the foreign over the English workman ; and until we can admit the working classes to our museums and our galleries of paintings and sculpture on those days and at those hours when they can take their wives and children, as foreigners do, to see and become familiar with works of art of every description, and thus enable them to appreciate the beauties of form and colour, and until we can add to the number of such institutions by establishing new museums and picture-galleries in the populous districts of our large manufacturing towns, I fear it will be hopeless to expect that technical education, as it is now the fashion to call it, can raise our national taste and skill in the production of artistic works, or in the application of artistic designs to ordinary work, to the level of that possessed by foreign workmen. This education of the eye and taste must be a work of years—almost of generations, which all foreigners have long since enjoyed without trouble or expense. It has been impressed on their minds during their hours of pleasure and relaxation—their Sunday afternoons are spent in the midst of works of art, mostly of the finest taste—and every year that we lose in affording the same advantages to our industrial classes is hastening forward the time when foreign countries, which possess models of our finest workmanship, and are rapidly equalling it in execution, will surpass us, not only as they now do in taste, but in taste combined with good workmanship.

If then this Society, by first affording to young men the opportunity of studying the principles which govern the industrial operations in which they are engaged, can afterwards give to a limited number annually—say to the first-class prizemen of the year who are working men—an opportunity of visiting the principal seats of foreign industry, much will be done to remove the erroneous idea now entertained by so many working men, that employment and good wages depend on the arbitrary restrictions upon labour imposed by trade societies.

The Council hope that the reports of the artisans sent to Paris to study the French Exhibition will induce their fellow-workmen to appreciate the importance of the cultivation of that pure taste which characterises most foreign work, and that trade societies will thereby be brought to see the necessity of co-operating in the work begun by this Society, by applying a portion of their funds, as we have done, in assisting their members to obtain a knowledge of foreign industry, its capabilities and its cost, instead of applying them to the maintenance of trade regulations, the tendency of which is often to cramp the energies and intellect of their members, and to foster ideas of native superiority quite inconsistent with the efforts which must now be made if we are successfully to compete with our intelligent and industrious foreign rivals.

The Council has every reason to believe that the reports, when published, will be interesting not only to the writers' fellow-workmen, but to all interested in the progress of industry ; they will be found to contain a singular unanimity of opinion upon the deficiency of artistic education in this country—upon the want of the opportunities enjoyed by foreign workmen to cultivate their taste, and upon the superior position workmen hold in Paris to that held by the same classes in England ; and, considering that they are written by men, most of whom have never before attempted to write a report on any subject, and all of whom are actually engaged in industrial occupations, they will be found, I venture to think, in most cases, creditable to their authors, and will, I feel satisfied, be received with the consideration they deserve. They will show the public that working men do not fear fair criticism, and that they are not unwilling to admit superiority when and where it appears to exist ; and they will be specially acceptable and useful to working men as emanating from members of their own body, selected only with reference to their fitness for the work they undertook.

During the past session many interesting papers have been read at the Wednesday evening meetings, and the Society's silver medals have been awarded, and will be presented this evening, to James Fergusson, Esq., for his paper "On the study of Indian Architecture ;" to C. R. Markham, Esq., for his paper "On the Tinnevelly Pearl Fisheries ;" and to S. J. Mackie, Esq., for his paper "On the Construction of Iron Ships, and their Preservation from Corroding and Fouling."

The Gold Albert Medal, which I shall also have the honour to present this evening, has this year been awarded to Messrs. Cooke and Wheatstone for the energy, scientific knowledge, and practical skill, with which they overcame the great difficulties incidental to the successful introduction of electric telegraphy not only in this country but all over the world.

You are aware that the first Albert Medal was presented to Sir Rowland Hill, the second to the Emperor of the French, and that of last year to Dr. Faraday ; it therefore appeared to the Council that the almost natural sequence of such awards to the originator of penny postage—to the promoter of free intercourse, personal and commercial, between two such great countries as France and England, the first in arts, manufactures, and commerce in the world—and to the philosopher to whose inquiries into the phenomena of electrical science, and especially as applied to electric telegraphy, the world owes so much—was the presentation of the Gold Albert Medal of 1867 to those by whose energy and genius and by whose application of scientific principles to this most difficult subject the invention and practical application of the electric telegraph to the daily wants of commerce and social life were eminently due.

The Cantor Lectures by Mr. Chaffers and Mr. Hullah, although not, perhaps, so popular as some which have preceded them, afforded a large amount of valuable information, and attracted special audiences

interested in pottery and in the history and study of music.

The arrangements for the present session are in progress. The Council hope to secure the services of Mr. Richard Westmacott, R.A., Professor of Sculpture at the Royal Academy, to deliver a course of lectures, on some branch of the Fine Arts, before Christmas. Dr. Letheby will afterwards give a course upon Food; and the Council believe, in the third course, that they will have the assistance of Dr. Crace Calvert, who, from circumstances beyond his control, has been obliged to postpone the delivery of the lectures announced in the *Journal.*

The competition for the prizes offered to art-workmen was better this year than on any former occasion. The number of competitors was 109 against 61, and the quality of the work greatly surpassed that of last year; and our judges, Mr. R. Redgrave, R.A., and Mr. Digby Wyatt, express their gratification in recognizing that the encouragement given by the Society "to the improvement of art workmen" is at length bearing fruit.

The Musical Committee, which was appointed two years since, has been reappointed this year. Great good has been done by the publication of the evidence taken by this committee. The exact state of our Musical Institutions, and the results derived from them, have been examined and compared with similar Institutions in foreign countries, and it will now rest with the public to decide whether, as at present constituted, the Royal Academy ought to receive an increased grant from Parliament (for without it the Governors cannot meet the demands of the times), or whether a National Academy should be established on a large and comprehensive basis, which would teach and train gratuitously, a certain number of students carefully selected, and give to those who can afford to pay for their education, instruction in vocal and instrumental music of the highest order.

The Council last session endeavoured to procure an amendment of the laws relating to Copyright in Fine Art. With this object in view they had a Bill prepared for consolidating and amending the law, which at present is in a most unsatisfactory condition; but circumstances rendered it necessary to postpone its introduction into Parliament at that time. The Committee under whose superintendence the Bill was prepared has been reappointed, and the Council will take the earliest opportunity of bringing the question before the Legislature this session.

Having thus explained the progress of the business of the Society during the past year, and spoken of our proposed action in the coming session, I will now refer to the International Exhibition just closed in Paris.

The active part the Society has taken in promoting international exhibitions, from 1849 to the present time, makes it almost our duty to consider the effect produced by the changes which altered circumstances, and the desire to avoid repetition, have gradually introduced into their arrangement and management. But before I enter upon any criticism of the Paris Exhibition of 1867, I will refer to its general character as a whole. This Exhibition, then, differed from all its predecessors in having combined with works of art and industry illustrations of the customs, habits, and actual social state of almost every country in the world. The addition of a section devoted to the "Histoire du Travail," from the earliest periods to the present time, was a most happy idea. The increased interest which the inspection of these industrial and ornamental works of ancient times, and of the implements used in their construction imparted to the examination of those of our own time, can hardly be appreciated by any one who was not fortunate enough to see them. The Exhibition of 1851 was confined to works of industry and fine art in sculpture only; paintings were excluded. In Paris, in 1855, the picture gallery was one of the most attractive and interesting parts of the Exhibition, and the painters of England were for the first time appreciated by foreigners. In 1862, the picture galleries formed one of the greatest attractions and fine art asserted a supremacy which had no place in 1851. And, again, in 1867, the paintings and sculpture of all nations, so arranged that the style and merits of the various countries could be easily compared, formed the great attraction of the Exhibition.

The building of 1851—as novel as specially applicable to the purpose for which it was constructed—was destined to destruction, when the public, feeling that so useful and interesting a structure should not be destroyed, interposed, and it was removed almost bodily to Sydenham, where it now stands, affording to millions recreation and amusement of a rational character such as has never before existed. This building was not, however, imitated in Paris in 1855, but one of a substantial character was erected, insufficient to contain the works to be exhibited, but to which temporary annexes were added for machinery and mechanical appliances. The main building, having no special pretension to beauty of design, still remains. In 1862, a building, of dimensions very far exceeding those of 1851 and 1855, and capable of containing the entire collection, was provided. The picture galleries were admitted by every one to be the most perfect ever erected, but from various causes, into which I will not enter, this building, like its predecessor, was doomed to destruction. This was, however, happily prevented by its purchase and subsequent removal to Muswell-hill, where it will soon be opened, not as a rival to its elegant predecessor of 1851 at Sydenham, but as an adjunct to it in providing rational amusement for the vast population on the north side of the river. The one, in its elegant and instructive courts, exhibits and illustrates the arts of past times, while the other will endeavour to exhibit the arts, industries and national sports of the world as they now exist. But, whatever may have been the opinion of the design of the building in Hyde-park in 1851, in the Champs Elysées in 1855, or of that at South Kensington in 1862, it is difficult to say a word in favour of the erection in the Champs de Mars in 1867. It had no pretensions to architectural design—there was no beauty of proportion—no one point of view externally or internally; all that can be said of it is—and that is no slight merit—that, as a huge, well-arranged warehouse, it answered the purpose for which it was designed.

The arrangement of the Exhibition of 1867 was geographical. Each country exhibited its products in separate compartments, and in fact has made an exhibition of its own. Great advantages appeared to attend this arrangement in former exhibitions where the space separating the products of each country was not so great as almost to preclude comparison one with the other; but, in a building so large as that erected this year in the Champ de Mars, the geographical arrangement was most unfavourable to any thing like a critical examination of the relative merits of the manufactures of the various countries, and this

difficulty was increased by the close approximation in the quality of many of the articles produced by the manufacturers in the different states of Europe.

We have not yet the exact account of the sum received at this Exhibition, but it is generally understood that it will considerably exceed the expenditure incurred for the erection of the building and the expenses of its management. In 1855, there were four rates of admission—5fr., 2fr., 1fr., and 4 sous; whilst this year there has been but one rate of 1fr. and season tickets. The receipts in 1855 from the 5fr. and 2fr. rates of admission were too small to induce a repetition of those high charges; whilst that for the 4 sous rate exceeded that from the 1fr. With such facts it is to be regretted that the minimum rate was on this occasion so high as 1fr. So with us in 1851, the receipts from the 20s., 5s., and 2s. 6d., rates were together only one-fifth of the receipts from 1s.; and in 1862 the same high rates and season tickets were retained. I then advocated that a lower rate should be fixed for one or two days in the week, on the ground that it was the people—the working classes—who were really to derive instruction, practical instruction, calculated to produce a really useful result, from an inspection of the manufactures of foreign countries. The more wealthy classes had many opportunities of observing them at home or abroad; information respecting them was accessible at all times; but no opportunity like that afforded by the inspection of a great International Exhibition could arise to the great mass of working men.

I repeat, then, the observation I made in 1861, that an International Exhibition does not fulfil its duty if it does not allow the artisans of the country in which it is held to study the works of the same class in foreign countries. International Exhibitions are sources of amusement to the upper classes, but they are great educational establishments to the working classes, to whom once in a lifetime they afford opportunities of studying, not only the handicrafts of various countries and peoples, but the natural products of all countries, the great gifts of creation—of examining them and satisfying themselves that the elements of close and active competition, of which they have read but never before seen, exist not only in labour but in the natural products of the world, and that on the cheap and constant supply of them the employment of millions of people and the maintenance of our national greatness depend.

The system of prizes, to which on former occasions I have objected, has been continued in this Exhibition, and I fear has produced, in a greater degree than before, discontent and injustice. If it were difficult, nay, almost impossible, to adjudicate awards of medals—gold, silver, and bronze—fairly among 20,000 exhibitors, how greatly must the difficulty be increased when the number of exhibitors exceeds 40,000; and in considering this subject it must not be forgotten that an incorrect award not only injures all engaged in the same trade, but also misleads and deceives the public. Nothing can, I think, be more delusive than the merit claimed by medallists for superiority over their brother manufacturers who have, or who have not, exhibited; and it appears to me to be manifestly unjust that the Government, upon such slender evidence as can be afforded by the exhibitors of special specimens—often mere *tours de force*, manufactured without reference to cost or to the practical demands of trade—should award prizes through the intervention of juries, which practically give almost a patent right to the recipients of medals.

To these remarks I must add a few upon the Exhibition itself. On no previous occasion have the customs and habits of the various peoples of the world been so elaborately exhibited. We saw not only the natural products and industries of each nation, but by means of costumes, domestic implements, model houses, and modes of living and employment, we were able much more accurately than at any former International Exhibition to appreciate the exact state of the civilisation and industry of every country in the world. The vastness of the Exhibition was its greatest drawback. None but those who systematically examined it could comprehend or appreciate the treasures it contained. On only one department—that of machinery—will I venture an opinion, and well aware as I am that it will not agree with those expressed by various high authorities, I do so with respect, though still with confidence. Various letters have appeared in our *Journal*, the tendency of which has been, if not expressed distinctly, to lead the public to suppose that foreign countries have already equalled, if not surpassed us, in mechanical skill and workmanship. The writers have exaggerated the skill of foreign workmen, and depreciated that of our own. They have assumed that because the first mechanical engineers of Belgium have taken a contract for a certain number of locomotives for the Great Eastern Railway, our superiority has passed away. They also appear to assume that every man engaged in productive industry should be equally well informed, whereas everyone familiar with such matters knows this is not necessary—however desirable it may be—to enable us to maintain our superiority. I took great pains to examine the locomotives and steam engines of foreign countries, carefully looking to the finish, the simplicity, and beauty of construction, and I endeavoured to bring to my mind the respective position of similar machines of the same countries in 1851 and 1862, and I am satisfied that whilst foreign countries, starting from a very much lower point, have advanced in a greater degree since 1851 and 1862 than we have, still our pre-eminence is complete.

During the sixteen years which have elapsed since 1851 every foreign rival has had our best examples to copy. He has had free access to our manufactories, where our newest and best mechanical tools have been seen in action. It would, therefore, have been more remarkable if our rivals had remained stationary in the quality of their work, than that they should have improved as rapidly as they have done. In the same time we have had nothing to learn from abroad, and have had little more to do than to improve and perfect our models of 1851 and 1862, for who that attentively examined the machinery exhibited in those years can forget the beautiful marine engines of Maudslay and of Penn, the locomotives of Stephenson, or the stationary engines of Boulton and Watt, and others, models of workmanship not now surpassed—nay, not equalled by any foreign machinery in the Paris Exhibition of this year, and the same comparison might be made in respect of our cotton and our woollen machinery. Moreover, when we compare our exhibits with those from other countries, we must not forget that many of our most important industries were very imperfectly represented. This, undoubtedly, was our own fault; we had the opportunity afforded to us of exhibiting our finest works, but we did not use it as we ought to have done, either in fine art, in machinery, or in many branches of manufacturing industry.

To our deficiency in style in "articles de luxe" I

have already referred; the remedy by affording our workmen opportunities of forming a correct taste is in our own hands—but in considering this branch of our manufactures we must recollect the effect the rapid progress we made between 1851 and 1862 produced on foreigners, which led to a special inquiry by the French Government into the means by which it had been realised. This rate of progress, I venture to submit, has not decreased since 1862, and we have only to go on as we have done, adding thereto opportunities for the workman to improve his taste and to obtain knowledge of the principles, scientific and practical, upon which the results he has to obtain by his labour are based, and no one can doubt that Saxon energy, skill, and perseverance will now and hereafter, as heretofore, assert its supremacy.

In illustration of the appreciation by the people of the value of the privilege they enjoy in being able to view at all times the most beautiful and costly works of art in their palaces and museums, and of the confidence the French authorities place in their well-known taste and respect for such objects, the troublesome custom of taking umbrellas, parasols, walking-sticks, &c., from each visitor entering the Exhibition was dispensed with, as it is also on their entering the Louvre, the Palace at Versailles, and other galleries, and it is to be hoped that our authorities will soon be able to follow so good an example.

Reviewing, then, the impression the examination of this Exhibition has made upon my mind—considering its vast extent—its cost, not to France, for that has been repaid by the receipts from admissions, but to foreign countries—the enormous number of exhibitors, and the consequent equality of the goods exhibited—and the difficulty, indeed the almost impossibility, of obtaining exact information respecting their relative merits, by those who visited it with a view to study the actual and comparative progress of the world's industry—I can but arrive at the conclusion that it has not realised the original intentions of these undertakings; but, considered as a somewhat indiscriminate exhibition of the world's products, its industries, its customs and daily life, no previous Exhibition has approached it. Admitting this, however, I think it must be many years before another International Exhibition is attempted. Since 1851 they have been too frequent; sufficient intervals have not elapsed to show national progress; and each has become more a great bazaar, than an exhibition of the finest works of art and industry, and the rarest of the world's treasures. Whenever then, another shall take place, let us hope it will be one of selected works, and not an indiscriminate collection of all descriptions of products brought together without reference to quality, variety, or beauty.

In my previous addresses I have referred to public works and improvements in progress; but I am sorry to say that beyond recording the fact that the Thames embankment and main drainage, the two great works of our time, are progressing towards completion, I have nothing to notice. We continue to erect handsome buildings in narrow streets, where they cannot be seen, concerted action and public improvement of our thoroughfares being out of the question. Indeed, the report recently published, in which it is recommended that we should build a new House of Commons, because the present house, still by comparison quite new, is insufficient for the accommodation of its members, is somewhat humiliating.

I hope, however, before we meet next year, we shall be able to record the establishment of a museum of science and art in the east end of the metropolis. Such an institution will be of the greatest value to the artizans residing in that densely populated district, and will be due, I may add, in a great degree to the energy and perseverance of a member recently added to our Council, Mr. Antonio Brady, whose efforts in this direction have been most remarkable. I have much pleasure in adding that the Council, appreciating the importance of this undertaking, have voted one hundred pounds towards the purchase of the site for the intended museum.

The visits to Paris, which so many have made for the first time this year, will, I hope, assist in forming an intelligent and vigorous public opinion upon the question of metropolitan improvements, and that ere long we may have an administration of metropolitan affairs that will not hesitate to make improvements which will raise our metropolis in our own estimation, as well as in that of foreigners.

It now only remains for me to congratulate the members on the continued prosperity of the Society. Our financial position is, I believe, better than it ever has been; and the only thing I wish to impress upon the minds of members is that they should lose no opportunity of communicating to the Society, either for publication in the *Journal* or for the use of our weekly meetings, any new or interesting information they may possess. The Society, from its earliest formation, has relied upon its members for useful information and for active support. It must still do so, and if the members cordially co-operate with the Council, that degree of success which has existed for 114 years will, we hope, be continued into the second century of its existence.

The Chairman then presented the Prince Consort's Prize of twenty-five guineas to Mr. William Meadows, of the City of London College, who had obtained, in the Society's Examinations, prizes and certificates as follows:—

1864. Chemistry—First-class certificate, with first prize.
 ,, Animal Physiology—First-class certificate, with first prize.
 ,, Geometry—First-class certificate, with first prize.
1865. Book-keeping—First-class certificate.
1866. Navigation and Nautical Astronomy—First-class certificate, with first prize.
 ,, Principles of Mechanics—First-class certificate, with first prize.
 ,, Algebra—First-class certificate.
1867. Arithmetic—First-class certificate, with second prize.
 ,, Domestic Economy—First-class certificate, with first prize.
 ,, English Literature—First-class certificate, with first prize.
 ,, Mensuration—First-class certificate, with first prize.

The Chairman then proceeded to distribute the silver medals awarded last session as follows:—

To James Fergusson, Esq., for his paper "On the Study of Indian Architecture."

To Clements R. Markham, Esq., for his paper "On the Tinnevelly Pearl Fisheries."

To S. J. Mackie, Esq., for his paper "On the Construction of Iron Ships, and their Preservation from Corrosion and Fouling by means of Zinc Sheathing."

The Secretary read a letter from Mr. James Fergusson, expressing his deep regret at being unavoidably prevented from being present to receive his medal. A letter was also read explaining Mr. Markham's absence,

caused by the fact of his having accompanied the Abyssinian Expedition in the capacity of geographer.

Mr. S. J. MACKIE expressed his gratification at the honour conferred upon him.

The CHAIRMAN, in presenting the Albert Gold Medal, which was awarded to Messrs. Cooke and Wheatstone, for the practical introduction of the electric telegraph, not only to this country, but to every country in the world, expressed his regret at the absence of Professor Wheatstone, and remarked that the Council of the Society, under the regulations which govern the adjudication of this medal, could only award one medal annually; but under the special circumstances of the introduction of the electric telegraph, which was due to the joint labours of Messrs. Cooke and Wheatstone, the feeling of the Council was that it was within their province to award, not two medals, but one medal given in duplicate; this course had therefore been taken. It was a cause of just pride to this country that we should have been the first to introduce this discovery to the world, one fraught with such inestimable blessings to mankind. It was a special gratification to him to be the medium of presenting this medal to one with whom he had been long on terms of close personal friendship, for in the year 1837 Mr. Cooke exhibited his first electric telegraph in his (the chairman's) own drawing-room. He now begged to present to Mr. Fothergill Cooke the Albert Gold Medal of the Society.

Mr. FOTHERGILL COOKE said he could not accept this award in silence. It was one of the highest honours that could be conferred upon any individual, associated as it was with the name and the memory of one who was for so many years President of this Society, and who was so much beloved for his personal goodness, and for the warm interest which he ever took in all that tended to the benefit of this country. They knew very well what the late Prince Consort was to this Society, and anything associated with his name must be especially valued. He received this medal under peculiar circumstances, because it was before this Society he first publicly exhibited the electric telegraph in operation, and from time to time he had had the honour of submitting papers to them on the subject, therefore any award from this Society would always have a peculiar value to him. Moreover, he felt not a little proud of having his name placed in the same roll of honour with those of Sir Rowland Hill and Professor Faraday. The Chairman had mentioned this evening that it was in this country the electric telegraph was first introduced. He hoped that would not be forgotten, for, besides being an individual source of gratification to himself, he hoped the nation would one day feel proud of having set the example in this respect to the other countries of the world. He returned his grateful thanks for the high honour which had been conferred upon him.

Proceedings of Institutions.

CITY OF LONDON COLLEGE.—On Thursday evening, the 7th November, the prizes and certificates gained at the annual examinations of this College and of the Society of Arts were distributed. The chair was taken by Mr. Alderman Finnis, and the Right Hon. Sir Stafford Northcote, Bart., M.P., distributed the prizes. The Rev. J. Maskell, the hon. secretary, read the sixth annual report, congratulating the members upon the continued prosperity of the Institution. Although it has been a period of considerable commercial depression, the average of members has been well sustained, and their interest in the work of the classes evidenced in the most encouraging manner. The average number of students during the year exceeded 840; and the average number of vouchers issued, to enable many of these students to join several classes, amounted to 1,050. Of the zeal and industry of the members, ample proof is furnished by the results of the various examinations. Although a smaller number of candidates offered themselves for examination, both at the Society of Arts and at the College, yet the proportion of prizes and first-class certificates is equal to that of any previous year. Out of the 61 prizes awarded by the Society of Arts, 11 were won by this Institution. These results will be better appreciated when it is understood that 1,439 candidates from all parts of the kingdom, of whom 57 were students from this College, competed for these prizes; also, that out of the 339 first-class certificates awarded, the College obtained 33. The College has acquired additional lustre by obtaining, for the third time, the Prince Consort's Prize of twenty-five guineas. This, which may justly be regarded as the blue riband of the Society of Arts, was awarded this year to Mr. W. Meadows. Upon information of this being communicated to the Queen, as patron of the College, Her Majesty was pleased to express "the greatest satisfaction at the marked success of the City of London College." The result of the examinations conducted by the hon. examiners of the College has also been very encouraging; sixty-three candidates presented themselves, and of these thirty-one obtained first-class certificates, nineteen second-class, and twenty third-class. Prizes were obtained as follows:—Arithmetic, W. Spiers; Book-keeping, J. Moles; Free-hand Drawing, J. K. Elliott; Geography, W. Spiers. The Annual Scholarship of £10, with free admission to the College for one year, allotted to the student who obtained the highest aggregate number of marks in any three of the subjects of examination—W. Spiers. The Greatorex Prize of £5, for proficiency in modern languages—J. E. Huntsman. The Lowth Prize of £3, allotted to the student who has attended the classes most regularly in three of the subjects of examination, provided he obtained two first-class certificates, and his conduct and character be unimpeachable—J. T. Medhurst. The English Essay Prize (subject, "Co-operative Societies") of £2—J. H. Ingram, J. B. Muir, *Æq.* The Goethe German Essay Prizes of £3 and £2, founded by the Professor of German, Dr. Zerffi, for the encouragement of the study of that language—T. Abbott, 1st prize; 2nd prize not awarded. The Thompson Prize of £5, for proficiency in arithmetic and book-keeping—W. Spiers. The Principal's Divinity Prize of £3 3s.—T. E. Skuse. Two classes of the College are now in connection with the Science and Art Department at South Kensington, viz., chemistry and drawing. Students from these classes were presented to the Government examinations held last spring, and passed with great credit to their instructors. The council desire particularly to allude to the success of Mr. Archibald Liversidge, who has obtained from the Government Examiners a Queen's scholarship, nine first-class and four second-class certificates, in addition to a gold medal for mineralogy, and a bronze medal for inorganic chemistry. So much of the credit of this success is due to the zealous and accomplished teacher of chemistry in this Institution, the Rev. Burford W. Gibsone, M.A., B.Sc., that the council desire, with special and grateful emphasis, to make this announcement. The balance-sheet shows a deficit of £57 0s. 2d. on the year's working, but this must not be attributed to the failure of any one essential department of the College, but may be regarded, perhaps, as a testimony of increased educational success. It has arisen partly from the loss of sub-lettings and partly from the employment of a more popular, and therefore a more expensive, class of lecturers. The council are not encouraged, by any adequate amount of public support, to pursue this system of paid lecturers, and will probably be compelled to fall back upon the old system, since, in their experience, professional lecturers of great repute can only be engaged at a considerable loss to the funds of the College. The College is now firmly established, and on all hands acknowledged to be a success.—The Chairman moved the adoption of the report, and congratulated the

meeting upon its extremely satisfactory character. The proposition having been agreed to, he introduced Sir Stafford Northcote, who distributed the prizes and certificates to each of the successful students who had gained them, their names having been first called by the Rev. R. Whittington, the Principal of the College.—The ceremony being over, Sir Stafford Northcote addressed the meeting at length. He expressed the great pleasure he felt in being permitted to witness such a picture as that which the meeting presented. He was not previously aware that the City possessed an institution which conferred such benefit upon so large a body, and that could effect such gratifying results in the way of education. All men's minds were turned just now to the consideration as to how the people were to be educated, and amidst the different schemes and systems propounded those most interested were puzzled which to accept. Out of this chaos, however, there must eventually be evolved a system that would prove acceptable to all. In the meantime we were not standing still, and such institutions as the City of London College afforded the means for the acquirement of that mental culture which was desirable for all.—The Rev. C. Mackenzie proposed a vote to the Society of Arts, which was seconded by Mr. J. P. Gassiot, F.R.S., and carried. —Mr. Harry Chester, as a vice-president of the Society, acknowledged the compliment, and expressed his belief that education must sooner or later be made compulsory. —Archdeacon Emery, Mr. Alderman Cotton, the Rev. Mr. Freemantle, Mr. R. N. Fowler, and other gentlemen having spoken, the proceedings terminated with the usual compliment to the Chairman.

THE ECOLE CENTRALE D'ARCHITECTURE AT PARIS.

On the evening of the day of opening the session, 11th inst., already reported briefly in the *Journal*, a banquet was given at the Grand Hôtel, in honour of the South Kensington Museum, represented by Mr. Henry Cole, the director, Mr. R. Thompson and Mr. Owen, assistant directors, which was attended by M. Emile de Girardin, M. Guerault, M. Arles Dufour, Baron Lesseps, M. Martin, M. Viollet le Duc, M. Christofle, M. Trelat, and about eighty other gentlemen connected with the Arts. The dinner was a very handsome one. Mr. Cole's health was drunk, with success to the Museum; and speeches were made by M. E. Girardin, M. Arles Dufour, M. Trelat, M. Viollet le Duc, Mr. Cole and Mr. Philip Owen. At the opening of the Session of the School, Mr. Cole delivered his *discours* in French. The following is a correct version in English. It contains some points of principle which seem worthy of preservation for the consideration of members:—

Gentlemen,—Readers of the Bible at the Exhibition —thanks to the Emperor—you know well that no man is a prophet in his own country! If the South Kensington Museum were animate, it would express surprise and thanks for your gracious recognition of it to-day, for in its own country it has to fight for its existence. Parliament pays for it, but discusses it stoutly, which is wholesome. An ignorant public, it is true, flocks with pleasure through its galleries, but our high priests of architecture in England crucified the author of the plan of its building—Captain Fowke—yet the International Jury at your Exhibition gave a gold medal of the first class to him! Among friends as you are of this museum, you will tolerate a few words in bad French about it, even from one who is no architect. I ask myself why have you done me this honour, and I fancy that I trace the reason in some analogy which exists between your Ecole Centrale and my museum at Kensington. I think we, in London, are working out in practice the theoretical principles you teach here. If I am right, I think you regard construction as the backbone of a building, so do we; you consider the wants which the building is to supply as a first principle, so do we; you consider the nature of materials as regulating form, so do we; then you proceed, and not till then, to consider decoration, so do we; you make decoration subordinate to construction, so do we at Kensington. Is it a heresy to do so? The wants of a public museum, frequented by thousands of blouses and fustian jackets, differ from those of a religious temple, whether Egyptian, Greek, or Roman. They are not those of a cathedral or church, reformed or not reformed. They are not those of a fortification or macchicolated tower; and not those of a monarch's palace, or noble's chateau. Museums are a sort of modern socialistic building, where the floors are level for all, and there is no daïs; and the architecture of past ages does not offer many precedents for the arrangement of them. London has not the bright climate of Paris, and, therefore, it is our aim to give our museum all the light of heaven possible. Having secured the light, we regulate its quantity by blinds. It is easy to stop out light, but not to make it! We have to provide heating on a large scale, and we use kilometres of steam pipes not over-heated. Thus early in our infancy we light up 14,000 gas burners in the evening, and expect to grow to the use of 40,000. We ventilate by means of the primitive principle of introducing plenty of fresh air, warmed or cooled, according to the season, and letting out the vitiated air at the roof. We use red brick and terra-cotta; for London has not the beautiful stone of Paris, which cuts like cheese; and terra-cotta, if properly baked, resists atmospheric influences more than granite. You may recollect an archway and some brickwork in the Exposition, to which the despotism of logical classification at last assigned a place in the machinery gallery. We have had the honour of presenting them to the Conservatoire des Arts-et-Métiers, where they will be re-erected in the garden. We follow at Kensington the example you set us in Paris, of daring to use iron to support roofs and floors. We even show iron girders, and decorate them with gilding. On the walls we place majolica, and mosaics of earthenware tesseræ, to which I beg leave to call your attention as a novelty, furnishing ready means of making wall pictures durable till the end of the world. Gentlemen,—if you will defy the terrors of the Manche, and have faith in all remedies against sea-sickness, and visit the Kensington Museum, it will delight us to act as your pioneers there, when I hope you will find that we are true to the principles of sound architecture, so ably instilled by the Ecole Centrale d'Architecture. Perhaps you may find there some useful suggestions, which you will accept in return for the remarkable specimens of studies which you have allowed us to acquire from your school. To me it seems that both architecture and many other things are, now-a-days, in a period of transition. Architecture is not studied in the cloister for buildings for the priesthood. It is not practised merely for the warrior or his fortresses, or for the monarch's palace; it has to administer to the wants of a civilised democracy all over the world. It can only advance when guided by common sense, scientific knowledge, and artistic inspiration, practised with all humility and devotion. May M. Haussmann continue to spare the peaceful gardens of the Ecole Centrale, —which remind me of the gardens of an old monastery, —for a long time, to promote studies so elevating, useful, peaceful, and conducive to man's happiness as yours are. Gentlemen students,—I have the pleasure of stating that your director permits me to offer a prize, for the next session, to that student who shall make the best study of the human figure. The prize will be awarded by the students themselves.

Fine Arts.

Artistic Courtesy.—French as well as English artists found great difficulty in obtaining the loan of works which had passed out of their hands for the gallery of

the late universal exhibition, and consequently many artists of both nations were most inadequately represented. Meissonnier was fortunate enough to obtain the loan of a very considerable number of his best works, and few artists were so completely represented. When the exhibition was closed, the pictures were of course returned to their owners, and, in each case, not only with a letter of thanks, but also an original sketch from Meissonnier's own hand. The idea was a happy one, and deserves to be recorded.

Manufactures.

Test for Alkalies.—A new and highly sensitive reagent for alkalies and alkaline earths has recently been discovered by Professor Böttger, in the leaves of *Coleus verschaffettii*. The reagent is prepared by digesting the fully-developed leaves of this plant in alcohol, and impregnating slips of Swedish filtering paper with the solution obtained. This test-paper is of a beautiful red colour, which becomes green under the influence of an alkali or alkaline earth. It is not affected by free carbonic acid, so that it may be used for detecting traces of carbonate of lime in water.

Regulating Watches in Switzerland.—At Neufchatel, in Switzerland, is an observatory organised on an extensive scale, and provided with the very finest instruments. Besides purely scientific results, it renders immense service to chronometer makers by enabling them to produce watches which are every day becoming more perfect. This is important to the branch of industry in question, which can only exist by constant improvement. Prizes are given to makers whose watches or chronometers approach as nearly as possible to perfection. To give an idea of the wonderful precision that has been obtained in this branch of industry, a marine chronometer, lately tested, gave the mean variations from day to day, in two months' trial, sec. 0·164. Common watches become more perfect every year. On 67 watches tested since 1866, the mean variation was only ¾ of a second in 24 hours.

In 1862	the mean variation	was	sec.	1·61
„ 1863	„		„	1·28
„ 1864	„		„	1·27
„ 1865	„		„	0·88
„ 1866	„		„	0·74

On more than three quarters of the chronometers observed in 1866, the mean variation was less than half a second. These practical results show the importance of such observatories as that of Neufchatel.

Commerce.

The State of Commerce in Italy.—The imports for the year 1865 amounted to 965,173,672 frs. (£38,606,947), and the exports to 558,285,576 frs. (£22,331,425). As regards imports, the most important items are those for silk stuffs, 168,500,000 frs. ; cereals, grain of every sort and flour, for 150,000,000 frs.; colonial produce for 128,250,000 frs.; cotton goods, for 106,000,000 frs.; woollens, for 84,250,000 frs. ; metallic goods, for 60,500,000 frs.: hardware, 44,000,000 frs.; hides, for 29,000,000 frs.; flax and hemp, 21,500,000 frs.; timber, 20,000,000 frs. ; tallow, and other fatty matters, 16,000,000 frs.; earthenware and glass, 15,500,000 frs.; tobacco, 15,500,000 frs.; and 15,250,000 frs. for fish. The principal items in the export trade of the kingdom are silk, 149,000,000 frs. ; wines, oils, &c., about 115,000,000 frs.; grain, 44,000,000 frs.; stone, marble, earths, &c., 41,000,000 frs.; flax and hemp, 26,250,000 frs.; fruits, seeds, vegetables, and plants, 67,000,000 frs.; cotton, 9,250,000 frs.; timber, 9,000,000 frs.; paper and books, nearly 7,000,000 frs. England and France are the only two countries which dispute with Italy the supremacy in her markets. The duties on imports and exports amount to 62,760,000 frs.; the tariff of 6·36 per cent. has been reduced to 4·03 per cent. The extent of coast line of the kingdom of Italy is estimated at about 3,360 English miles. The total tonnage of 17,048 sailing and steam vessels, which constitute the merchant navy of Italy, amounted to 722,263 tons; in 1865, 65,727 vessels were entered at the ports of the kingdom, including those of the Venetian provinces, and 18,048 were cleared with cargoes for the various ports of England, France, Austria, Russia, Turkey, Spain, and Roumania. These figures will give some idea of the state of Italian commerce, and will show the immense importance of developing especially the industries and manufactures of the country, so as to be able to compete with England and France, at least in her own markets.

The Production of Coin in Italy.—The quantity of money coined at the three Mints in Italy, from 1862 to 1865, amounted to the value of 331,961,292 francs (£13,278,452 sterling); of this 175,511,850 francs were gold, 128,449,442 silver, and 28,000,000 copper; of these, 86,081,854 francs were coined at the Mint of Milan, 31,477,426 at Naples, and at the Mint of Turin 214,402,191 francs, whilst during the same period 35,248,068 francs were coined at Venice. The total amount of money coined in the whole of Italy, from the beginning of the present century, amounts to 1,507,371,205 francs (£60,294,848 sterling). The value of buildings, machinery, motive power and implements, constituting the four above-mentioned mints, amounts to 2,189,557 francs; 534 persons are employed in these mints at an annual expense of 428,553 francs per annum.

Monthly Progress of Mont Cenis Tunnel.—According to the usual monthly statement of the progress made in the Mont Cenis Tunnel, published by the Italian Government, the length of boring during the month of October was 131·85 mètres, of which 71·20 mètres were on the Italian side at Bardonnèche, and 60·65 mètres at Modane, on the French. The position of the tunnel up to the 31st October is as follows:—

	Mètres.
Total length of tunnel	12,220·00
„ boring	7,664·10
Remaining to be done	4,555·90

During the first ten months of the present year, the progress made in the tunnel has been 1,329·56 mètres, whilst on the other hand, during the whole of last year, the progress made was only 1,024·99 mètres. The boring at the southern end advances more rapidly than at the north. Up to the 31st October, the progress made at the south was 4,640·10 mètres, whilst at the north end only 3,024 mètres have been bored. From the steady progress made every month, it may safely be predicted that in 1870 this great work will be completed.

Colonies.

The last Settlement formed in Queensland is Burke Town, at the head of the Gulf of Carpentaria, and, according to the latest news, it is thriving.

Banking in Victoria.—A return, published by the Registrar-General of Victoria, shows that the total deposits held by the banks amount to £5,301,500 12s. 8d., showing an increase of £1,000 since last year. The total amount of liabilities is £9,746,575, and of assets £14,885,354. The amount of notes in circulation for the year 1866 is £1,211,887, and the coined money £1,377,645. The total number of depositors at the savings' bank at the close of the year ended June, 1866, was 16,985, and the amount deposited £642,028. There were 6,101 new accounts opened, and 7,064 accounts closed.

The Labour Question in Queensland is receiving more and more attention. Many who are contemplating sowing cotton extensively, are beginning to cast about for the necessary labourers to pick it by-and-bye, and a general uneasiness is felt on the subject. From all parts of the colony increased emigration is much wished for. In the north it seems to be felt that the only sort of remedy will be the introduction of coolies or South Sea islanders. In the southern portion of the colony, however, the demand is for the introduction of agricultural labourers from home. A great want of farming hands is already felt, and good ploughmen cannot be got in sufficient numbers.

Notes.

Selling Food by Auction.—The mode by which all kinds of perishable goods, consisting of poultry, fish, meat, fruit, and provisions, are disposed of in the Paris and continental wholesale markets is by auction, which method has been commenced by Messrs. Browne, of Newgate-street, whose very large supplies compel them, in consequence of the frequent late deliveries by the railways, to have recourse to this plan to effect sales to enable them to make returns to their consignees. Mr. George Brooke, their manager, has been over to Paris, and it is under his hammer that the new system was inaugurated.

A Deaf and Dumb Bachelor of Sciences.—A pupil of the Deaf and Dumb Asylum, of Paris, has just obtained the degree of bachelor in Science, the first case on record.

Rock Salt.—The Prussian Government has been recently making active researches in the kingdom to discover fresh mines of rock salt. The borings, executed under the orders of Count d'Itzenplitz, Minister of Commerce, have now led to the discovery of a rich deposit of that mineral near Sperenberg, to the north of the Lake Krummsee, at a distance of twenty-two miles from Berlin. The salt is found at a depth of 300 feet from the surface.

South London Working Men's College.—This college is intended to offer to working men in South London an education of a high character, by means of classes in languages, mathematics, and physical science, together with lectures on history, politics, moral and social science, &c. There willl be also, in connection with the college, a night school (for men only), a day school for boys and girls, and afternoon classes for women. The college is to consist of six classes of members:—1. Ordinary students. 2. Certificated students: those who have gained at least one certificate in some subject, as algebra, Latin, &c. 3. Scholars—those who have passed a satisfactory examination in one branch of study, as mathematics, physics, &c. 4. Associates—those who have gained two certificates, and also passed a satisfactory examination in Bible history, English history, arithmetic, and English grammar. 5. Fellows—those who have been elected by the Council from among the associates on account of their moral qualities, and their willingness and ability to take part in the college teaching. 6. The Council, or governing body of the college. Every alternate vacancy in the Council will be filled by the election of a fellow. The college is expected to open immediately after Christmas. Particulars of the classes, school, &c., may be had from the Hon. Sec., William Rossiter, Tottenham, N.

Correspondence.

Society of Antiquaries, London,
November 13th, 1867.

The Initials F.S.A.—Sir,—Would you have the kindness to call the attention of your governing body to the following resolution, passed at the last meeting of our council, Earl Stanhope, president, in the chair:—"It having been represented to the council that several members of the Society for the Encouragement of Arts and Manufactures, &c., have appended to their names the initials F.S.A., and thus led to a confusion between the 'members' of that society and the 'fellows' of this, the secretary was instructed to call upon Mr. Le Neve Foster, secretary to the aforesaid society, and invite his attention to the inconvenience of this practice." Hoping some measures may be taken by your council to deter your members from adopting initials to which they have no title,—I am, &c., C. Knight Watson, Secretary.

P. Le Neve Foster, Esq.,
&c., &c.

*** The secretary begs to inform members of the Society of Arts that, neither by the charter, by the bye-laws, nor by custom, is there any authority for their placing the letters "F.S.A." after their names.

The Postal Telegraph.—Sir,—It will be satisfactory to those members of the Society, and of the chambers of commerce connected with it, to be informed that her Majesty's Government has adopted the principle of a telegraphic post, and that a Bill is to be submitted to Parliament to purchase the interest of, or to make fair compensation to, the trading companies for their outlay and plant. It is proposed that the maximum rate of general messages for twenty words chargeable for a telegraphic message shall be one shilling. But it is to be borne in mind that, for the reasons I explained in my paper, from the closer proximity of the postal stations, which will be eight or nine to one of the ordinary telegraph stations, the reduction of the time and charge of any special foot messengers will be considerable. Though it is proposed that the post-office shall be restricted to a maximum charge of a shilling for a message of twenty words, it is proposed that the postal authorities shall be entrusted with the discretion of adopting such minimum charge as they shall deem expedient. I hope that the facts may be in due time considered for warranting the exercise of that discretion in beginning where Belgium has successfully ended, in the half-franc message, *i.e.*, in England at the sixpenny message, at all events for large and populous districts, for in Paris the half-franc message has brought a large increase of the net return. I believe that where a change of habit is to be produced, especially in slow districts, and with the lower classes, the best speed will be attained by the highest stimulus of the lowest charges applied in the first instance. Apprehensions are expressed that a general postal telegraph system will not accommodate, or may impede, separate means of telegraphic communication by large manufacturing or commercial establishments, or by private individuals, now in course of extension. On the contrary, as the postal service now admits of private letter-boxes for large firms, in manufacturing towns, it may do all that is now done in telegraphic communication for such firms, or for private individuals, by trading companies, and more. It may allow participation in the public service, and care of private means and lines at a lower rent for the service than it can be given for separately. The manufacturer or the merchant may have a wire of his own, from his private house in the suburb to the next postal station, and he may telegraph to that station—"Put me in communication with my office, or my works;" whereupon his line would be "switched on" to the telegraph line, and to his private wire at the other end, and he would be signalled that he may go on communicating, in cipher if he likes. In large towns, and under many circumstances, I apprehend, separate wires may be given for branch banks, or to shipping establishments, or newspapers. In short, everything now in progress may have a more ready. economical, and complete development, more ready and complete, even, than at present on the Continent. I take the opportunity of mentioning, as a point of special interest to members of the Society, that some protectionist restrictions on the conveyance of samples or specimens by post

have been withdrawn, so that up to 24 oz., at a charge of twopence for every quarter of a pound, or fraction of a quarter of a pound; a commencement, though a slow one, may be said to be made in a parcel post.—I am, &c., EDWIN CHADWICK.

Richmond, Surrey.

MEETINGS FOR THE ENSUING WEEK.

MON......R. Geographical, 8½. 1. Letter from Dr. Kock: Fresh News regarding Livingstone. 2. Mr. A. S. Bickmore, "Journey through Central China from Canton." 3. Mr. J. Collinson, "Surveys in Nicaragua."
Actuaries, 7. 1. Mr. Samuel Brown, "Report on the Sixth International Statistical Congress at Florence." 2. "Memoir on Instrument for furnishing the D numbers to four figures each, in two Joint Life Annuity Tables, on any basis."

TUES ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Continued discussion upon Mr. Byrne's paper, "Experiments on the Removal of Organic and Inorganic Substances in Water."
Ethnological, 8. 1. Sir John Lubbock, "On the Origin of Civilisation." 2. Major R. Stuart, "On the Vlakhs of Mount Pindus."

WED ...Society of Arts, 8. Professor Leone Levi, "On the Diplomatic and other Conferences held recently in Paris with reference to International Coinage, Weights, and Measures."
Archæological Assoc., 8½.

THUR ...Antiquaries, 8½.
Zoological, 8½.
Philosophical Club, 6.
Mathematical, 8.

SAT ......Royal, 4. Annual General Meeting.

Patents.

From Commissioners of Patents' Journal, November 15th.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—3112—T. Wingate, jun.
Armour plates—3019—F. M. Smith.
Axles—3071—J. Watkins.
Bags, dressing, &c.—3007—T. Stennett.
Barley, pearl, decorticating—3073—D. Sykes.
Boiler tubes, cleaning—3059—Rt. Hon. J. Earl of Caithness.
Boilers—2929—J. Seward and H. Smith.
Boilers—3070—I. Kendrick.
Boilers—3094—C. Riley.
Boilers—3122—W. E. Newton.
Boilers, preventing incrustation in—2997—C. W. Harrison.
Boilers, preventing incrustation in—3051—G. Davies.
Books, counter-check—3096—J. Fraser and G. Duncan.
Braces, looped fabric for—3114—S. H. Foster and T. Bunney.
Brushes—3089—J. J. Hicks.
Buildings, &c.—3080—S. Parr and A. Strong.
Cables, &c., twisting and coiling—3045—E. T. Hughes.
Cap frames for spinning worsted, &c.—3053—J. Feather.
Carpet linings—3005—W. R. Lake.
Carriages—2993—H. Ritchie.
Cases for packing bottles—3085—A. G. Avenell.
Cisterns, preventing effluvia entering—3047—W. Bishop and B. Burningham.
Coal, &c., machinery for getting—3076—J. Sturgeon.
Corsets—3088—R. Parry.
Corsets, &c.—3118—E. C. Vine.
Digging machines—3067—O. C. Evans.
Distilling apparatus, &c.—3072—A. Chaplin.
Drawer suspenders and brace fastenings—3074—F. Tew.
Dye, blue—3064—W. S. Dixon.
Evaporators—3031—W. E. Bourran.
Fabrics, doubling, &c.—3093—J. Orr.
Fabrics, linen and cotton—2738—A. Ward and C. G. Virgo.
Fabrics, ornamental—2985—J. Thom and A. Maclure.
Fabrics, removing knots, &c., from—3011—B. Cooper.
Fibrous substances, machinery for spinning, &c.—3063—W. Hall, J. Wren, and J. Brandwood.
Fire-arms, breech-loading—3075—R. B. Roden.
Fire-arms, ordnance, &c.—3039—The Hon. H. G. P. Meade.
Food-preserving, &c., exhausting the air in vessels for—3069—W. R. Lake.
Furnaces—3035—J. Glover.
Gaiters—2921—J. Hale.
Gas—2989—G. Olney.
Gas, &c., lamps, shades for—3084—J. Scott.
Gates—3083—W. Darcey.
Glass, ornamenting—2983—H. R. St. Martin.
Gunpowder flasks, &c., filling—3078—G. Haycraft.
Hats and caps—3077—H. and G. S. Hunter.
India-rubber, &c., substitute for—3108—W. R. Lake.
Kilns—2991—H. Adcock.
Lace—3033—C. E. Brooman.
Lace—3091—T. B. Cutts and F. W. Brooksbank.
Lace, &c., machines—3103—T. Wright and I. Fox.
Leather, joining—3097—W. Dickinson.
Levels—3017—W. R. Lake.
Light, artificial—3105—J. Kidd.
Locomotives—3023—W. Kendall.
Looms—3013—R. Carter.
Looms—3081—J. Wright and M. B. Nairn.
Looms—3098—R. Ackroyd and G. Hodgson.
Marking materials, &c., holders for—3015—W. E. Wiley.
Matches—3016—R. M. Letchford.
Mats and matting—3092—W. Cooke and W. Francis.
Mattresses, feather beds, &c.—2956—J. Clapier.
Motive-power—2995—A. M. Clark.
Motive-power—3021—J. Brooks.
Motive-power—3066—J. T. Caird and S. Robertson.
Motive-power—3090—A. M. Clark.
Paper, preparing for drawing, &c.—2844—T. Nelson.
Photographs, &c., colouring—3057—F. Piercy.
Pianofortes—3079—J. Gilmour.
Postage stamps, &c., manufacturing—3009—A. M. Clark.
Pumps—3027—W. Payne and A. B. Fraser.
Pumps—3062—R. Clegg.
Reaping and mowing machines—2905—D. Pidgeon & W. Manwaring.
Screw propellers—3061—C. and J. Jobson.
Sea-sickness, apparatus for preventing—2602—H. A. Bordin.
Seed, &c., machine for dropping, &c.—3043—G. W. B. Edwards.
Sewing machines—2687—W. Winter.
Sewing machines—3106—A. V. Newton.
Ships, applying metal sheathing to—3095—W. Day.
Ships of war, &c., plating—3003—G. J. Günther.
Shuttles—3100—R. Baguley.
Smoke, consuming, &c.—2987—J. Ellison and J. Stirk.
Soil, excavating, &c.—3049—W. P. Savage.
Spoons, forks, and ladles—3037—T. Bennett.
Steam generators—3025—A. M. Clark.
Steel or iron plates, covering with copper—3107—W. E. Newton.
Stone, &c., preserving—2919—J. Cubitt.
Tobacco pipes—2963—C. Ritchie.
Upholstery or furniture springs, cap for—3068—W. R. Lake.
Valves—3055—J. B. Fenby.
Whips, canes, &c., holders for—3058—J. H. Johnson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Sewing machines—3192—G. T. Bousfield.
Street tramways—3143—C. H. Bright.
Type-setting machines—3164—G. T. Bousfield.
Workmen's dwellings—3141—E. Sephton.

PATENTS SEALED.

1451. C. E. Brooman.	1490. H. A. Dufrené.
1455. J. Denis.	1497. V. Barford and J. Skerman.
1457. H. Peel.	1499. W. M. Cranston.
1459. A. Angot.	1500. D. Thomson.
1463. W. R. Lake.	1504. J. Gough.
1464. W. R. Lake.	1534. A. M. Clark.
1465. W. R. Lake.	1549. C. Sanderson.
1467. S. Regan.	1555. A. M. Clark.
1474. J. T. and E. J. Bland and T. Brevetor.	1560. H. B. Barlow.
	1582. A. M. Clark.
1485. J. L. Norton.	1611. M. A. F. Mennons.
1486. J. L. Norton.	1641. J. Inshaw.
1488. J. Bottomley.	1660. B. Templar.
1489. T. McComas.	2274. M. Jones.

From Commissioners of Patents' Journal, November 19th.

PATENTS SEALED.

1487. T. Metcalf.	1557. W. Ryland.
1498. E. Young.	1565. P. A. J. Dujardin.
1502. J. Davies.	1569. H. Pether.
1509. C. H. Thurnham.	1578. H. and F. C. Cockey.
1511. W. F. Henson.	1599. W. E. Newton.
1513. A. Barclay.	1608. W. E. Newton.
1515. O. Wassermann and J. H. Herbst.	1609. W. E. Newton.
	1623. P. Lawrence.
1516. J. Mabson.	1624. A. M. Clark.
1520. J. Hargreaves & T. Robinson.	1645. T. Laidlaw.
	1689. J. C. Ralston.
1528. A. A. Hely & J. Marshall.	1752. W. E. Newton.
1538. T. G. Green.	2002. W. Andrews.
1544. T. W. Helliwell.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2828. T. Jones.	2848. P. Lachèz.
3205. A. V. Newton.	2850. J. Bullough.
2819. C. Martin.	2862. J. Aubin.
2920. G. M. Bayelt and J. E. Vigoulète.	2875. H. Wilson.
	2858. M. Destrem.
2884. M. Henry.	2869. R. G. Grimes.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2788. R. W. and J. Waithman.	2792. J. S. Crosland.
2789. R. Furnival.	2802. A. Henry.
2935. J. A. Fanshawe and J. A. Jacques.	2855. W. and E. Cope and W. G. Ward.
3150. W. Clark.	3138. J. Chatterton & W. Smith.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 29, 1867.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at Eight o'clock :—

December 4.—"On the Relation between Health and Wages." By J. H. Stallard, Esq., M.D.

December 11.—"On Industrial and Scientific Education; with Notes on the Systems pursued, and the Works produced, in Continental Schools, as exemplified in the Paris Exhibition, and Suggestions for the Establishment of Trade Schools in England." By Ellis A. Davidson, Esq.

December 18.—"On the Principles that Govern the Future Development of the Marine Boiler, Engine, and Screw Propeller." By N. P. Burgh, Esq., C.E.

Cantor Lectures.

Owing to unavoidable circumstances, Dr. Crace Calvert regrets that he will be unable to give a course of lectures before Christmas, as arranged.

The first course for the present session will be "On Art, especially including the History and Theory of Sculpture," by Richard Westmacott, Esq., R.A., F.R.S., Professor of Sculpture in the Royal Academy, and will consist of three lectures, to be delivered on Friday evenings, the 6th, 13th, and 20th December.

The second course will be "On Food," by Dr. Letheby, Medical Officer of Health for the City of London. A third course will be given.

The following is a syllabus of Professor Westmacott's course :—

December 6th.—Lecture I.—"On the Want of Public Education in Art; and How Works of Art should be looked at."

December 13th.—Lecture II.—The subject of the Introductory Lecture illustrated, by a general survey of the history and practice of Sculpture in ancient times, especially among the Greeks.

December 20th.—Lecture III.—The subject continued, including a review of the mediæval and more modern schools, to the close of the eighteenth century.

The lectures will commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Second Ordinary Meeting.

Wednesday, November 27th, 1867; Sir Daniel Cooper, Bart., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society :—

Cox, William Sands, F.R.S., Dosthill-house, Wilnecote near Tamworth.
Flavelle, Henry, 14, St. Stephen's-rd. Westbourne-pk. W.
France, James Robert, 98, Rotherfield-street, N.
Hendriks, Frederick, 30, Palace-gardens-terrace, Kensington, W.
Morris, Augustus, 118, Cannon-street, E.C.
Pagliardini, Tito, Portman-street, W.
Rabbeth, George, Edinburgh-house, 13, Cornwall-road, Paddington, W.
Robert, Dr. C. Russell, Park-house, Hampton-wick.
Tindal, C. G., Marchfield-house, Bracknell, Berks.

Previously to the reading of the Paper, the Secretary called the attention of the Members to some very beautiful specimens of artificial marble, shown by the inventor, Mr. Guelton, termed "marezzo." It is manufactured in the form of slabs, of large dimensions, mouldings, cornices, table-tops, &c., and imitates every variety of marble, both antique and modern. The colours and veining are traced on large surfaces of plate glass, and the cement, or material composing the artificial marble is then run over it; when set the slabs are removed from the glass. The surfaces are then polished by friction, in the same way as those of marble. The material is suitable for all internal decoration where marble is ordinarily used. It is fixed to walls by the methods usually employed for facing walls with marble.

The Paper read was—

ON THE DIPLOMATIC AND OTHER CONFERENCES HELD RECENTLY IN PARIS WITH REFERENCE TO INTERNATIONAL COINAGE, WEIGHTS, AND MEASURES.

By Dr. Leone Levi, F.S.A., F.S.S., &c., Professor of Commercial Law in King's College, London.

Another Universal Exhibition has just ended, the fruitful source, I hope, not only of further and still more decided progress in industrial art, but of many measures calculated to further the interests of civilization, to elevate the morals of nations, and to bring together the scattered members of the human family. It is a high merit of such International Exhibitions that they do enlarge our citizenship, and extend the bounds of our interest and regard. A narrow isolation seems altogether incompatible with them. A more generous and liberal spirit is thereby engendered, and we breathe a freer life, because the field of our horizon becomes widened, and the object of our aspirations is greater and higher. This Society may well be proud of the origination and organisation of such great undertakings; and the success of the first, and of each successive exhibition, must for ever redound to her praise and glory. By it she has indeed encouraged "Arts, Manufactures, and Commerce." A new era, of loftier conceptions and greater attainments, has thereby been inaugurated; and what is still more solid and expansive, seeds have been sown the fruits of which will continue to be seen, in a higher civilization, nobler

sentiments, and, I trust, more permanent peace among the nations of the world. All honour to those foremost minds—princes, indeed, in rank, talent, and heart—who have rendered a service so signal to the world and to humanity. And may this Society, whose history is associated with almost every discovery of practical science which has rendered this country illustrious, ever count among its members men of high thought, large views, and liberal mind, who, by their energetic labours and benevolent designs, will succeed in maintaining the Society in the noonday splendour of usefulness and glory.

It was the Universal Exhibition that first gave to the proposal of establishing one common system of weights, measures, and coins, in all countries, a decided prominence. In ancient times the Latin tongue was the universal language of science. Amidst the jargon of so many hordes of barbarians, and the confusion of unknown tongues, men of science could still speak to one another in a language universally known. And when we endeavour to fathom the problems of industrial and scientific discoveries, with which these great exhibitions abound, the want comes home to all of us, of some ready means for mastering those instruments of calculation which enter so closely into the conception and execution of the works of art of every country. The evils arising from the great confusion in the weights, measures, and coins in use in all states, had indeed long been experienced. Men of science of all countries most liberally deposit fruitful gems of thought and discovery in their memoirs and transactions, that they may become the heritage of mankind; yet, though reduced to the certainty of numbers, they often fail to pass to the apprehension of the world, from the discordant methods pursued in their exposition. With the great facility of communication by land and by sea, thought flashing through the air, and penetrating the depth of the ocean, and with a liberal commercial policy, the interchange of produce and manufactures between different countries is increasing at a most rapid pace, yet everywhere the same difficulties arrest progress, and, in many cases, absolutely hinder the increase of trade. Happily, the Society of Arts, still fresh in the recollection of the advantages of the glorious Exhibition of 1851, seized the moment, when public attention in the country was directed to the decimalization of the coinage, for generalising a question which had hitherto been apprehended solely from a narrow national aspect, and from that moment the attainment of universal uniformity in such instrument of exchange ceased to be theoretical and hyperbolical, and received the countenance of thoughtful and wise men of all countries. In their memorial to the Lords Commissioners of her Majesty's Treasury,* in the year 1853, the Society of Arts, after urging the importance of a system of decimal coins, weights, and measures, in advancing, the arts, manufactures, and commerce of the country, pointed out how the growing intelligence and education of every people were sweeping away those feelings of personal antipathy which formerly existed; and how much the beneficent result would be increased by facilitating international relations; that a uniformity in measures, weights,and coins would be of the utmost importance to commerce; and in measures and weights especially, would greatly facilitate scientific research. They submitted, as a matter of grave consideration, whether, in introducing a change to a decimal system of coins, weights, and measures, some arrangements might not be made with neighbouring nations for the adoption of a uniform system throughout the world; that sooner or later such a system would be loudly called for by different nations, and the inconvenience of a second change might be obviated by a little judicious forethought; that it was worthy of the country which had inaugurated "unrestricted commerce," "unrestricted navigation," and which invited, by its exhibitions and by its policy, the most unrestricted competition, "to make the first advances towards such a glorious act; and that there was nothing impossible in the idea, since several nations on the Continent of Europe have already the same coinage, and the metrical system of weights and measures is still more widely adopted."

In 1853, the International Statistical Congress was first inaugurated in Brussels, for the purpose of establishing a complete body of national statistics in all countries, scientifically classified, and so prepared as to be readily comparable among themselves; but the importance of a uniform system of measures, weights, and coins, forced itself upon the attention of the Congress as a great obstacle to the study of comparative statistics, and a resolution was passed, recommending that in the statistical tables of countries not possessing the metrical system, a column should be added, indicating the metrical reduction of weights and measures. In 1855, at the International Exhibition in Paris, the jurymen and commissioners of the Exhibition signed a declaration in favour of a universal system of weights and measures, and earnestly recommended the same to the consideration of their respective governments, and of enlightened individuals, friends of civilisation, and advocates of peace and harmony throughout the world. Again, in that same year, at the second session of the International Statistical Congress, held at Paris, another resolution was passed, in the following form:—"The Congress, considering how much the adoption by different nations of a uniform system of measures, weights, and coins, would facilitate the comparative study of the statistics of different countries, resolves that it is desirable to put such a uniform system into energetic practice." And, ere the second Universal Exhibition closed, with all its happy influences on commerce, science, and international relations, an international association was formed for obtaining a uniform decimal system of measures, weights, and coins, mainly by the energetic and wisely-directed efforts of Earl Fortescue and Mr. James Yates, who thenceforth bestowed on the attainment of this object their unremitted zeal, labour, and talent. Into the action of this association I shall not enter, further than stating that, at its fourth general meeting, held at Bradford in 1859, M. Michel Chevalier, Member of the Institute, in the chair, a resolution was passed—"That the metric system now in use in France, and many states in Europe and America, being founded on a scientific basis, and being complete and homogeneous in all its divisions, has indisputable claims, at least in its fundamental principles, to universal adoption, reserving for the discretion of the different states to adopt such nomenclature for the same as may best facilitate the introduction of the system." This resolution having put an end to all doubts and discussions on the special system to be advocated as a basis of uniformity, for weights and measures, immensely strengthened the position of the association, and thenceforth it gave itself, by every means in its power, to promote the extension of the metric system throughout the world. As regards coins, the time was unfavourable to the enunciation of any specific scheme. Many suggestions had been made, of more or less practical importance, but the majority of them viewed the question from a purely national aspect. The legislature itself seemed most perplexed. In 1847 Sir John Bowring made a motion for an address to the Crown in favour of the coinage and issue of silver pieces of the value of one-tenth and one-hundredth of a pound sterling, avowedly as a step to the complete introduction of the decimal division of the pound; and soon after the florin was issued. In 1853, on the motion of the late Sir William Brown, a Committee of the House of Commons was appointed to take into consideration and report on the practicability and advantages, or otherwise, that would arise from adopting a decimal system of

* See *Journal*, Vol. I. p. 205.

coinage, and the report was highly favourable to the decimal system, recommending the pound sterling as the unit of the new system of coinage. Yet, when in 1855 Sir W. Brown moved resolutions expressing satisfaction at the issue of the florin, and recommending the issue of silver coins to represent the value of one-hundredth part of a pound, and copper coins to represent the one-thousandth part of a pound, to be called cents and mils respectively, the resolution of the florin was only carried by a majority of 135 to 56, and those advocating further progress in that measure had to be withdrawn. The next step, in 1855, was the issue of the Royal Commission, in which Lord Overstone took a conspicuous part, and with their report, which was in every way most unsatisfactory, the efforts to advance a measure of so much importance received a decided check.* But the International Exhibition of 1862 again revived the necessity of definite action on the whole subject, and on the motion of Mr. Ewart, M.P., a committee of the House of Commons was appointed to consider the practicability of adopting a simple and uniform system of weights and measures, with a view not only of benefiting our internal trade, but of facilitating our trade and intercourse with foreign nations, and the result was the unanimous recommendation to introduce into this country the metric system of weights and measures by legalising the use of the system, sanctioning its introduction into public offices, and making it the subject of examination in schools receiving grants. A Bill was thereafter introduced on the subject, and it became the Act† now in force, which "legalises or renders permissive the use of the metric system."

In 1864, the British Association for the Advancement of Science nominated a committee to prepare a report on the best means of providing for a uniformity of weights and measures, with reference to the interests of science, and it also recommended the adoption of the metric system. That committee, under the presidency of Sir John Bowring, has been reappointed from year to year with grants from the funds of the association, and an evidence of the gradual change of public opinion on the subject is shown in the fact that, whereas some years ago the metric system met with but few supporters at the British Association meetings, now the object is attracting every year increased attention, whilst the discussions became more animated, several sections being almost unanimous in the advocacy of the metric in preference to any other system. At home and abroad the question continued to excite the greatest attention. The International Statistical Congress, at its meeting in London in 1860, under the presidency of the lamented Prince Consort, nominated an international commission for the purpose of preparing a formal report on the whole subject to the following Congress, and at its meeting in Berlin, in 1863, the Congress resolved, as regards weights and measures, "That the adoption of the same measure in international commerce is of the highest importance, and that the metric system appears to be the most convenient of all that could be recommended for international measure; that the arrangements and rules to be followed in the construction of the standards and in the introduction of this system should be confided to an international commission, which should also be charged with the duty of ascertaining the means of correcting the slight defects in the original standards." And as regards coins, "That the existing units of money be reduced to a small number; that each unit should be as far as possible decimally subdivided; that the coins in use should all be expressed in weights of the metric system, and should all be of the same degree of fineness, namely, nine-tenths fine and one-tenth alloy." Lastly, towards the end of 1865, a monetary treaty was concluded between France, Belgium, Italy, and Switzerland, by which the money of the respective states might be rendered legal in all the others; by Article 12 of which "the right of accession to the convention was reserved to any other state which would accept the obligations, and would adopt the monetary system of the union in what concerned the gold and silver specie." Such was the state of the question prior to the conferences, the proceedings of which I have now the honour to place before the Society.

In anticipation of the Universal Exhibition held in Paris, the Metric Committee of the British Association, and the Council of the International Decimal Association, suggested to the Imperial Commissioners of the Universal Exhibition the organisation of a special exhibition of the weights, measures, and coins of all countries, and by their desire, in May, 1866, I proceeded to Paris to confer with the Commissioners on the subject. M. Le Play thereupon invited the Commissioners for the Exhibition to meet me, and, the proposal having been unanimously accepted in the terms of a note which I read on the occasion, the Imperial Commissioners decided that a special place be appropriated for an international exhibition of measures, weights, and coins of all countries in the vestibule of the palace. A special committee from the scientific commission was also established (in which I had the honour of being nominated) to preside over the formation of the exhibition, and such committee was also empowered to use the most efficacious means for taking advantage of the universal gathering of 1867 for the promotion of a uniform system of measures, weights, and coins. The committee forthwith proceeded to the organisation of the exhibition, and having received the aid and co-operation of all countries, we were able to erect the beautiful pavillion erected in the centre of the palace, with the weights, measures, and coins, bank-notes, postage-stamps, and calendars of all nations, arranged with great symmetry and elegance, which daily attracted a large crowd of visitors. Nor were we content with the silent lesson which such an exhibition was calculated to afford. A great conference was appointed to be held to discuss the mode of removing the many discrepancies thus palpably exhibited; and having divided ourselves into three sub-committees it was arranged to prepare special reports on weights and measures, coinage, and areometry, which might serve as a basis of discussion. The conference was appointed to be held in June, and to it were invited some of the foremost men then in Paris from all countries, including official delegates and commissioners from foreign states or scientific societies. The metric committee of the British Association and the British branch of the International Association were represented by Mr. Samuel Brown and myself, and we had the pleasure of associating with us M. Louis P. Casella, the constructor of the mural standard. The Chamber of Commerce of Liverpool was represented by Mr. Edward K. Muspratt, Member of the Council, and Mr. William Blood, Secretary. For the Huddersfield Chamber of Commerce there was Mr. Wrigley, and Colonel Younghusband represented the British Commission at the Universal Exhibition. On the 27th June, 1867, the conference met at the Palais de l'Industrie. M. Mathieu, of the Bureau de Longitude, Chairman of the Committee, presided over the first two meetings, but a communication having been made that his Imperial Highness Prince

* The 9th and 12th resolutions of the Royal Commissioners gave the following, among other important reasons, against the adoption of the pound and mil scheme :—

"9. That the particular form of decimal coinage proposed as the pound and mil scheme cannot be looked upon as a well-assured or demonstrated improvement on our present coinage; but must rather be considered as an experiment of very doubtful result, accompanied, beyond all question, by many serious transitional difficulties."

"12. That, duly weighing the foregoing considerations, it does not appear desirable, under existing circumstances, while our weights and measures remain as at present, and so long as the principle on which their simplification ought to be founded is undetermined, to disturb the established habits of the people with regard to the coins now in use, by a partial attempt to introduce any new principle into the coinage alone."

† 27 and 28 Vict., c. 117, 29 July, 1864.

Napoleon would accept the presidency, he was unanimously elected to that office, which he filled, I must say, with consummate skill and tact, and showing a business capacity not often met with. The report on weights and measures was prepared by M. Jacobi, member of the Imperial Academy of St. Petersburg. Having laid down, as primary propositions, that the decimal system is the best adapted to express multiples and sub-multiples of weights, measures, and coins; that the metric system has the greatest claim to universal adoption; and that the adoption of such would produce great economy of labour, tantamount to a decided increase of wealth, M. Jacobi exhibited the position of the question in different countries. He stated that France, Belgium, the Netherlands, Italy, the Pontifical States, Spain, Portugal, Greece, Mexico, Chili, Brazil, New Grenada, and the Republics of South America, have already accepted the metric system in an obligatory manner; that in England and the United States it is now legal but not compulsory; that Switzerland, Sweden, Prussia, Baden, Bavaria, Austria, Wurtemburg, and Denmark have borrowed certain portions of the system; that in Russia and other countries the existing systems could easily be adapted to the metric, and that only some coasting states of the Mediterranean, Turkey, Greece, and Egypt, have systems which have no relation with the metric. In his opinion, the fact that the metric system was already so extensively in use, encouraged the desire and established the necessity of rendering it universal. M. Jacobi exhibited the great advantages of teaching it in the primary schools, and of using it in science and scientific publications, in commercial transactions, industry, and mechanics, the postal tariff, telegraphs, and customs. He was in favour of using the proper nomenclature of the metric system, and no other, and did not sanction the combination of the metric with any existing system, even as a measure of transition; and concluded with recommending the immediate teaching of the metric system in schools, and the use of the same in statistical and other public departments. A report so complete and judicious could not fail to be received with great favour, and it was adopted unanimously. In fact, it became almost unnecessary to discuss it at any length, seeing that nearly every one of the members present was prepared for the adoption of the metric system, and the merits of the reform had been canvassed freely and thoroughly in so many occasions. In consequence of some observations made on the state of preservation of the original standard, it was stated by General Morin, of the Conservatoire des Arts-et-Metiers, that in 1863 the Minister of Agriculture, Commerce, and Public Works of France, appointed a commission to make an official comparison between the prototype standards of the meter and kilogram kept at the archives, with that deposited at the Imperial Conservatoire des Arts-et-Metiers more particularly destined to be used for comparisons with the standards made by or for the different governments which may adopt the metric system, and it was found that the difference was very infinitesimal, and that the condition of the standards gave every possible guarantee of exactitude.

Upon the subject of coinage much greater difficulty was experienced, and after considerable discussion, in which the Austrian delegate, Baron de Hock, the American Commissioners, Mr. Ruggles and Mr. Kennedy, took a leading part, the committee submitted to the conference the following distinct propositions:—

1. The first condition to be fulfilled is the adoption, by the different governments interested in this question, of the same units in the issue of their gold coins.

2. It is desirable that such coins be everywhere coined nine-tenths fine.

3. It is desirable that each state should introduce among its gold coins one piece at least of a value equal to that of one of the pieces in use among the other states interested, so that there may be among all the systems a point of common contact. From that each nation will afterwards endeavour to assimilate gradually its system of coinage to that which may be chosen as a uniform basis.

4. The series of gold coins now in use in France, being adopted by a great part of the population of Europe, is recommended as a basis of the uniform system.

5. Whereas, in consequence of accidental and happy circumstances, the most important monetary units may be adapted to the French gold piece of five-francs, by means of very small changes, this piece seems the most convenient to serve as a basis of a monetary system, and the coins issued upon such a basis may become, as soon as the convenience of the nations will permit, multiples of this unit.

6. It is desirable that the different governments should decide that the coins issued by each nation, in conformity with the uniform system proposed and agreed, should bear legal currency in all their countries.

7. It is extremely desirable that the system of double standards be abandoned wherever it yet exists.

8. It is extremely desirable that the system of decimal numeration be universally adopted, and that the money of all nations should be of the same fineness and of the same form.

9. It is desirable that the governments should come to an understanding for adopting common measures of control, so as to guarantee the integrity of the coinage both when issued and whilst in circulation.

It will be observed that these propositions laid down no specific scheme of universal coinage. They took gold coins for their basis because most nations had already adopted it as the sole standard. Mr. Ruggles stated that between 1851 and 1865 the United States, France, and Great Britain issued collectively, in round numbers, £420,000,000 in gold coins to £24,000,000 in silver coins. The Congress adopted the fineness of one to ten as already extensively in use. It simply aimed at one point of accord in the different systems of coinage, in having one piece at least alike everywhere; and fixed upon the five-franc piece in gold as on the whole the most convenient for the basis of the uniform system.

It is quite possible that were we to start a new system, irrespective altogether of the existing conditions, a better and a more scientific plan might yet be suggested, but the conference had a practical object in view, and we had to consider not what might be theoretically the most perfect, but what under present circumstances could best be attempted. When, therefore, M. Michel Chevalier proposed a totally new system—to take a piece of five grammes of gold, nine-tenths fine, as the universal monetary unit—it was felt that, whatever might be its merits, it would be impossible to disregard the immense amount of coinage of silver and gold now in existence, which would require to be altogether withdrawn. The new coin suggested would agree with no existing coinage, and therefore its introduction would be quite impracticable. For my part I objected to taking the piece of five francs in gold as a unit, it being too small and too easily lost. I proposed to substitute for it the ten-franc piece, but it was agreed that the word "unit" attached to the five francs, as at first inserted in the 8th proposition, should be omitted; and the proposition as adopted simply laid down that value as a basis of calculation, the different nations being quite at liberty to choose for their unit any multiple of the same, say 10, 20, or 25 francs. M. Wolowski, so able and so eloquent, fought hard in favour of the double standard. He argued in favour of leaving it optional with debtors to pay in gold or silver, and thought it inexpedient to fix on the gold standard for all nations, having regard to the changes which have occurred and may still occur in the production of gold and silver. M. Wolowski was, of course, answered that the system of a double standard was unjust in itself, since it left the creditor at the mercy of the debtor, in allowing him to pay in the least valu-

able metal; that if it was desirable that the standard of exchange should be as little as possible subject to oscillation of value, it was certainly inexpedient to subject it to the oscillations affecting both gold and silver; whilst the adoption of a double standard would render any agreement with England and America impossible. Thus the discussion ended, and the resolutions proposed passed almost unanimously, with some verbal alterations.

As regards areometry, the conference, in terms of the report prepared by M. De Baumauer, resolved that, for international transactions concerning liquids, the same system of areometrical gradations be employed in all countries. It is desirable that the special scales employed for different liquids be decimal, and based either on demilitres or specific volumes. The conference expressed the wish that the centigrade thermometer, as well as the metric scale of the barometer, be generally adopted.

We must now turn our attention to the Diplomatic Conference, which was held about the same time at the Foreign-office, especially about international coinage.

I have already stated that France, Italy, Belgium, and Switzerland, towards the end of 1865, concluded among themselves a monetary treaty, the negotiation of which is greatly due to M. de Parieu, Vice-President of the Council of State, and Member of the Institute. And it was with the view of extending the provisions of that treaty to other countries that the Diplomatic Conference was summoned. The two conferences differed essentially in their constitution, though their ultimate object in reality was one and the same. The Diplomatic Conference was attended by official delegates nominated by the different governments, and having first been presided over by M. Moustier, the Minister for Foreign Affairs, and then by M. de Parieu, was afterwards, by decree of the Emperor, placed under the presidency of His Imperial Highness Prince Napoleon. The conference was opened on the 17th of June, and ended on the 6th of July, 1867; and, instead of having any resolutions previously prepared by a committee, the conference first agreed upon a *questionnaire*, or a series of points to be discussed, and then entered deliberately on the questions embraced, each member speaking and voting affirmatively or negatively on the alternative submitted. The first question was, What is the best means to realize the uniform system of money? Is it by the creation of a system altogether new, independent of the existing systems, and, in that case, what should be the basis of that system; or, by a mutual co-ordination of the existing systems, having regard to the scientific advantages of certain types and to the number of persons who have adopted them; and, in that case, which monetary system should be principally taken into account, subject to any improvement of which it may be capable? Here, too, as in the other conference, some members, especially from Belgium, expressed a preference for a system entirely new, but, after some discussion, the congress voted unanimously in favour of the second alternative, adding that the system agreed upon by the Monetary Convention of 1865 should be the one principally to be taken under consideration.

The next question referred to the standard, and having regard to the decided advance made everywhere towards the adoption of a gold standard, it was unanimously resolved, with the exception of the representatives of the Netherlands, "That it is not possible to attain the desired uniformity, or even a partial coincidence, on the basis and on condition of the exclusive adoption of a silver standard, but that it is possible to attain it on the basis of a gold standard, allowing each state to preserve the silver standard in a transitory manner. The latter condition being necessary for states such as Prussia, Sweden, and the Netherlands, where the silver standard alone is still maintained." Then a resolution was added supported by all the representatives except those of Prussia and the Netherlands, "That the advantage of internationality which the coinage taken for common standard would possess, is not itself a sufficient guarantee for its being maintained in circulation in all the states, but it is necessary to stipulate that, in the countries which continue to use the silver standard only, and in those which have a double standard, the relation between gold and silver should not be established on too low a footing, in order to give due facility for the practical introduction of the gold coinage." It appears that at present the relation of gold to silver in Prussia is 1 to 15·45, in Spain as 1 to 15·48, in France as 1 to 15·50, and in the United States as 1 to 16, about.

The congress then entered on the difficult question of the common denominator, and, having first unanimously agreed that, for the success of the monetary unification it is necessary to fix types having a common denominator for the weight of the gold coin, with an identical fineness of $\frac{9}{10}$ fine, it was decided by a majority of 13 against 2, the representatives of England and Sweden having voted against, and those of Russia, Bavaria, Baden, Wurtemburg, and Belgium having abstained from voting, "That the common denomination should be the piece of 5 francs." Though many members spoke in favour of the reduction of the dollar to 5 francs, and of the pound sterling to 25 francs, M. Wallenberg, the delegate from Sweden, preferred the 10 francs in gold; and M. de Parieu himself said that that piece would be specially convenient to France, since she would only require to change the place of the comma to express the new unit, whilst, moreover, the piece of 10 francs, under the name of ducat, a piece of about the same value, had once a universal circulation.

As regards the reduction of the pound to 25 francs, Prof. Graham, the master of the Mint, stated that even if it was true that the difference of 20 centimes was included within the limits of tolerance, it is, nevertheless, a fact that the English Government considers itself bound in honour not to take advantage of it. There would, therefore, be much inconvenience in having in circulation sovereigns of 25·20 should the issue of new sovereigns reduced to 25 francs be resolved upon, and a re-coinage would be necessary. In his opinion, if the piece of 10 francs were adopted, it would have an advantage over the piece of five francs. It was then agreed by all, except the representatives of Prussia, Baden, and Wurtemburg, who abstained from voting, "That it would be useful that the types of coinage determined by the Monetary Convention of the 23rd December, 1865, should be, in the interest of unification, and, consequently, of reciprocity, completed by new types, as per example of 25 francs." But when the proposal was made that a piece of fifteen francs be also added, the representatives of only seven countries voted in favour of it, those of seven countries voted against it, and those of six, including Great Britain, abstained from voting. It was then unanimously agreed that the measures which may be adopted by the governments of the different states in order to modify their respective monetary systems, in accordance with the basis indicated by the conference, should be made as much as possible the subject of diplomatic conventions. That soon after the reception of the answers which may be given by the different states to the official communication which will be made to them of the labours of the conference by the French Government, that government may, if necessary, call another conference. But as to the time by which such answer should be given, the representatives of ten countries voted that it be given before the first of February next; those of five voted that it be given before the first of October, 1867; those of the United States voted for the 15th of May, 1868; and those of Great Britain for the first of June, 1868; the representatives of France and Spain having abstained from voting. In substance, the resolutions of both conferences perfectly agree, the principal recommendation consisting in taking advantage of the particular position in which

the five-franc piece stands towards the dollar on the one hand, and the pound sterling.

It now remains for me to consider the position in which this country is placed in relation to these two conferences. Officially, I may say the United Kingdom is in no way pledged by their resolution, the government having maintained itself almost altogether passive as regards the one and the other. The conference of the Palais de l'Industrie owed its origination to the Metric Committee of the British Association and the British branch of the International Association; and in the International Committee no official member was deputed by Her Majesty's Government, though the British Commission was nominally, at least, represented in it. At the Diplomatic Conference, the Master of the Mint and Mr. Rivers Wilson, though officially deputed, were expressly precluded from in any way binding this country to any course. Nevertheless, it is vain to imagine that this country can remain indifferent to what is passing in all the rest of the world; and it would be far better for her to place herself, by a spontaneous and generous policy, at the head of those measures which tend to improvements in human society, than to lag behind till necessity and self-interest compel her to accept what is already irrevocably settled. The measures advocated by these conferences affect on the one hand our entire system of weights and measures, and on the other the basis of our coinage and our entire system of accountancy. As regards weights and measures, the only course left is the early introduction of the metric system, pure and simple, as it exists in the greater part of Europe, and in different States of America. The Act of 1864, which renders the use of it permissive in this country, is manifestly imperfect. It is simply of a negative character, removing the previous illegality. It does not provide for standards, and it is a question whether any one could actually use the metric weights and measures, since they cannot be stamped. What is wanted is a more definite measure, preparing the way for the early substitution of the metric system, for the present uncouth, complicated, and conflicting practice. In other countries the law provided that after three, five, or ten years' time, for preparation, it should become compulsory; and I am satisfied a similar method must be adopted in this country, if we wish the reform to be introduced in our time at least. Meanwhile, the introduction of the system should certainly be encouraged in all the schools, and demanded in all schools receiving grants from the Privy Council; and an examination in the same should also be required of teachers in the Normal Schools, and candidates for Government certificates. Let us hope that during the next session of Parliament some measures may be introduced for bringing this important object to some practical issue.

As regards coins, the proceedings of the conference have greatly simplified the question by leaving us the only alternative as to the mode of adapting either the gold piece of five francs, or any of its multiples, to British coinage. To my mind, a gold unit of five francs, or 4s. 2d., is decidedly too low; the choice lies between reducing the sovereign to 25 francs or taking the 10 francs as a new unit. The reduction of the sovereign to 25 francs is connected with the following difficulties. The difference between 25 francs and 25·20 francs may appear small, yet it cannot be ignored in making that arrangement. It will not do to say that many sovereigns now circulate under weight. The Government does not recognise it; nor could we declare that to be 25 francs which is in effect 25·20 francs. A new coinage would be necessary, and in that case either we should have in circulation two kinds of sovereigns, differing very slightly in value, or we should need to have resort to the issue of a pound note to assist the withdrawal of the large number of sovereigns now in circulation. With the sovereign as a unit there would never be an easy analogy between ours and the one leading system prevalent in almost every other European country. With a unit so large, requiring three decimal fractions in all accounts, the best advantages of the decimal system, viz., the brevity and saving of time, are practically lost. Lastly, not to mention more difficulties and objections, the counting of every sum less than a pound by mils seems to me exceedingly awkward and complicated. The main advantage ever adduced in favour of retaining the pound as a unit is that it is universally known in the trading and banking circles of the world, that it is associated in this country with every calculation of value, and that it is a well-defined and invariable value. But if all European and American countries enter the convention on the terms of the conference, the pound will be the coin least known in Europe. There would doubtless be much inconvenience in changing the unit of value, but the difficulty is greatly exaggerated. And as for the invariability in the value of the sovereign, the same will apply to any coin which may be legally declared by this country as the unit of accounts. These are some of the many obstacles to our adopting the plan of reducing the pound to 25 francs, and making that the unit of a decimal system for this country. But there is another plan, which appears to be far preferable, viz., the taking of the gold piece of ten francs, equivalent to 100 pence of present money, as a unit. The present penny is practically the same in value as the ten centimes. Let a gold piece representing one hundred pence, which might be called a ducat, be issued and coined of the exact value of ten francs. Let this coin for a time be put in circulation as a token only, or as a coin of convenience, in which manner it would make no difference if its real value be slightly inferior to its nominal value, and let every encouragement be given to use this hundred-pence piece as a unit. Should it prove popular and convenient, a ten-pence piece might also be issued, to take eventually the place of the present shilling; and when the time comes for the ultimate declaration of the ducat as the unit of value, the exact relation of the same to the sovereign would be fixed, and the difference between the sovereign and the ducat would be duly allowed in exchange.

The convenience of this method is very decided. It would be strictly decimal. It would be plain and simple for computation. In a ten-ducat piece, equivalent to one hundred francs, we should have an excellent coin of accounts for large transactions, as in the tenth of a penny we might, if required, have a coin adapted to the most minute business of life; and, above all, it would place us on an exact level with the system likely to be universal, it being a fact that already 100 millions of people have accepted it, and probably 100 millions more will adhere to it almost immediately.

I do not wish to be dogmatic in propounding such a plan. I only suggest it for serious consideration, and I am certainly encouraged in thinking that it does in a great measure accord with many of the most valuable suggestions made to this Society some ten years ago. In the preference thus given to the ten francs rather than to the 25 francs, I speak my own mind only, the Metric Committee of the British Association and the Council of the International Association having come to no resolution on the subject. I am strongly convinced, however, that the scheme is not only sound and practical, but the only one likely to prove in the end successful and permanent. The time has come when some decisive measure must be taken, Her Majesty's Government having to give answer on the subject at least not later than June next. The action of the Government will probably be either to move for a Committee of the House of Commons or to nominate a Royal Commission to consider the question. Whatever method may be preferred, let us hope that the inquiry will be instituted in a liberal spirit, and with an intention to come to practical and final conclusions. As His Imperial Highness Prince Napoleon said to the conference, "Let us keep always before our eyes the

object at which we aim. Let us think that the public expects a result from our conference, and let us endeavour to remove the objection that commissions and conferences always remain sterile of results. We should see that our meetings should not end in an able report, and in a barren pleading for the cause of unity; but, that they aim to realise a practical result."

In laying this important subject before the Society, I know I speak to men who, while alive to all the difficulties which necessarily surround every social reform, are not easily deterred by them from advocating or promoting what they deem to be a useful and substantial improvement. The moment is most opportune for removing one more of those barriers which hinder and arrest international intercourse. Shall England refuse to lend her helping hand? Her influence is enormous. At her bidding are upwards of one hundred millions of people. Will she resist the tide of social progress? There was a time when, surrounded by the stormy deep, she deemed herself independent of what was passing in other countries. But she now feels that she belongs to the great European family, and that she is bound up with the social and political interests of other states. To stand aside, when all other nations are intent upon a reform of so practical a character as the one now advocated, would be derogatory to her position. Whatever be her power and influence in the commercial and monetary world, England must remember that the world is marching onward in the path of progress, that *Eppur si muove* is the motto engraven on every object in the world of matter and mind, and that her highest and noblest prerogative is and will ever be to place herself at the head of all measures which tend to advance the interests of civilisation and science throughout the world.

DISCUSSION.

Mr. F. Hendriks said it was either his misfortune or obtuseness not to be able to appreciate his friend Professor Levi's paper, with the exception of the exordium and the peroration, quite as much as some persons present would no doubt appreciate it. He had the misfortune to differ from almost every one of Prof. Levi's conclusions. It seemed to him (Mr. Hendriks) that a good deal of prominence had been given to the resolutions of the Royal Commissioners on the decimal question, more, he thought, than they were entitled to. That Royal Commission was composed of only three gentlemen, one of whom, from age or some other circumstances, thought fit to retire; another was a banker, who stated, at a meeting held some time previously, that he had made his money under the old system, and was, therefore, not peculiarly biassed in its favour; and the third was a member of Parliament, who saw nothing further in favour of the decimal system of coinage than that it might be very convenient to inexperienced travellers on the Continent. He submitted the conclusions, arrived at under such circumstances, were not of great importance. He contrasted with them the resolutions which were come to by a commission which recently sat in Austria with reference to the projected change. That commission was composed of twenty-two gentlemen drawn from all classes of the community, and all of those persons were well qualified to deal with the subject referred to them. That commission unanimously resolved in favour of joining the convention referred to by Prof. Levi, and adopting the 25-franc piece as the unit. France was about to issue a 25-franc piece, and he believed this coin would be the future international pound sterling. He felt certain, notwithstanding the favour with which the 10-franc piece was regarded by Professor Levi, the pound sterling, associated as it was with the commercial transactions of a thousand years; current as it was in all our colonies; current as it was by several foreign countries having adopted it,—Portugal amongst others; speaking, as it did, a universal language throughout the world, it would ultimately become the monetary unit. With regard to the conference which had lately been sitting on this subject, he took exception to the term "diplomatic" given to it by Professor Levi. He (Mr. Hendriks) was not aware that any member of that conference held any diplomatic status, except the representative of the Turkish Government, who was selected solely for his special knowledge of the subject. It was a conference invited by the French Government, the members of which were to be nominated by some twenty states. He did not agree with the learned professor in thinking that the 5-franc piece was in any way recommended by that conference, because in their resolution they spoke of the 5-franc piece as a common denominator of the coins of the convention. If they took a survey of the chief coins of the European nations, they would be found to be multiples of 5 francs. Thus, from the following table it would be seen that in England the pound sterling would be a multiple of 5 francs; and the same would be the case in the other countries:—

States.	Unit.	Present value.	New value.
		fr. c.	f.
England	Pound sterling	25 22	25
Austria	Florin	2 47	2½
Spain	Doubloon of Isabella	26 0	25
France	Franc	1 0	1
Frankfort-on-Maine	Florin	2 12	2
Greece	Drachma	0 90	1
Holland	Florin	2 25	2½
Portugal	Mille Reis	5 00	5
Prussia	Thaler	3 70	5 (3¾)
Russia	Rouble	4 0	4
Sweden and Norway	Ricks daler	5 66	5
United States	Dollar	5 18	5
Turkey	Pound Turkish	22 57	25
India	Rupee	2 45	2½
Persia	Thoman	11 87 to 12 90	12½
Japan	Itzebu	2 50	idem.

Now, he could not conceive any proposition which could less approve itself to a practical set of men like Englishmen, than to have a coinage of a 10-franc piece. It was notorious to those who had given attention to monetary matters that the wear and tear of small coins was greater and more costly than that of larger coins; and he thought the learned professor had confused what he recommended as a coin of account with a coin of circulation. In England, the pound sterling had the advantage of a unit, convenient both for circulation and account; and he could assure the meeting, from some knowledge of the subject, that this country was envied in the possession of this unit by most foreign nations. All they had to do, to bring the pound sterling into strict union with this convention, was to reduce the weight of gold in the sovereign to the extent of 932 thousandths of a grain. It might seem an infraction of public faith to reduce the weight of our coinage in any degree, but the amount was so small that he considered the effect would be inappreciable. We might take examples from other countries—countries quite as anxious as ourselves in keeping faith with the national credit; as Holland, who had never been accused of breaking faith, in 1851 made a difference of far greater amount without giving rise to any practical inconvenience. The difference there made was three times as great as that which would be required in this country. In America—and no one would accuse that country of any desire to repudiate its obligations—public men were very ready to advocate measures for the reduction of the value of the gold dollar by nearly four times the amount which was required in this country in the case of the sovereign, and yet we could not regard America as a country nationally advocating repudiation. And, again, we found the coin circulating in this country was reduced by wear and tear nearly to the value of the 25-franc piece. Mr. Hendriks noticed that Prof. Graham

stated that the ordinary wear and tear was not so great as to bring it exactly to the 25-franc piece, but there was no precise information before the public on that point. He had tried in vain to get information from the Bank of England as to the actual wear and tear of the coin in circulation. Their opinion was scarcely reliable, inasmuch as it was derived from a partial and incomplete experience. It was well known that if light coin was taken to the Bank it would be at once separated from that of full weight, and at once defaced. With this knowledge, no one intentionally took light coin to the Bank of England. It was taken to the joint-stock and private banks, and thus kept in circulation; and thus millions of coins were constantly circulating in the country which were of much lighter character than the experience of the Bank of England would admit, and, in his opinion, depreciated to an extent which would assimilate them to the proposed coin of the convention. In fact, there was a degree of "tolerance" allowed at the Mint which persons were scarcely aware of. Persons might think they got the exact number of grains of gold, but that was not so. They might think in a thousand sovereigns they got the full amount of gold, but in reality they only got the value of £993 and a fraction. Even assuming the current coin was a little above the value of the 25-franc piece, that would enable the government to carry out the new coinage of the 25-francs with facility. With regard to the injustice to the present holders of money, he thought the effect would be infinitesimal. Every man was a debtor as well as a creditor. If he was a greater debtor than creditor, it would be to his advantage to pay in light coin. He hoped he should not be understood as in any way advocating the debasement of our coin; but when there was a great national object to be effected—with our 30 millions of population in England, our 10 millions in our colonies, and our 130 millions in India, and having advanced posts of civilization in all parts of the world, it was desirable that we should be enabled to join in the convention, which already included in its numbers 100 millions of people; and he thought that we might fairly make some small sacrifice to enable us to do so. It might be asked why should not the representatives at the convention have agreed to adopt our coinage as the standard unit? the answer was they have probably half as much again of gold coin in circulation as we have; for during the last sixteen years, since the discovery of Californian and Australian gold, the coinage of foreign gold pieces had increased to the extent of upwards of £120,000,000 sterling; and gold had, to a great extent, taken the place of silver in continental currency. We ought not, he submitted, to object to alter our system a little to meet the foreign views of the subject. The nations which formerly coined silver in the proportion of $15\frac{1}{2}$ to 1, were now reducing the relative proportion between their gold and silver coinage, and, following the example of England, were making silver coins mere tokens. He thought there were solid grounds for adhering to the pound sterling as the system for the future. With regard to the metrical system of weights and measures, that was no doubt a subject of equal importance with coinage; but that was not quite the question of the evening. The real question was the practical means by which this country might join in this international convention. All the other great nations were joining in it, and we should be in the ungraceful position of being the last to enter it. He had in his possession the model, from the French mint, of the intended new 25-franc piece, which was exactly 24 millimètres in diameter, and this would meet the metrical system. He could not understand why the friends of the metrical system saw anything in the 25-franc piece more antagonistic to that system generally than they did in the 20-franc, the 10-franc, and the 1-franc system. He begged to point out that the 10-franc piece, advocated by Professor Levi, would simply be an impossibility for the people of this country to understand. They might understand the Napoleon or the franc as the unit; and they did understand the pound sterling. He had that afternoon endeavoured to reduce to the shortest rule the method by which the 10-franc piece could be converted into pounds sterling, and *vice versâ;* but he thought it would be extremely difficult for the public generally to adopt. The 10-franc piece = 8 shillings = £0·4 or $\frac{2}{5}$ = 4 florins. Therefore, to convert the pound sterling and its sub-divisions into 10-franc pieces, those who are unacquainted with decimals must first divide by 5, and then multiply by 2, or else, if acquainted with decimals, they must multiply by ·4, after converting the sub-divisions of the pound into decimal fractions; and *vice versâ*, as £1 is equal to 25 francs, or $2\frac{1}{2}$ 10-fr. pieces, therefore, to convert the 10-franc piece and its sub-divisions into pounds sterling, those who are unacquainted with decimals must divide the number of 10-franc pieces by $2\frac{1}{2}$, which they can only accomplish by multiplying by 2, and then dividing by 5, or else, if acquainted with decimals, they must divide the 10-franc piece and its sub-divisions decimally, stated by 2·5. He thought the use of the 10-franc piece, as proposed by Professor Levi, was beset with such difficulties as to render its adoption all but impossible.

Mr. FELLOWS remarked that he was in the unhappy condition of disagreeing both with the learned professor who had read the paper, and also to some extent with the last speaker. The former gentleman had overlooked one or two important points with regard to the introduction of the decimal system of coinage in this country. He had assumed that there would not be the same difference between the English new ducat and the French coinage that there would be between the new sovereign and the existing 25 francs. But there would, in fact, be exactly the same difference. It would be this—if the new ducat were exactly 100 pence, of course it would be as 100 was to 240; so that 240 new ducats would be equal to 100 sovereigns. We should have to make an alteration of 2d. in the pound to bring our present sovereign to be equal with the 25 francs, and we should have to make the same proportionate alteration in the 100 pence. Therefore, the difficulty with regard to making the system international was equal both in Professor Levi's system and in that of Mr. Hendriks.

Professor LEVI said there were two operations suggested in his plan. At first let the 100d. be a subsidiary coin, and when the time came to make the difference the twopence could easily be allowed for.

Mr. FELLOWS—Then Professor Levi proposed that the new ducat should pass as 100d., which would only be worth 99d. [Professor LEVI—As a subsidiary coin.] It would appear to have one value, but it was really another value. He could not understand a course more opposed to true monetary principles than that Professor Levi argued for. If it was to be simply regarded as a token it was a different thing, then there was no necessity for making it exactly equal to the French ten francs, as our penny was merely a token. He conceived Prof. Levi had made another mistake in saying that the penny was equal to 10 centimes. There was the same proportional difference between the 10 centimes and the penny as there was between the present sovereign and the proposed new sovereign; but it must be remembered all the copper coins were tokens. The penny represented the 240th part of a pound; it was the same as a note. The £5 bank-note represented the value of five golden sovereigns, and all the other coins were merely tokens in connection with it. Passing from that subject, he thought they could not well consider this question without dividing it into two parts: there was the question of decimalization and the question of making it international. It was as easy to make the pound sterling international, as it was to make the learned professor's unit international. There would be the same change required with the one as with the other, and it was

the same with the dollar. If we coined a piece equal to 100 half-pennies, we could have the dollar, or five-shilling piece. There would be the same proportion of alteration in Prof. Levi's as in Mr. Hendriks' principle. With regard to decimalization, he thought the principle to be adopted was to begin with the smallest coin, which practice had shown to be the least necessary for practical use, and below which we ought not to go. The farthing in this country had been found the least practical coin of England, and as such entered into accounts, as well as into the prices of various articles. It did not follow because we went no lower than the farthing it was not wise to do so in other countries. Each country must choose for itself. He thought Mr. Hendriks' remarks showed that the sovereign was about the right value for the highest coin, and the great popularity of that coin abroad was because it so nearly coincided with definite proportions of existing coins, and was of convenient size for ordinary transactions. In decimalizing, he maintained that the French and American system, and all those which he was acquainted with, had started at the wrong end. They had placed the cart before the horse. He submitted we ought to treat our coin, weights and measures as we do our numeration—begin with the lowest and increase by tens upwards. It was wrong to call the hundredth of a dollar a cent. So with the pound and mil system, it was wrong, to begin with the pound. We should take the farthing, then a coin of ten farthings, and then 100 farthings, and then 1,000 farthings, to represent the pound, and so with the French and American coinage. In addition to the difficulties inherent to any change of this kind, there was imposed, he said, the difficulty of reorganising the whole of the Post-office, Customs, and Excise transactions of the country, which would lead to interminable disputes, from the introduction of the pound and mil, instead of the farthing, and with regard to all printed prices throughout the country the same alteration would occur; but beginning with the farthing, and having a coin which we could use, it could be employed in all transactions of trade, and they could mete it decimally. or in pounds, shillings, and pence. That was the system he proposed; and it might be made international. To begin with the pound, and go down to the farthing, he considered was wrong, as also going so low as the half-farthing. He concluded by expressing his obligations to Professor Levi for the able manner in which he had brought this subject before the meeting.

Judge Manockjee Cursetjee said the gentleman who last addressed them had found equal fault with the theories proposed by Professor Levi and Mr. Hendrik. He was not himself going to find fault with the one or the other. He was not able to penetrate into the depth of the several questions so ably urged, for the best of all reasons, that he had not paid a sufficient amount of attention to the subject before them. But there was one matter in connection with it on which he might be permitted to say a very few words. A great deal had been said with regard to the wants of this country, but, to his surprise, the only sentence which had been dropped with respect to India was that in which the first speaker mentioned, as it were, incidentally, that in our Indian dependencies there were 130 millions of the Queen's subjects who were interested in this question; he was right in saying it was nearer 200 millions than 130 millions throughout British India. The requirements of that vast mass of the population had not been touched upon this evening further than in that passing allusion. It was a subject which ought to go home to every heart, because India was an integral part of the British empire. Its bulwark! The difficulty of carrying out any new measure of this kind might be great in this country, but in India it was different. The government had only to determine to carry out a thing, and issue a *Hookum*, and it was forthwith done, and the *Hookum* went round from one part of the country to the other to be respected. They had in India a very complicated monetary system indeed. In this country the proper weight and the intrinsic value of the coin in circulation were known by one appellation —pound sterling—but in India, that which was called the rupee—the standard of currency there—differed in weight and value as every few hundred miles one travelled up or down the country. The rupee of Bombay was of different value to the rupee of Surat, whilst the latter differed again from that of Hyderabad, and so on. At one period they had gold coins in India which were now only matters of history. Formerly there were what were called gold rupees, which were about the size of a green pea, and one could hold from 700 to 1,000 of them in the palm of the hand, but they had all gone out of use. The subject of the introduction of gold coin into India had been under discussion for the last two or three years, and had been under the consideration of the Government, and at the council presided over by Sir W. Mansfield, who had taken up the question in a most masterly manner, resolutions were passed, which he begged to read to the meeting, as he thought they would be listened to with interest. They were as follows:—

"With respect to the introduction of gold, the following points seem to be generally and firmly established:—

"1st. That gold coins of various descriptions of mohurs and sovereigns, English and Australian, although not used as money by the state, are generally at par, or above par in price, whether in the presidency, towns, or in the cities of the Mofussil.

"2nd. That they are sought for in the provinces for trading purposes by merchants and bankers, and as a medium of a reserve of wealth by the people at large.

"3rd. That when gold is below par in price, it happens either because gold is almost practically unknown in the district concerned, or because the people are too poor to create a demand for it.

"4th. That the demand for gold currency is unanimous throughout the country.

"5th. That gold coins of 15, 10, and 5 rupees respectively would find more favour in the eyes of the people than notes of like value.

"6th. That the introduction of gold would facilitate the establishment of the currency notes, outlying treasuries being assisted by such a measure towards the convertibility of the notes; and

"7th. That the opinion is general, almost unanimous, that the currency should consist of gold, silver, and paper."

He would, in conclusion, throw out a suggestion, that in all their conferences or congresses on this subject they should have some gentlemen who had experience of the wants and requirements of India added to the list of members.

Mr. Browne said the question was divided into two parts—first, that of weights and measures, and, secondly, that of money. They were all pretty well agreed that very great advantage would result if the change proposed were of an international character. Hitherto they had never been able to find a system so perfect in itself as the metrical system. At all meetings he had attended unanimous resolutions were passed in favour of that system. At present the metrical system was legal in this country only by voluntary adoption, but no good would come of it till it was made compulsory. He hoped there would be a full discussion of this subject in the House of Commons in the present session, and that a period would be definitely fixed at which the system should come into operation, whatever the number of years might be, and he hoped some pressure would be brought to bear upon the Government on the subject. The question of money, however, divided itself into two parts—viz., whether we were to adopt a national system of decimal coinage or an international one? For many years he was an advocate for the pound sterling divided into a thousand parts, but when he looked at it in an international point of view, he saw so much trouble in converting our pound sterling into an international pound sterling, that he was inclined to adopt the metrical system already adopted by so many millions of people. They could not ask those nations which have coined 200 or 300 millions of money to abandon it because we have made the pound sterling our unit. We must rather consider how we can alter our pound sterling to make it correspond with the 25 francs of the French. Whether we

adopt a new coin or alter the pound sterling, it must equally be the unit. The new pound sterling would be a pound of twopence less value, or equal to the 25-franc piece; whereas if we took the 10-franc piece as the unit, and multiplied that by ten, we should have the same figures in all our accounts, and it could be read both as English and French money. With regard to the issue of the 25-franc piece in gold, he saw no objection to it, but the question was on what terms it should be issued to express a value. If the unit was 10 francs, and if we had a unit of gold to represent that 10 francs, we might have 20-franc and 30-franc pieces. Having a 10-franc piece as a unit, the next higher unit beyond that would be 100-franc piece, and the expression of a 100-franc piece, by giving a name to it, would be very convenient. In large transactions in financial matters, we wanted the aid of numbers greater than those we have experienced hitherto. He believed the 100 francs would be a more convenient unit than the pound sterling. That would leave the franc as it was now called; we should have the 10-franc piece, and accounts would be brought into decimals by the alteration of one place in the decimal point. From that consideration mainly he had given up the advocacy of the division of the pound sterling into mils, and it would be introducing a very useful coin, the 10-franc piece, divided into 100 pence, as they now existed. If we altered the pound sterling to the 25-franc piece, no one would think of recoining the whole of our silver and copper money because of that small difference in value; and, therefore, the 100 pence, as now coined, would pass as an equivalent to the new coin of 10 francs, and as definite proportions of the new coin of 25 francs. He hoped to see, as he believed he should, the metrical system gain ground in this country, as being the most satisfactory basis on which the coinage and measures of this country could be placed.

Signor Pagliardini remarked that all who had spoken on this subject were in favour of a change in the present system; and all the objection he had heard to the different systems propounded was that change must be necessarily accompanied by alteration. The gentlemen, however, who stood out for the pound and mil system forgot one thing, viz., to make it interchangeable; all they did was to make it decimal. They all admitted the value of one international coin, viz., the franc, hence it was impossible that the English pound sterling could be admitted as the universal coin. It must be the franc, for the defenders of the pound sterling, or the ducat, or the florin, were obliged to found those coins upon their several proportions to the franc, except Mr. Fellows, who stood upon the farthing. But the objection to the farthing was that it was not international. [Mr. Fellows said it could be made so as easily as any other unit.] He submitted that the franc was too low a unit for the expression of large figures. The French figures were obscure when applied to the commerce or statistics of the country. If England had started in this matter fifty or sixty years ago, we might have had the pound sterling divided decimally, but we were too late now to come forward with our pound sterling, because it would not fit into any one European system. He would say the only logical way of dealing with this question was, if they went for the decimal system, to go for it frankly and stand by it. He supported the proposition for a 10-franc piece, by whatever name it might be called; and it was for all the nations joining in the convention to say that henceforth the gold coin of 9s. 10d. standard should be an international coin, and then all other money might come in as tokens.

Mr. Pollard Urquhart remarked that in all discussions of this subject it was assumed that a change of the unit of account implied a change of the unit of coin; and it was further assumed that such a change would put us to a little inconvenience. He did not himself regard the diminution in the value of coin as a matter so trivial as those who preceded him seemed to think it. He must say he regarded with great apprehension even the appearance of lowering the standard of our coin. He believed our good name had been of great benefit to us in the extension of our commercial and financial transactions in every part of the world; and he believed the national credit would suffer, and that we should sacrifice our good name amongst the nations of Europe if we gave even the appearance of diminishing our standard. The standard of our money was restored in the year 1819. The return to cash payments did not produce any great amount of distress, but we had received great benefits in return for it. He believed it had been the means of enabling us to lower the interest on the public debt to a far greater proportion than the addition that was made to it by the return to cash payments; and the system had resulted in bringing to this country a larger amount of financial operations, from all parts of the globe, than could have been produced in any other way. We had had the pound sterling as a unit of account for a very long time, but only as a gold coin for the last 40 or 50 years. There was formerly one unit of account, but no coin to represent it, and he was not aware that any great inconvenience resulted from that state of things. We had better submit to any temporary inconvenience than give the appearance of want of national faith with the nations of Europe.

The Chairman, in proposing a vote of thanks to Professor Levi, would briefly express one or two opinions on this subject. He thought, with respect to the pound sterling, the shilling, the sixpence, the penny, and the halfpenny, a great deal of the prejudice which existed in their favour was the result of education. What we were brought up to in youth we kept to in old age. He began and continued a commercial life for many years in France, and of course he was drilled into the decimal system, and though he had been engaged in commercial operations in the British dominions for many years since, he found a difficulty in his calculations in pounds, shillings, and pence, because they was so intricate in comparison with the French system. At the same time, he admitted the force of what had been said with regard to the French system in matters of large accounts and statistics. He also admitted that there might be great difficulty in getting the English people of the present generation to comprehend that system thoroughly; and some could probably never be made to do so; but we were not now so isolated as we formerly were. Europe was becoming as one nation, and was so closely connected together in business transactions, that it was desirable, if possible, to effect a change which would enable our transactions to be carried on with the utmost facility. He believed this might be brought about by the system being regularly taught in our schools. In the course of a few years we should think as well in the metrical system, or whatever system was chosen, as we did now in the pound sterling. If we were brought up to think in ten-franc pieces, or in any other pieces that were found more convenient for all nations—not for England alone—it would soon become as convenient to us as the pound sterling. We were in the grub state at present; we wanted to become a butterfly, but had to get through the chrysalis state. He concluded by proposing a vote of thanks to Professor Levi for his very able paper.

The vote of thanks having been passed,

Professor Levi said he was very grateful to the meeting for the patient attention that had been given to a subject so dry. He hoped after this discussion there would be no great difficulty in promoting a measure which, he was certain, would be of the greatest benefit to the world at large.

The Secretary has received the following communication:—

Sir,—There is little, if any, room for doubt that, accustomed as India has been for so many ages to a

silver currency, the Government will adopt the double standard at first as matter of temporary expediency. But there is no reason to suppose that the ultimate results in India will be different from those experienced in other parts of the world. The continuous new supplies of gold will demonetize silver, and India will at length be obliged to coin its silver money in a debased or token form. The relative value of Indian and English money is subject to the fluctuations of the money market. A rupee may sometimes be worth two shillings and twopence, at other times only one shilling and ninepence, but two shillings is the average par or medium commercial value. The convenience of the two countries would obviously suggest that the ten-rupee piece should be coined of the same weight and fineness as the sovereign. Singularly enough, however, the agio upon gold in India which has actually prevailed has apparently blinded the eyes of the commission to this convenience, and by their virtual adoption of the suggestion that the golden multiple of the rupee should be calculated and minted with regard to the value of the rupee only, and apart from all other considerations, sovereigns being allowed to run for their relative value, they have taken rather the exchange, or bullion brokers' views of the question, than the views of those who consider that the gold coinage of England and of India might, with a certain degree of adjustment, made once for all, be easily rendered international. It is by no means clear whether the proposed golden rupees are to be minted at an average price of the British or Australian sovereign, as measured by the agio on gold in Calcutta, over a given period of years—say from $10\frac{1}{8}$ to $10\frac{1}{4}$ rupees per sovereign—or whether the double standard is to be arranged by fixing on some stated proportion according to the best opinions upon the present relative values of gold and silver bullion in the open commercial markets of the world. The most recent price of the gold sovereign in India is 10 rupees and two annas, or $10\frac{1}{8}$ rupees. This, expressed decimally, is 10·125 rupees per sovereign, or an agio of 1·25 per cent. above par. I would submit that, under these circumstances, the adoption of a par of exchange between our sovereign and 25 francs, by the reduction (explained in my pamphlet) of 0·825 per cent. in the intrinsic value of the sovereign, would bridge over this difficulty entirely. This reduction of 0·825 does not, obviously, quite at a moment remove the whole agio of 1·25 per cent., but it would do so practically in a very short time, as the introduction of a gold coinage into India would make gold commoner, and bring down this agio to its true level or remove it altogether.—I am, &c., Fredk. Hendriks.

PRESERVED FRESH MEAT FROM AUSTRALIA.

The following account is taken from the *Sydney Herald* of September last. Mr. Morris, the gentleman named in the article, has arrived in this country, and states that the particulars, as given below, are substantially correct. Mr. Morris has offered to give further explanation on the subject to the Society's Food Committee :—

In a small nook, near the top of the winding valley of La Croza (not yet shorn of all its sylvan beauties in that part of it which opens into the low alluvial tract at Rushcutter's Bay) stand the New South Wales Ice Company's Works, sheltered from hot winds and fervid afternoon sunshine, by steep banks of earth and ranges of rock. Cottages are rising here and there on the adjacent slopes, and imperfect outlines of streets are beginning to be visible in the green fields so long left untouched, to the left of the main road from Sydney to Paddington—near the site of the old toll-bar, and just beyond the Roman Catholic Church of the Sacred Heart. It is not a spot which presents any very peculiar local attractions, for everything is in that rather disagreeable transition state which seems to be inevitably antecedent to all material improvement and hopeful progress. Nevertheless, a number of gentlemen visited the Ice Company's Works on Tuesday, and there gratified their curiosity and increased their knowledge by a personal inspection of Mr. Mort's meat-preserving apparatus—an invention which has been already guarded by Australian patents, and for which Mr. Morris is about to seek the additional protection of patents in England, in France, and in America.

About seven years since, when fat sheep and cattle were fetching but very low prices, Mr. Augustus Morris endeavoured in the neighbouring colony of Victoria to form an association of Australian stock owners, with the object of raising a sum of money sufficiently large to induce men of science to turn their attention to the discovery of some practical method by which the surplus fat stock of the colonies might be introduced into the European markets. Mr. Morris proposed that scientific experimental research should be particularly directed to the reduction of temperature, as likely to prove the readiest means for producing the desired results. His enterprising and far-sighted proposals were, however, not received with the favour which they deserved at the hands of the public; much witless ridicule being expended orally, and through the newspapers, in opposition to his idea—that it was here quite feasible to preserve meat by a freezing process, and thus to have it conveyed round the world, transported across the wide ocean to the other hemisphere, where the constant supply of millions with animal food is a problem which, year after year, becomes more difficult of solution. Satisfied that he had suggested the true mode of accomplishing the object he had in view, Mr. Morris was not to be deterred by the sneers of the conceited and ignorant, and ceased not to advocate the adoption of his idea. Rather better than two years ago, he became acquainted with Mr. Nicolle's method for producing cold, and felt convinced that he had at last met with the man who was, of all others, the most competent to realise his long cherished hopes in this direction. Mr. Nicolle, as we are given to understand, entered with commendable zeal into the matter, and expressed himself confident of being able to carry out all that was desired by Mr. Morris, who vainly endeavoured to interest other stockowners, so that a fair trial might be made, as a test of the proposed plan. The late Mr. J. D. M'Lean was, it would seem, the only person of note who thought favourably of it. Again, about twelve months ago, Mr. Morris invited public attention to this important subject by a circular which, in face of the success which has been realised, will doubtless be interesting to our readers. That document was as follows :—

"An experiment is about to be made for the preservation of meat by freezing without the use of ice, and without the meat being touched by any substance, except the iron tank containing it.

"Should the experiment be successful, an economical plan will have been devised, by which the superabundant meat of the Australian colonies can be introduced into the European and Asiatic markets in the same condition, both in regard to freshness and quality, as it is daily supplied in our own local markets. Ships can be fitted with the apparatus, by which, without injury to their capacity for carrying any other cargo, they can convey all over the world fresh meat for sale, or for the use of their crews and passengers during the voyages from and back to our ports, and without any risk of the meat spoiling.

"To give the plan a fair trial, the model, on which can be constructed, with greater certainty of success, the larger apparatus with which ships can be fitted for the conveyance of a partial or full cargo of fresh meat, will be made to contain about 7,870 lbs., or $3\frac{1}{2}$ tons of meat. It is proposed to fill the model for the most part with beef and mutton, to avoid unnecessary expense, only leaving room enough for such fresh fish, poultry, game, &c., as will be required for a public dinner, to be given after the experiment is pronounced successful. The model will be submitted to the severest test the subscribers may themselves consider necessary; and unless it fulfils the conditions proposed their subscriptions will be returned.

"Messrs. Mort and Co. have kindly consented to act as treasurers, and will only disburse the funds as directed by a committee selected by the subscribers. On the completion (in about six weeks) of the model, Mr. Augustus Morris will read a paper explaining the theory of the proposed plan for preserving fresh meat, and its practical and economical adaptation to the purposes intended, and showing the manifold benefits which will follow, should its success be demonstrated.

"The co-operation of all interested is invited.

"Sydney, 13th September, 1866."

Still those whose interest it most certainly was to give every encouragement to the project held aloof; and a trial of its value might, perhaps, have been indefinitely postponed had not the matter been brought under the notice of Mr. Thomas S. Mort, who immediately appreciated the importance of the proposal, and, with characteristic liberality, offered to bear the whole expense of the necessary experiments. Since the time that Mr. Mort was known to have come to such a resolution, he, of course, has had to bear his share in the bantering and discouragement previously lavished upon Mr. Morris and Mr. Nicolle. Notwithstanding many obstacles—arising principally from the want of right materials and men accustomed to the work—an admirable apparatus has been invented, constructed, and put in use by Mr. Nicolle—an apparatus capable of freezing several hundred tons of meat, and of keeping it in such a refrigerated state. The powers of the apparatus have been fully tested, and the invention has been crowned with a most triumphant success. Meat preserved in a perfectly fresh and uncooked state for months has been partaken of at the table of the governor, at the clubs, and in many private houses; and in all instances thus preserved has met with unqualified approval. It is, moreover, a remarkable fact that meat thus kept frozen neither loses flavour nor becomes putrescent immediately upon its thawing, as does meat preserved in ice, or frozen in the open air. On the contrary, it has been found that meat thus preserved, when suddenly released from the refrigerating influence to which it has been subjected, will keep as long as when obtained fresh from the butcher. Mr. Mort has obtained a patent for this invention under the laws of New South Wales, and has also applied for similar protection in other Australian colonies. The title of the invention is "A self-acting method of, and apparatus for, preserving fish, flesh, and fowl, and all other articles of food, by a process of refrigeration." The inventor (Mr. Nicolle) in his specification filed in the Supreme Court of this colony, on which the patent here has been granted, states that—"The invention being an application of Faraday's discovery of the liquefaction of certain gases by pressure, and the capacity of such gases for the absorption of heat on their release from liquefaction, has for its object the introduction of improved mechanical arrangements, whereby such gases may be employed to produce a temperature sufficiently low to secure the preservation of all articles of food. Although claiming the use of other liquefying gases, I claim and propose to work my apparatus by means of ammoniacal gas, which, by reason of its great solubility in water, and of the quantity of caloric which it absorbs in passing from the liquid to the gaseous state, and on account of its safety for use on shipboard, appears to be the most suitable agent to employ."

The apparatus now in active use at the Ice Company's Works has been set up in a shed on the eastern side of the yard, and is sufficient for preserving as much as 3,000 bullocks—or, say 1,000 tons of meat. The apparatus is more particularly designed for use on board ship, the whole of the machinery and fittings being so arranged that everything can be conveniently stowed away, and space so be properly economised. The larger portion of the apparatus is to be placed between decks, the feeders and desiccators, &c., where the water flows, being on deck, and the large meat receiver or receivers down below. The material used is ammonia—the liquid ammonia of commerce. This, being greatly rectified, is put into cylinders called "separators," the quantity of absolute ammonia in such cylinders being indicated by glass gauges. From a small steam-boiler the steam is led by a coil which passes into a closed cylinder, called a "separator;" the object in using the steam being to heat the ammoniacal solution in the separator, and so to cause the ammonia to be volatilised—or, in other words, resolved into gas. So gasified, the ammonia is driven off from the water, and conveyed by a series of pipes, through a number of coils, into a bath or tank of water on the deck of the vessel. The object of this is to refrigerate the gas, condensing the aqueous vapour (by which the ammonia is accompanied), so that it may re-return to the separators below. This particular portion of the apparatus is termed the "desiccator." In the employment of cold water for this purpose, in the bath of the desiccator, a great economy is made available; the desired end—the "drying" of the gas—not being otherwise attainable, except by an expensive chemical process. The gas, being thus dried, is forced by the heat of the steam into an iron cylinder immersed in a bath (also on deck), and there, by pressure on itself—being a non-permanent gas—it becomes liquefied. This last-named vessel is called the "the liquid gas receiver." From this receiver, the gas, in a liquid state, is passed by pipes into an outer compartment of the "meat-receiver," a large double iron cylinder, as capacious as may be required. The meat-receiver of the apparatus at the Ice Works is a huge affair, somewhat resembling an enormous long cask outside, and, in its interior, not unlike a cavern. The meat-receiver is made with a double casing—so as to form a compartment intervening between the "cave" and the outer surface, its walls perfectly tight, to contain the liquefied gas supplied from the liquefied gas-receiver. This vessel is to be surrounded with some good non-conducting substance, such as charcoal, felt, or gutta-percha, enclosed in a wooden covering, painted or varnished, to exclude all moisture. The two shells of the cylinder are eccentric to each other, so that the inner shell rests on the bottom of the outer one, leaving at the top a space of about two inches. At the ends of the meat-receiver are two holes, big enough to give entrance to a man, through which the meat-receiver may be conveniently loaded or emptied. These orifices are made to fasten up with wooden covers or doors, which are fitted round their oval rims with gutta-percha, and securely attached into their proper places by means of screws.

Having thus given the reader an idea of the general nature of the apparatus, it remains for us now to attempt briefly to explain the *modus operandi*:—the manner in which the refrigerating gas is hereby generated, and conducted to the compartment surrounding the interior of the meat receiver, where its immediate effect is to cause everything to freeze which is deposited in that cavernous spot.

The gas, having been driven out of the "separator" by the heated water, is first forced by the heat (arising from the action of the steam supplied from the boiler) through two "coolers." From the "coolers" it passes on, by a pipe, into an iron cylinder called the "re-absorber," which is immersed in a water tank. The "separator," being now again emptied, is again supplied with fresh ammoniacal solution from the "feeder" on deck, and the process is repeated. The re-absorber, now containing a weak solution, is prepared to receive the gas coming into it from the compartment round the meat receiver. It must be understood that ammoniacal gas has so great an affinity for water that water at 60 Fahrenheit will take up six hundred and seventy times its volume of gas. The consequence of this is that when, by opening a stopcock, admission for the gas to the water in the re-absorber is obtained, it rushes in with great violence, passing from its state of liquefaction into a gaseous form, and carries with it all the caloric or heat contained in the meat, &c., it has been surrounding. It is in this transition, when the liquid expands into a gaseous state, that the freezing, or complete refrigeration, takes place. Only as much ammonia is required at a time as will fill one of the series of receivers. From the special details of the apparatus, there is no loss whatever of the chemical substance employed. The compartment round the meat receiver is filled with the icy current from time to time, and emptied off by the stopcocks, until all the meat, &c., in the place is frozen with as much intensity as may be desired. The ammoniacal gas is capable of freezing 100 degrees below zero.

Beyond, at 103 below zero, however, that gas itself becomes solidified. To freeze a compartment on board ship containing one hundred tons of meat would be accomplished by Mr. Mort's apparatus at the ice works, invented by Mr. E. D. Nicolle, in about twelve hours. The particular apparatus we have been describing would take up about thirty tons of cargo space on board a ship. The refrigerating power attained by it is enormous, considering the small bulk of the apparatus. But Mr. Nicolle has discovered a modification which will reduce the size of the apparatus to one-third, and, at the same time, increase its refrigerating power tenfold.

The gentlemen who visited the self-acting meat preserver on Tuesday, and who ventured into the meat receiver, finally found themselves (as we have intimated) in a small cave, on the dark side of which the air was, in some places, condensed into snow an inch or two thick. All along the floor of the compartment tin buckets, from two to two and a-half inches across in their narrowest part, and about six inches high, stood full of, what appeared at first, by the dim light of the candle, to be water, but which, by the application of experimental fingers, were found to be full of solid ice. Fish, poultry, legs of mutton, saddles of mutton, and such other goodly provisions, were piled up near the entrance, and at the further end,—all frozen, hard as pieces of board, but sweet and good. Mr. Morris unlocked a large metallic box, and showed his friends a frozen rabbit, ready trussed for the table, and a fish which had come three weeks ago from Government-house, and was destined to be returned to that locality. Some of the meat there had been in that icy den for more than twelve months, some for six months, and some only for a week or two. The larders of most of the city clubs were well represented. The change from the hot winds outside to the sharp and frosty air of the receiver was, to say the least of it, a very remarkable sensation—one that could not be experienced without astonishment. On the whole, however, the visitors evidently preferred the warmth of the atmosphere of Australia, and wondered at the stoical indifference which Mr. Morris manifested for the intense cold. Mr. Mort claims eight things as peculiar to Mr. Nicolle's invention. First, the continuous operation of the apparatus without the use of any external force—beyond the occasional application of heat from a steam boiler; second, the mode in which he applies heat to the "separator;" third, the mode by which he rectifies the gases after liquefaction; fourth, the mode by which he removes the weak liquor from the "separator" into the "reabsorber" by its own pressure; fifth, the mode by which he sends up into the "feeder" the strong liquor from the "reabsorber;" sixth, the mode by which he returns the strong liquor into the "separator;" seventh, his admirable arrangement of the "meat receiver;" and, lastly, the arrangement he has made of what he calls the "portable meat preserver."

We are given to understand, that to Mr. T. S. Mort is due the honour of enabling this invention to be brought into practical application. The patience, the perseverance, and the liberality which he has displayed can only be fully appreciated by Mr. Nicolle and Mr. Morris. Day after day, week after week, month after month, Mr. Mort has watched the progress of the experiment, and by his cheerful encouragement and practical suggestions has contributed in a high degree to its satisfactory results. In fact, the portable meat preserver was wholly suggested by Mr. Mort.

Mr. Morris intends leaving for Europe by the present mail steamer.

PARIS EXHIBITION.

The *ouvriers délégués* of France are commencing the publication of their reports on the late Exhibition, the first announced being that of the bookbinders, which forms a volume of about 30 pages in 18mo.; the price is fixed at 2·50 francs for Paris, and 3 francs for the departments; and in order that no one may find a difficulty in obtaining it, the sum may be paid or remitted in postage stamps by instalments; all applications are to be addressed to M. Ad. Clemence, 19, Rue des Juifs, Paris.

The vast building in the Champ de Mars is being rapidly cleared of its contents, and the operation has been facilitated by the fineness of the weather. Clearing out seldom presents much interest, but the other day a small object was taken away under peculiar circumstances; the carpenters of Paris exhibited a small temple, constructed in wood, as a specimen of fine workmanship, and which drew deserved admiration, and it was taken away the other day with much ceremony. More than five hundred affiliated carpenters, all in their best clothes, and each carrying a long wand, which is traditional with their corporation, appeared at the Champ de Mars, and, having received the model, carried it triumphantly to their head-quarters, at La Villette—"to their mother's house," to quote their own picturesque expression; a gay band of music preceding the procession, which had a fine effect as it passed along the whole length of the last of the great new thoroughfares, the Rue Lafayette prolonged.

It will not be out of place, now that the Exhibition is passing into history, to speak of two words which have come into use in connection with exhibitions, namely—*annex* and *exhibit;* the former was used by the commission in 1862 as written above, but of late it has been the fashion to add a final *e* because the word was taken directly from the French, but surely it is more logical to maintain the analogy of our own language, and write the new noun without the *e*, as we write affix, prefix, and suffix. The word *exhibit*, used as a noun, has been pronounced barbarous, but it has been in use for ages to represent a legal document exhibited. Where, therefore, is the objection to applying it to an object shown?

While on the subject of international Exhibitions we may mention the appearance of the fourteenth volume of the reports, or, to quote the official title, the *Travaux de la Commission Française sur l'Industrie des Nations*, on the Great Exhibition of 1851. The new volume forms a portion of the introduction by Baron Charles Dupin, which bears the title of "The Productive Force of Nations," and continues the subject of India, dealing with Bombay, the Punjab, Cashmere, and the Mahratta territory; the next volume is to be devoted to Madras, Mysore, Hyderabad, the Portuguese and French possessions, and Ceylon.

M. Dupin's introduction is a general review, not only of the commerce and resources, but also of the government and condition of the various people; and the volumes which treat of the British present great interest, as coming from a point of view different from our own. The delay in the publication of the volumes really adds to their value, as M. Dupin has thereby been able to avail himself of all events that have occurred during the sixteen years that have elapsed since the first great international exhibition occurred. The British rule in India finds a fearless, though not a one-sided critic in M. Dupin.

Fine Arts.

PARIS SALON, 1868.—The regulations for the next annual exhibition of pictures have just appeared. The *Salon* is to open as usual on the first of May, and to close on the 20th June; all works, whether by native or foreign artists, to be sent in between the 10th and 20th of March at the latest. The chief regulations are the same as they were last year: no artist can exhibit more than two works in any of the seven sections of painting, drawings, &c., sculpture, engraving, medal, and fine stone engraving, architecture, and lithography, but he may contribute to all or any of these sections. With respect

to the election of the jury, a great change has been made, this being entrusted, without any reserve, to the whole body of artists who have had a single picture admitted at any former exhibition except that of 1848, when there was no previous examination, and who send anything for the coming *Salon*, each artist voting only in his own section or sections.

Manufactures.

Woollen Manufacture in Italy.—The woollen industry in Italy has greatly declined from its ancient prosperity. Five centuries ago Florence alone produced woollen goods to the amount of 1,200,000 golden florins per annum, and gave employment to 30,000 persons. Venezia was formerly celebrated for dyeing cloths, especially crimson and scarlet, and, with Como and Bergamo, previous to the Austrian dominion, dyed 1,848,000 pounds of wool woven into cloth. Sheep are scarce in Italy, not numbering more than 8,804,918 in the whole kingdom. The best wool is from Ascoli, Chieti, Ancona, Foggia, Lucca, and Bari, whilst that of Messina, Reggio, and Porto Maurizio is inferior in quality. Besides the raw material produced in the country, 11,660,000 lbs. are imported, which, after being spun and woven, amount to £2,640,000 in value, of which sum £537,600 represents labour, dyeing, and other expenses. The mills are chiefly worked by water power, and the machinery is principally of Belgian make, and especially from Verviers. The most important manufactories of cloth are at Prato, Schio, and Biella.

Commerce.

Agricultural Statistics in Italy.—The Minister of Agriculture has recently addressed the various agricultural committees (*comizii agrarii*) inviting them to furnish returns on the cultivation and production of corn in their respective provinces and communes. In his circular the minister states "that the average production of corn in other European countries varies from 23 to 25 hectolitres per hectare (about 25½ bushels to 28 bushels per acre), whilst average produce per hectare in Italy does not amount to more than from 10 to 12 hectolitres (or about from 11 to 13½ bushels per acre). If this produce could only be raised to 15 hectolitres per hectare (16·70 bushels per acre) Italy would cease to be dependent on other countries for one of the most important articles of food. Such results will be greatly facilitated by improvements in the manufacture and proper use of manures, to which the committees should especially turn their attention." In order to obtain exact returns of the production of corn, the following questions have been sent to the presidents of the committees:—1. The total amount of hectolitres produced in the commune at the last harvest (of 1867). 2. What is the average produce in hectolitres per hectare? 3. What is the average weight of a hectolitre of corn produced in the said commune? 4. What is the number of hectares at present sown with corn with a view to the harvest of 1868? 5. What is the average quantity of grain used for sowing per hectare? A subsidy of 100 francs (£4) has been given to each of the committees by the government, with a view to facilitate the collection of the data on the production and cultivation of the most important grain crops.

Colonies.

The Manilla Fibre in Queensland. — Another manufacture is about to be commenced in this colony. A firm is just commencing the manufacture of manilla fibre from the stalk of the banana. There is no reason whatever why this branch of trade should not become an important one, as there is any quantity of the raw material, which, at present, is either used as manure for the young plants, or entirely thrown away. The same firm is also commencing the manufacture of starch from the sweet potato, and is thus opening up a market for a crop which can be grown with little trouble, and to any extent.

The Revenue of New Zealand in the year 1866 was £1,343,951, and the total expenditure £1,345,753. The export of gold was valued at £2,605,000, against £2,858,000 in the year 1865. The expenditure for the years 1867-1868 is proposed as follows:—

Permanent charges	£305,818
Postal	155,241
Law and justice	69,892
Public departments	45,025
Customs	44,810
Miscellaneous	39,403
Militia and Volunteers	28,052
Native	24,058
Civil list	27,500
Public domains and buildings	4,376
	£744,175
Revenue is estimated at	£1,084,000

Notes.

Population of Berlin.—Berlin, in 1864, contained 633,000 inhabitants, of whom 22,000 were soldiers. Of the civil population, 302,304 were natives of Berlin; 44 per cent. were born in the provinces; 5 per cent. of other German countries; and 1 per cent. from abroad. Of 130,671 heads of families, 32 per cent. were born in Berlin, 67 per cent. elsewhere, and the origin of the remaining 1 per cent. is not known. As in all large towns, the immigrants form a large majority amongst the adult population: ecclesiastics, professors, &c., 1 per cent.; the working classes, 29 per cent.; traders and manufacturers, 18 per cent.; persons of independent means, 7 per cent.; and 12 per cent. individuals without any regular means of subsistence. The receipts of the municipality of the Prussian capital amount to 3,504,000 thalers, and the expenditure to 4,803,115 thalers. The octroi duties produce annually 748,261 thalers, and the tax on dogs, 53,500 thalers. Public instruction absorbs 721,939 thalers. The receipts for 1868 will be 145,017 thalers; and the expenditure 217,075 thalers more than that of the present year, and will constitute a total deficit of 1,661,207 thalers.

Paris Theatres.—The Paris theatres have had an exceptional time in consequence of the Exhibition, as will be seen by the comparative list of receipts during the seven months in which the Palace in the Champs de Mars remained open. The concerts, dancing rooms, and various exhibitions are as usual included in it:—

	1866.	1867.
April	2,029,937 francs	1,710,788 francs.
May	1,590,678 ,,	2,285,725 ,,
June	1,092,990 ,,	2,240,976 ,,
July	902,431 ,,	2,289,896 ,,
August	1,054,427 ,,	2,246,306 ,,
September	1,329,622 ,,	2,702,752 ,,
October	1,640,729 ,,	2,876,917 ,,

This difference in favour of 1867, is 6,893,148 francs for seven months, or (£40,000) per month. That the Exhibition season did not commence before the month of May is shown by the above figures, as the receipts for April, 1867, were less than of the same month in 1866.

Revenue of the Principal Towns in France.—The *Moniteur* gives the following as the revenue of the twelve principal towns of the empire. Paris, 134,393,800 francs;

Marseilles, 11,218,938 francs; Lyons, 9,174,877 francs; Bordeaux, 9,066,222 francs; Rouen, 5,645,068 francs; Lille, 2,910,422 francs; Nantes, 2,495,263 francs; Toulouse, 2,225,850 francs; Havre, 2,215,583 francs; Toulon, 1,775,906 francs; St. Etienne, 1,729,492 francs; Strasbourg, 1,690,280.

Correspondence.

HOT DINNERS.—Sir,—With reference to Mr. Riddle's most excellent suggestions for supplying the working classes with hot-cooked meat from certain depôts, I would remark: 1st. That the system would be much appreciated by a large class not belonging to the working classes, viz., by a class, and a very numerous class it is, to whom the saving of £20, £30, or £50 a year constitutes the difference between being in easy circumstances or in difficulties; this applies especially to the poor upper classes, who rarely have any knowledge of how to economise. The lady of the house, for instance, orders a joint of meat, but is quite unable to calculate how many days or hours it should last. After the first day she declines to inspect the remains of the joint, but timidly asks cook if there is enough to last for the second day's dinner? and cook, in the great majority of cases, replies, "Oh! no, ma'm, not near enough." The lady rejoins, "Then just get in 2lbs. of steak to make up." "Yes, ma'm." When the butcher's book comes in on Monday, the aforesaid joint is found to have cost a fabulous sum; and the 2lbs. of steak ordered has swelled probably to 3lbs. 10oz., at 14d. a lb. Now, if it were once fixed what the proper weight of meat for a family, say of six, should be, I believe the consumer could save about one-third of the present cost of his butchers' meat by ordering daily the proper cooked allowance. 2nd. The system would admit of a much greater variety of food than can be now enjoyed easily. 3rd. It would tend to annihilate marine-store thieves, and put an end to a thousand little peculations, now peculiar to the "airy" department. 4th. To give a dinner to half-a-dozen dear friends or fashionable acquaintances would be an easy, agreeable, and inexpensive amusement, instead of, as at present, to all (except very rich people, who keep professed cooks) a source of unknown expense, and ludicrous or dangerous excitement. 5th. The system advocated would enable many to dispense with the most exacting and tyrannical class known to genteel but poor householders, viz., "good cooks." 6th, and lastly. The most wasteful of all domestic contrivances, kitchen ranges, might, if the system advocated were carried out, be sold off as old iron.—I am, &c., M. D.

MEETINGS FOR THE ENSUING WEEK.

MON......Entomological, 7.
Royal Inst., 2. General Monthly Meeting.
Society of Engineers, 7½. Adjourned discussion on paper by Mr. Arthur Rigg, jun., "On the Connection between the shape of Heavy Guns and their durability."
British Architects, 8.
Medical, 8.
Asiatic, 3.

TUES ...Civil Engineers, 8. 1. Mr. Wm. Wilson, "Description of the Victoria Bridge on the line of the Victoria Station and Pimlico Railway." 2. Mr. Charles Douglas Fox, "On New Railways at Battersea; with the Widening of the Victoria Bridge and Approaches to the Victoria Station."
Pathological, 8.
Anthropological, 8.
Syro-Egyptian, 7½. Mr. Samuel Sharpe, "On the Invasion of Palestine by the Assyrians and Babylonians."

WED ...Society of Arts, 8. Dr. Stallard, "On the Relation between Health and Wages."
Geological, 8. 1. Dr. H. A. Nicholson, "The Graptolites of the Skiddaw Series." 2. Dr. P. Martin Duncan, "The Fossil Corals of the West Indies." Part IV.
Pharmaceutical, 8.
R. Society of Literature, 4½.
Obstetrical, 8.

THUR ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Mr. E. Ray Lankester, "Contributions to the Knowledge of the Lower Annelids." 2. Mr. C. A. Wilson, "On the *Moloch horridus* of S. Australia."
Chemical, 8. Mr. W. H. Perkin, "Artificial formation of Comnaric Acid."

FRI ......Society of Arts, 8. (Cantor Lectures.) Prof. Westmacott, "On Art, especially including the History and Theory of Sculpture."
Geologists' Association, 8.
Philological, 8.
Archæological Inst., 4.

SAT ......R. Botanic, 3¾.
Artists and Amateurs, 7. Annual Meeting.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 23rd August, 1867.*

476. Churches, &c. (Ireland)—Return.
496. Mines—Report and Evidence.
522. India Office—Order in Council.
536. Cathedral and Collegiate Churches—Return.
550. Browne's Charity—Report.
556. East India (Judges)—Return.

Delivered on 24th August, 1867.

482. Army (System of Retirement)—Report.

Delivered on 26th August, 1867.

523. Metropolitan Workhouses (Roman Catholic Children)—Return.
540. Navy (Iron Ballast)—Letter.
567. District Lunatic Asylums, &c. (Ireland)—Returns.

Delivered on 27th August, 1867.

Turkey—Reports on the Condition of Christians, Part II.
River Plate (No. 2)—Correspondenee.
Public General Acts—Cap. 106 to 146.

Delivered on 28th August, 1867.

353. Ship "Northumberland"—Return.
520. Metropolis Gas Bill—Report.
Public Petitions—Supplement to Thirty-seventh Report.

Delivered on 3rd September, 1867.

Public General Acts—Cap. 125 (corrected).

Delivered on 12th September, 1867.

Ritual Commission—First Report of the Commissioners.

Delivered on 14th September, 1867.

470. Malt Tax—Report.
492. Industrial and Provident Societies—Return.
497. Oxford and Cambridge Universities Education Bill—Special Report.
521. Woodhouse Collection—Report, Evidence, &c.
Patagonia—Correspondence.
North America (No. 1)—Correspondence respecting British and American Claims.

Delivered on 16th September, 1867.

46. (VII.) Trade and Navigation Accounts (31st July, 1867).
450. East India (Land Revenue)—Return.
453. Military Reserve Funds—Report, Evidence, &c.
573. Register of Deeds (Middlesex)—Report.
Colonial Statistics—Statistical Abstract from 1852 to 1865, Third Number.
Births, Deaths, and Marriages—Twenty-eighth Annual Report.
Trades Unions and other Associations—Third Report of the Commissioners.

Delivered on 17th September, 1867.

46. (VII.) Trade and Navigation Accounts—Corrected Pages.
428. Grand Jury Presentments (Ireland)—Abstract of Accounts.
443. Sea Coast Fisheries (Ireland) Bill—Report.
492. (I.) Industrial and Provident Societies—Return.
508. Treasure Trove—Returns.
510. Joint Stock Companies—Returns.
514. Spirit Licenses—Returns.
537. Navy (Armour-clad Ships and Batteries)—Return.
539. Ship "Olivia"—Report.
554. Demerara Barracks—Report.
555. Places of Worship, &c.—Returns.
569. Terminable Annuities—Warrants.
570. Biliingsgate Market—Return.
571. Farringdon Market—Return.
572. Poor Relief (Ireland)—Returns.
577. Weights and Measures—Return.
581. Poor Law (Ireland)—Correspondence.

Delivered on 19th September, 1867.

Public General Acts—Table.

Delivered on 21st September, 1867.

490. East India (Madras and Orissa Famine)—Return.
519. Public Accounts—Second Report.
544. Illicit Distillation—Returns.
553. Standing Orders.

Delivered on 23rd September, 1867.

301. (I.) Metropolitan Local Government, and Index to Reports.
541. War Department—Return.

Delivered on 24th September, 1867.

Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation (No. 7, 1867).

Delivered on 25th September, 1867.
Trades Unions and other Associations—Fourth Report of the Commissioners.

Delivered on 28th September, 1867.
403. Savings Banks—Return.
431. (A III.) Poor Rates and Pauperism—Return (A).
471. Fire Protection—Report.
520. (I.) Metropolis Gas Bill—Index to Report.
531. Exchequer and Audit Departments Act—Minutes, &c.
547. Fees on Appointments, &c.—Treasury Minute.
549. Post Office—Returns.

Delivered on 3rd October, 1867.
46. (VIII.) Trade and Navigation Accounts (31st August).
551. Steam Ferries (Firth of Forth)—Return.

Delivered on 5th October, 1867.
495. (I.) Metropolis Subways Bill—Index to Minutes of Evidence.
515. Friendly Societies—Report of the Registrar.

Delivered on 7th October, 1867.
389. The "North"—Report of Mr. Montagu Bere.
Portugal and France—Treaty of Commerce.

Delivered on 8th October, 1867.
French Army in Algeria—Report on the Causes of Reduced Mortality

Delivered on 11th October, 1867.
Civil Service—Twelfth Report of the Commissioners.

Delivered on 12th October, 1867.
478. Army (India and the Colonies)—Report.
503. (I.) Ecclesiastical Titles and Roman Catholic Relief Acts—Index to the Report.
Exhibition of 1851—Fifth Report of Commissioners.

Delivered on 19th October, 1867.
446. Steam Vessels—Return.
574. East London Waterworks Company—Correspondence.

Delivered on 24th October, 1867.
431. (A IV.) Poor Rates and Pauperism—Return.
451. House of Commons (Arrangements)—Report and Evidence.
532. Abyssinia—Account.
568. Fortifications—Treasury Minute.
Rivers Pollution—Third Report of the Commissioners (Rivers Aire and Calder).

Delivered on 25th October, 1867.
507. Health of the Navy—Statistical Report.

Patents.

From Commissioners of Patents' Journal, November 22.

GRANTS OF PROVISIONAL PROTECTION.

Boilers—3212—A. M. Clark.
Boilers, fuel feeding apparatus for—3131—R. Newton.
Bookbinding, &c.—3020—J. J. Perry.
Boots, knives, &c., cleaning and polishing—2935—J. J. Holden.
Boxes, anti-friction journal—3123—A. V. Newton.
Boxes, lubricating—3195—H. A. Bonneville.
Brakes—3119—A. M. Clark.
Bricks, &c., moulding—3196—H. A. Bonneville.
Buckles—3201—T. Evans.
Calculating apparatus—3117—C. E. Brooman.
Carriages for tramways, &c.—3144—C. H. Bright.
Cartridges—3187—W. R. Lake.
Casks, &c., bungs for—3204—L. A. Badin.
Castors—3188—W. R. Lake.
Chlorine, producing—3132—I. Baggs.
Cylinders, polishing—3126—R. Leake and J. Beckett.
Eye-preservers—3116—H. Adeane.
Fabrics, dyeing textile—3135—J. Botterill.
Fabrics, elastic—3173—C. Bedells.
Fabrics, narrow, arranging in boxes, &c.—3202—M. B. Westhead and R. Smith.
Fabrics, waterproof—3136—W. R. Lake.
Figures, &c., revolving apparatus for exhibiting—3156—H. Jewitt.
Files, manufacturing—2982—A. Chambers.
Fire-arms, breech-loading—3189—W. R. Lake.
Fire-arms, breech-loading—3214—W. R. Lake.
Fire-arms, breech-loading—3216—R. Adams.
Fire lighters—3194—J. C. Bayley and D. Campbell.
Flour—3140—T. J. Baker.
Flour and bread—3120—R. Palmer and H. S. Hird.
Fuel, artificial—3198—W. H. Crispin.
Furnaces—3133—E. and R. Thornton.
Furnaces—3168—E. B. Wilson.
Furnaces—3180—C. B. Hodgetts.
Furnaces—3200—C. E. Brooman.
Gas, &c., increasing light or heat from—2045—F. Wilkins.
Glass globes, &c.—3158—S. Landells.
Gloves—3149—J. Wheeler.
Grindstones—3193—F. and E. L. Ransome and H. Bessemer.
Gun cotton, treating—3127—E. C. Prentice.
Iron, rolling into bars, &c.—3184—T. J. Leonard.
Knitting machinery—3190—W. and W. Campion.
Label bands—3102—A. A. L. Harrison.
Labels, forming, printing, and counting—3147—I. Hewitt.
Lace, &c., clipping—3109—W. Marshall.
Lamps—3162—S. A. Kirby.
Lamps—3171—M. Rollason.
Lamps—3172—T. W. Ingram and E. C. Kemp.
Lamps—3181—S. Buxton and W. Gardam.
Liquids, distilling, &c.—3148—J. F. Brinjes.
Locks—3166—S. Hall and M. Whittingham.
Looms—3113—T. Briggs, jun., and W. E. Yates.
Looms—3134—W. Pearson and W. Spurr.
Looms—3152—T. Blackburn.
Metal, &c., forming and working—2063—T. Berney.
Metal bolts, securing—3082—M. A. Soul.
Metal plates, feeding to rolls—3218—E. Madge.
Mineral oils, burning—3176—W. Lawrie.
Motive-power, &c.—3050—L. Perkins.
Mules for spinning, &c.—3101—H. Herden.
Omnibuses, &c.—3178—W. Thompson.
Panel doors and frames—3121—W. Geeves.
Paper, filtering—3150—R. Robinson.
Parasols—3167—H. Ellis.
Petroleum, &c., burning and distilling—3183—C. E. Brooman.
Pianofortes—3137—A. M. Clark.
Pontoons and rafts—3175—G. F. Parratt.
Postage stamps, &c., obliterating—2109—W. Warden.
Printing machines—3186—W. R. Lake.
Printing rollers—3210—F. Andrew and E. Whittaker.
Pumps—3179—W. Payne.
Railway carriages, coupling—3163—W. Chippindale.
Railway points and signals—3128—T. F. Cashin.
Railways—3151—T. Clark.
Railways—3161—T. Wrigley.
Rocking-horses, &c., propelling—3125—J. W. R. Hill.
Shaft couplings—3159—W. Inglis.
Ships—3056—T. E. Symonds.
Ships, &c., armour for—3145—E. Sacré.
Ships, &c., armour for—3185—W. R. Lake.
Skins, clearing coarse hairs from—3065—E. Donner.
Smoke, consuming—3139—T. R. Bardsley and W. Blackshaw.
Steam governors—3138—C. L. Hett.
Surfaces, indicating horizontal, &c.—3154—I. McKimm.
Tables—3146—B. T. Newnham.
Telegraphs—2960—W. R. Lake.
Umbrellas, &c.—3115—H. Smyth.
Venetian blinds—3130—W. E. Gedge.
Votes, taking and registering—3174—G. Farren.
Webs or bands, regulating the position of endless travelling—3153—G. Anderson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Axles, conveying rotatory motion to—3271—K. J. Winslow.
Bricks, &c., making, drying, and burning—3220—P. E. Bland.

PATENTS SEALED.

1530. F. H. Johnson.	1616. J. and J. Hinks.
1532. C. W. Siemens.	1663. T. Brown.
1535. E. Howell and T. Hardy.	1706. T. Holt.
1536. S. and T. Atkinson.	1822. E. McClintock.
1552. J. M. Napier.	1865. A. C. F. Franklin.
1554. A. Oldroyd.	1933. W. R. Lake.
1556. I. Baggs and F. Braby.	1943. H. Clarke.
1559. W. P. Struvé.	1958. H. Clarke.
1575. H. A. Bonneville.	2102. C. Klug.
1581. L. H. Dethiou & F. Beaubry.	2111. J. J. and E. Harrison.
1585. W. J. Burgess.	2257. L. V. Hue and C. Rozière.
1606. J. Astbury.	2587. J. R. Cooper.
1607. W. Wood.	2672. J. R. Cooper.

From Commissioners of Patents' Journal, November 26.

PATENTS SEALED.

1563. W. Affleck.	1621. R. Reece.
1567. W. H. Whettem and E. Walker.	1622. J. Lancelott.
1571. E. T. Hughes.	1643. J. Waddington & B. Longbottom.
1574. W. Coulson.	1644. G. Davies.
1580. W. Mitchell.	1648. J. McOwen.
1589. F. J. Brean.	1653. T. H. Saunders.
1593. F. B. Gage.	1907. J. J. Lane.
1594. T. E. Passee.	2485. A. V. Newton.
1596. H. Turner.	2582. H. Stewart.
1597. E. Jones.	2588. W. Brown.
1620. Rt. Hon. J. Earl of Caithness.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2888. J. Petrie.	2910. G. Köttgen.
2905. S. Bourne.	2912. J. Snider, jun.
2914. P. E. Gay.	2917. R. Morrison.
2926. J. S. Gisborne.	2995. T. Harris.
2985. H. Caunter.	2949. J. Grundy.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2862. R. Jobson.	2886. J. H. Johnson.
2867. G. E. Dering.	2889. J. Fowler, jun., R. Burton, and D. Greig.
2865. D. Auld.	2907. J. S. Manton and T. Islip.
2874. B. Beniowski.	

Journal of the Society of Arts.

FRIDAY, DECEMBER 6, 1867.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at Eight o'clock:—

December 11.—"On Industrial and Scientific Education; with Notes on the Systems pursued, and the Works produced, in Continental Schools, as exemplified in the Paris Exhibition, and Suggestions for the Establishment of Trade Schools in England." By Ellis A. Davidson, Esq.

December 18.—"On the Principles that Govern the Future Development of the Marine Boiler, Engine, and Screw Propeller." By N. P. Burgh, Esq., C.E.

Cantor Lectures.

The first course for the present session will be "On Art, especially including the History and Theory of Sculpture," by Richard Westmacott, Esq., R.A., F.R.S., Professor of Sculpture in the Royal Academy, and will consist of three lectures, to be delivered on Friday evenings, the 6th, 13th, and 20th December.

The second course will be "On Food," by Dr. Letheby, Medical Officer of Health for the City of London. A third course will be given.

The following is a syllabus of Professor Westmacott's course:—

December 6th.—Lecture I.—"On the Want of Public Education in Art; and How Works of Art should be looked at."

December 13th.—Lecture II.—The subject of the Introductory Lecture illustrated, by a general survey of the history and practice of Sculpture in ancient times, especially among the Greeks.

December 20th.—Lecture III.—The subject continued, including a review of the mediæval and more modern schools, to the close of the eighteenth century.

The lectures will commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Notice to Members.

A practical demonstration of Captain Warren's system of cooking for the army and other large bodies of men, will take place at the Society's House on Friday, the 13th inst., at the request of the Society's Food Committee. At the same time the Norwegian cooking apparatus (see *Journal*, Vol. XV., p. 664) will be shown in operation. Members and their friends are invited to attend at one o'clock p.m.

Institutions.

The following Institution has been received into Union since the last announcement:—

Glasgow, Tonic Sol-fa Choral Society.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee resumed their sittings, after the recess, on Saturday, the 16th November, when there were present—Mr. Benj. Shaw (in the chair), Sir William Bodkin, Mr. Harry Chester, Mr. Samuel Redgrave, Mr. J. T. Ware, Mr. E. Wilson, Mr. E. W. Holland, Mr. W. H. Michael, Capt. Warren, R.N., and Mr. James Greenwood.

Mr. McCall attended before the Committee for the purpose of giving information on the subject of markets for the supply of provisions to the public in various quarters of London. In reply to interrogatories by the Committee,

Mr. McCall stated that the subject of the distribution of food to the consumers had occupied a good deal of his attention, and by way of experiment he was now building a market in the Whitechapel-road, for the sale of all kinds of meat and other provisions, which he expected would be opened on that day three weeks. It had been in hand for the last twelve months. He was in treaty at the present time for suitable sites in other parts of London on which to erect suitable markets. He thought if anything on a larger scale was contemplated the experience he acquired in respect of this experimental market might be of some use to this Committee. He wished to state, at the outset, that this was not a new idea of his, and had not been suggested by the correspondence which had taken place in the newspapers with respect to the high prices of butchers' meat. The market-place in the Whitechapel-road, now nearly completed, was 80 feet long by 60 feet wide, with a gallery round it. Counters would be placed all round the ground floor, and also in the gallery. The lower part of the building would be appropriated to meat and other heavy goods, and the gallery to grocery and other household stores. It was quite a private matter of his own. He did not intend to let out the stalls or counters, but would employ his own people entirely to see how it worked. If the plan were carried out on a larger scale, it might be desirable to let the stalls; but he had started this project with a view to show how provisions might be sold and distributed at a reasonable profit, instead of the present extravagant prices. Dried fish would form part of the stores, and after a time, perhaps, other fish. He admitted that, as the stalls were not let, it was a large store, more than a market, in the usual acceptation of the term. It was his opinion that by his plan the public would be benefited by getting their food at a lower rate than is generally charged. He did not omit from his calculations the interest on the outlay for the building, but this was very small indeed; in fact, quite inappreciable. The market will not stand me in a rental of more than £250, including £130 a year ground rent. The cost of the building and fitting up would be about £2,500.

In reply to further questions, Mr. McCall said:—I calculate the returns would be something like £2,000 a week, or £100,000 a year. I have no doubt whatever of that. I calculate as profit about 10 per cent. on the prime cost of the articles. I have not made inquiries as to the amount of per-centage now

added to the cost of food by the retail dealers, but I am well acquainted with the wholesale meat market in London. I attend there every day, and I know the wholesale prices, and also the rates at which the meat is retailed. Taking the case of mutton, the value of first-class mutton at present varies from 5d. to 5½d. per lb., by the carcase. The fore-quarters can now be purchased at 4d. to 4½d. per lb.; the hind-quarters at 6d. to 6½d. As regards the price charged by retailers in Whitechapel for such meat, I have seen it ticketed up, shoulders and necks of mutton, 6d., and legs, 7d.; but further east, going towards Stratford, I noticed shoulders and necks ticketed 5d., and legs 6d. At one shop in particular there was a great crowd of people, as it was a new thing reducing the price to those figures. I do not propose to undersell those parties in my market. My idea is to sell at about the prices which obtain at the extreme east end—legs of mutton 6d., and shoulders 5d. I make a distinction between very first-class meat and another class. I do not refer to the very first class mutton, such as South Down. I am speaking of such mutton as is sent in carcases from Scotland and Holland. I should not propose to sell the very first-class mutton in that locality. I should confine myself to ordinary medium quality. I have not entered into the calculation with regard to beef; but I may tell the committee that the wholesale price of ordinary beef at present is, by the carcase, about 5½d. per lb. I do not mean Aberdeen beef, but good ox beef, killed in London. Buying beef by the quarter it would be 5d. for fore-quarters, and 7d. for hind-quarters. I should propose to sell the beef at about a halfpenny per lb. upon those prices; the prices at present charged in the above locality are upon that scale. I have no reliable information about fish. I am a large buyer of dried fish occasionally. I can buy Yarmouth bloaters at four a penny which are usually sold retail a penny each. As regards tea, I think I can supply a good black tea at 2s. per lb., the price they are charging in that district. I do not propose to undersell the shopkeepers in that article.

Have you considered the costermonger question at all?—My plan would compete with them to some extent in the case of some articles, no doubt. The recent agitation has no doubt tended to bring the prices down considerably.

What special advantages do you think would accrue to the public from the carrying out of your scheme?—The basis on which I went was, that being already a large buyer of meat in the market, I might be able to buy upon rather better terms than the general class of butchers; and seeing there is a great glut of mutton from Holland and other places sometimes, I thought I was about the best person in London to find out a way whereby to get the glut from Newgate and Leadenhall to the centres of large populations. No doubt there are large numbers of persons always on the look-out for such gluts. I propose to be one of the same class, only on a larger scale. My own trade would be entirely retail. I compete with butchers now in the dead-meat market. I contemplate that under my system my supply will be better in quality; that would be the great advantage the public would get. I am better known to all the salesmen. They know the money is safe. I think I should have considerable advantages over the low-class butchers.

In reply to questions by other members of the committee, Mr. M'Call stated that the market he was now building was situated a short distance from Whitechapel Church, about a quarter of a mile from Lemon-street and Commercial-road. His proposed plan could not be strictly called that of a market, which implied stalls held by different people, and competing with each other, while the whole of the trade in this instance would be entirely in his own hands, and conducted by his own employés. It would, in fact, be rather a store upon a large scale. At present he was not aware of the existence of a shop or store which embraced meat, grocery, and other provisions. With reference to other sites, Mr. M'Call stated that he was in treaty for sites on which to erect similar buildings in the neighbourhood of the New Cut, Lambeth; the Edgware-road; and near the Liverpool-street Railway Station, Bishopsgate. He did not propose to sell cheaper than the retail-dealers were at present doing in Whitechapel; but there might be some advantages probably in respect of the quality of the articles supplied. In Lambeth there were cheap tradesmen—low-priced—as a rule, and the prices would be about the same as at the east-end. The neighbourhood of Edgware-road had not at present the advantage of the lower prices which obtain in the other localities he had mentioned. He believed the middle-classes in the district of the Edgware-road would be content with the quality of meat, &c., which he would supply. It might be a question whether the middle-classes generally would alter their system of paying their butchers' accounts weekly, or monthly, or quarterly, and go to market with the money in their hands. It was only a question of getting people out of their long-established habits. No doubt the poorer densely-populated neighbourhoods were best adapted for the system he proposed to establish, although, in better neighbourhoods, no doubt larger profits might be gained. He believed the addition to the prime cost in an establishment at the west-end would not be more than £250 or £300 for interest on the outlay and ground-rent. He also believed that the quality of meat he would supply would be quite admissible at the tables of the majority of the west-end tradesmen. He had been buying in the market for the last two months at the rate of 300 or 400 quarters of mutton per day. He was, therefore, well acquainted with the wholesale prices. He considered the newspaper quotations of the markets were not always reliable. When the Dutch ports were closed by ice, a considerable rise in the price of mutton must be expected, as the supply would be reduced to that extent. He could at the present time buy good London-killed ox-beef at the prices he had stated. Aberdeen beef always commanded the highest price in the market; and there was a wide range between the best and inferior quality of beef. The very best quality was a fancy article in the market. He could state the price of the very best quality of beef. He would undertake to supply twenty legs of the best quality of mutton at 7d. per lb. He did not think the difference between the very best quality and that which he usually bought in the market, would be more than a halfpenny per lb.

Mr. Chester remarked that it seemed to him that the plan proposed to be carried out by Mr. McCall did not come within the character of a public market at all. This might be a venture which, in its way, might be useful to the public in the supply of provisions in particular localities, and would probably bring considerable profit to the projector; but it was not one which, he thought, would much assist the Committee in regard to the question of public markets for the distribution of food in London.

The Chairman remarked that the outline of the scheme was very interesting; and the Committee might be able to avail themselves of Mr. McCall's experience of the working of his system hereafter.

Captain Warren remarked that it was departing from the system of competition by which the public, and more especially the lower classes, benefited to a great extent in the purchase of articles of food.

The Chairman, in the name of the Committee, thanked Mr. McCall for the information he had given them.

Mr. Russell attended before the Committee for the purpose of submitting a plan for a West-end public market, and gave evidence as follows:—

I am the promoter of a market building at the West-end of London, about three-quarters of a mile from the goods station of the Great Western Station, in Talbot-road. The area of the site is two acres and three-

quarters. The communication could be made with the railway by a siding or otherwise. The nearest point to the railway is three-quarters of a mile. The estimate of the cost of the market is £120,000, of which £12,000 would be paid for the land. The building and other provisions for the market would amount to £108,000. There would be a general market for meat, fish, and vegetables. I had thoughts of raising the capital by a joint-stock company, but I now propose it as a private enterprise, and selling it at 25 years' purchase. I think as an investment it would pay 10 per cent. In my opinion, the establishment of a market at this spot would tend to reduce the price of provisions to the consumer very considerably. I have no particular details as to the requirements of the market, further than that I know the dealers in that locality have to go to the long distance of Newgate and Leadenhall for their supplies of meat, &c. I propose a retail market, and the stalls to be let for the sale of various kinds of provisions.

Have you taken into consideration the question of the supply of fish to this market, that is, wholesale, as opposed to Billingsgate? Are you aware of the difficulty there is at the present time in obtaining adequate supplies of fish at Billingsgate; and do you think there is any probability of getting any large supply for a new market at the West-end?

Yes; I think arrangements might be made for the supply of any quantity of fish from the West of England, and the telegraph would be a great aid in that matter. I should propose that the fish which came up by the railway should go direct to this market instead of Billingsgate. I believe almost any amount of fish could be had from Devonport in ten hours. I calculate upon a regular supply of fish for the market from the West of England.

Is it not the case that all the fish, in various parts of the country, is forestalled for Billingsgate market?

I have not inquired as to that. I am not committed to this special site. No doubt the purposes of a market would be better answered by the selection of a site in immediate connection with the railway, but the difficulty is to get a suitable site so situated. As regards the regulations of the market they would be such as would ensure competition between the different holders of the stalls; and care would be taken that there was no risk of any undue monopoly being secured by a few individuals only.

The Chairman, in the name of the Committee, thanked Mr. Russell for the information he had furnished.

Third Ordinary Meeting.

Wednesday, December 4th, 1867; George Ferguson Wilson, Esq., F.R.S., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Atkins, Samuel Elliott (Deputy), Cowper's court, Cornhill, E.C.
Bath, Charles, Pfynone, Swansea.
Crowther, George Henry, Bond-terrace, Wakefield.
Davis, Lewis, 7, Bute-crescent, Cardiff.
De Jersey, Henry (Deputy), 13a, Gresham-st. west, E.C.
Dimsdale, Robert, M.P., 11, George-st., Hanover-sq. W.
Dodd, G. Ashley, 40, St. James's-street, S.W.
Fellows, Frank, Hampstead, N.W.
Haywood, W., Guildhall, E.C.
Jenkinson, William, 44, London-wall, E.C.
Legg, Cyrus, 192, Bermondsey-street, S.E.
Levick, John Musgrave, Great Winchester-street, E.C.
Lindroth, Gustaf W., Drottinggatan, Stockholm, Sweden.
Miller, W. M., Tonic Sol-fa Choral Society, Glasgow.
Montgomery, Sir Robert, K.C.B., 7, Cornwall-gdns, W.
Page, Charles H. Dulwich-house, near Cardiff.
Phillips, J. S., 54, Euston-square, N.W.
Sims, Davis, 3, Bartholomew-lane, E.C.
Warne, Frederick, 15, Bedford-st., Covent-garden, W.C.
Woodley, Thomas, 74, Aldgate High-street, E.C.

The following candidates were balloted for, and duly elected members of the Society:

Argles, Frank, A., J.P., Eversley, Milnthorpe.
Atwood, Josiah, 2, Lyncombe-villas, New Wandsworth, S.W.
Blagrove, John Henry, Calcot-lodge, Reading.
Blanford, Thomas, 91, New Bond-street, W.
Bostock, E., Stafford.
Boulton, William, Burslem, Staffordshire.
Brown-Westhead, T. C., Cauldon-place, Staffordshire Potteries.
Champion, Alfred J., 816, Old Kent-road, S.E.
Clark, Charles, 10 Albert-road, Regent's-park, N.W.
Conder, Edward, Kingsland-bridge, N.
Corcoran, Bryan, jun., Charlton-house, Bow-road, E.
Cottenham, Earl of, Tandridge-court, Godstone, Surrey.
Curwen, Rev. John, 7, Upton-place, Forest-gate, E.
Dartmouth, Earl of, Patshull-hall, Wolverhampton, and 40, Grosvenor-square, W.
Dawson, Thomas, Mayville, near Taunton.
Dodd, George Ashley, 40, St. James's-street, S.W.
Evens, John Harry, Rose-lodge, Castle Bar-hill, Ealing, W., and 22, Moorgate-street, E.C.
Fazakerley, S. N., 17, Montagu-st., Portman-sq., W.
Frodsham, George, jun., Change-alley, Cornhill, E.C.
Giles, George, Westfield, Bonchurch, Isle of Wight.
Gover, Charles Edward, Madras, (care of A. G. Gover, 7, Grundy-street, Poplar New-town, E.).
Griffin, Daniel, 2, Cavendish-ter., Clapham-common, S.
Healey, Thomas, Science and Art Department, South Kensington, W.
Helsham, G., St. Mary's Hall, King's Lynn.
Hippisley, Henry, Lamborne-pl., near Hungerford, Berks.
Johnson, Thomas, 32, John-street, King's-road, Bedford-row, W.C.
King, William, Gas-office, Newington-street, Liverpool.
Le Cheminant, John, 39, Queen Anne-street, W.
Lent, Richard, 41, Bloomsbury-square, W.C.
Lichfield, Earl of, Shugborough-hall, Staffordshire.
McLagan, Peter, M.P., Burlington Hotel, Cork-st., W.
Munbee, Major-General G. B., R.E., J.P., Highbury-villa, Weston-super-Mare.
Nelson, George H., the Lawn, Warwick.
Nicholls, Richard, 46, Aldermanbury, E.C.
Pam, Jacob, 9, Ely-place, E.C.
Peczenik, Leon, 1, Bloomsbury-square, W.C.
Peirce, Clement James, 57, New Bond-street, W.
Pleydell-Bouverie, Philip, 16, Hill-street, W.
Pratt, J. Tidd, 28, Abingdon-street, S.W.
Procter, William, M.D., 24, Petergate, York.
Stephens, Henry, 18, St. Martin's-le-Grand, E.C.
Van Owen, Lionel, 34, York-terrace, Regent's-pk., N.W.
Ware, James, Tilford-house, Farnham, Surrey.
Woodward, H. Toze, Blakebrook, Kidderminster.
Wright, Edwin, Dixon's-green, Dudley.

And as Honorary Corresponding Members.

Salamah Bey, Chief Telegraph Engineer, Railway Station, Cairo.
Traun, Otto, Fray Bentos, Uruguay.

The Paper read was—

ON THE RELATION BETWEEN HEALTH AND WAGES.

By J. H. Stallard, Esq., M.B. Lond: M.R.C.P.L.

There is no problem of political economy which has received more profound attention, or is apparently settled on a firmer basis, than the relation between capital and labour. Wages depend, says Mr. Stuart Mill, on the proportion between the number of the labouring popu-

lation and "the capital" devoted to the purchase of labour; and he adds the indisputable corollary, that the condition of the labouring class can be bettered in no other way than by altering the proportion to their advantage; and every scheme for their benefit which does not proceed on this as its basis is, for all permanent purposes, a delusion. In the same way, Mr. Fawcett informs us that the circulating capital of a country is its wages fund; and if we desire to calculate the average money wages received by each labourer, we have simply to divide the amount of this capital by the number of the labouring population. "It is evident," says he, "that the average money wages cannot be increased, unless either the circulating capital be augmented, or the number of the labouring population be diminished." This explanation of the law of wages appears to have been evolved out of the theoretical examination of the relation between labour and capital in the aggregate, without reference to those secondary or intermediate conditions which determine the question of value in the case of other commodities which become the subject of exchange. By the same method of reasoning, it would not be difficult to prove the existence of a tea fund or a bread fund, and to argue that the price of either commodity is determined by the quantity imported or produced, in relation to the sum destined to be spent upon its purchase; and it would be perfectly correct to say that the price could not be raised, except by augmenting the capital employed upon the purchase, or by diminishing the quantity produced. Nevertheless, this would be a very imperfect explanation of the causes which regulate the price of tea, especially when we find that it may be purchased in bond at prices varying from 6d. to 10s. per pound. So likewise with bread, we may state that at the two extremes, when food is positively scarce, and capital abundant, or when food is abundant and capital otherwise employed, there can be no question that the price will be determined in the manner indicated; but in all the intermediate states, the capital destined to the purchase of bread will vary with the nature and position of the land upon which the wheat is grown, the suitability of the climate, the character of the harvest, the quality of the produce, the conditions under which the crop is brought to market, and a variety of other circumstances which determine the relation between supply and demand. To these we must generally look for the causes which influence the price, and not to any particular amount which is spent upon them, even if that could be exactly ascertained. The statement that wages depend on the relation between labour and capital, however true, is therefore useless for any purposes of explanation. No one will doubt that if the number of labourers were to be doubled suddenly, wages would fall; nor, on the other hand, if the supply were suddenly curtailed, that wages would rise in consequence. But, besides these opposite conditions, there are a thousand intermediate influences constantly at work to alter the nature of the contract between employers and employed; and it is certain that the amount of capital employed in the purchase of labour is determined as certainly by the peculiar qualities and relations of the article supplied, as it was in the cases already given, with the additional peculiarities that the labourer must live, and that he is not a passive instrument, to be transferred from one owner to another, without his own protest or consent.

If, then, we desire to determine the price of labour, we must adopt the same principles and pursue the same method as though we were about to estimate the value of any other commodity; we must find out the cost of production. Every labourer must be born and reared so as to become fit for work. He must be taught industrious habits and principles of honesty, that he may serve his master faithfully. He must be educated physically as well as mentally, and the cost of all this will vary according to the success of the breeding process, the relative number of failures, the price of food, clothing, and lodging, the peculiar sanitary conditions of the locality, and the habits of social life in which the labourer is reared. As in the case of wheat, we shall find that the cost of producing a healthy labourer will depend on the nature of the soil and air, and the time and cost bestowed upon him, and the result will be that a natural value will attach to the article produced, bearing some approximate relation first to labour of a similar kind, and then to industry at large. We may have good, bad, and indifferent labour, just as those qualities attach to wheat or tea; and the varieties bear exactly the same relation to productive industry as do the varieties of food to the sustenance of the human frame. These considerations, moreover, are independent of the various conditions under which the article produced is brought to market. We may notice, for example, that the better the quality, the more ready is the sale, and the more steady the demand; that ignorance and poverty confer a power upon the purchaser which is all but irresistible; that the worse the condition of the labourer the less able is he to dispose of his labour with advantage, and as his labour cannot be stored up like wheat, it must be sold at once or lost for ever to the possessor; nay, worse than this, its very loss is costly, because the labourer must live, and the sacrifices of privation involve the destruction of his health, which is the only source and basis of all he has to sell. There are many other causes which influence the rate of wages which we need not consider on the present occasion, but one observation is necessarily preliminary to the development of the subject immediately in hand. It is that what is called the law of wages has usually been discussed separately from the differences which exist between the wages of various employments, and the term labour is generally understood to include only "common unskilled labour of the average degree of hardness and disagreeableness." Now, if human beings were mere machines, or nothing better than mere beasts of burden, this method of procedure would be justifiable and sound; but they are not so, and the very first characteristic of all human labour, even of the very lowest grade, consists in the exercise of a certain degree of intelligence superior to that of brutes. If we are to discuss the question properly, we cannot exclude this qualification; the more so, as mental endowments confer power and value out of all proportion to the exertion of mere physical force, however industriously employed. It requires a certain degree of intelligence to act as scarecrow, and the ability of the lowest boor is increased by practice in proportion to the intelligence he brings to bear. There is no employment which depends exclusively on physical strength for its most successful performance. Put two men of equal powers to work together on equal terms, and before long one will be sure to beat the other either in energy or skill. The quantity and quality of the work done will depend on combined physical and mental qualifications of the men, and he who does the most and best, will, in some form or other, earn better wages on that account.

There is no labour which is perfectly unskilled. The shepherd boy learns to count the sheep, the farm boy to drive the team and milk the cows, and the errand boy to go his errands correctly and with dispatch. The rate of wages is determined relatively to that of the same class of labour, and through that to the rate of labour generally, on the same principles, whether it be skilled or not. No distinction of principle can be drawn, and our only resource is to examine the conditions of its successful exercise, which are the elements of its intrinsic worth; we must bring every kind of labour to the same test and compare it with the same standard; and regarding it only as a contribution to the total advantage which society derives from labour in the aggregate. The sum total of this advantage, if it were possible to put it in the form of money, would constitute the "Wage Fund" to which the labourer is legitimately entitled in return for his work, and the share of each ought in justice to be in

proportion to the quality and quantity of his contribution to the general result. This is the true basis of the labourer's claim, and it is a fair presumption that there is generally an approximative though not always just, relation to the wages given. When this is not so, it is probably owing to extraneous conditions, which at present exert an abnormal influence, such as the poverty of the labourers, the combination of masters and of men, the customs and opinions of society as to the remuneration due, and a variety of other causes over which the labourer himself has practically no control.

What, then, are the conditions essential to successful labour? They may be divided into three categories. First, the power or physical ability to work. Secondly, the mental and moral qualifications, viz., the will to work and industry to work honestly, these being united with more or less of intelligence and skill. And lastly, the opportunity of working which depends locally on the demand for labour and the profit which it yields. Taking the world at large, this opportunity is given to all who have will, intelligence, honesty, and strength, a combination of which will inevitably lead the possessors to seek the best market for their labour, and to rest satisfied with none which does not enable them to gratify the reasonable wants of an independent life.

Now, although the immediate object of this paper is to point out the intimate relation between health and wages, it must not be forgotten that the essential conditions of labour are most closely mixed up together, and react one upon the other with the most complicated results. Thus in a depressed state of trade, want of employment and privation lead inevitably to exhausted health, and to the many consequenees of exhausted health to be noticed presently. Moreover it drives the labourer to tramp the country in search of work; it unsettles his ordinary mode of life, and brings him into collision with a class of wanderers whose habits he gradually acquires. One of the saddest features in the present state of society is the extraordinary increase of vagrancy which is now observed throughout the entire country. These vagrant habits are only gradually acquired. They commence either in want of employment or a desire on the part of the labourer to better his condition, or they result from a state of physical exhaustion, which may be hereditary or the result of insufficient food and imperfect sanitary conditions during the period of growth. But take the strongest and most industrious labourer, and examine the effect of a fortnight's tramping in search of work. In the first place he has not yet acquired the art of begging successfully, and lives hard on the road. At the end of a long day's journey he arrives at the workhouse, weary and wet through; without food or fire, or even the comforts of a pail of clean water, he is shut up in a filthy dog kennel or rabbit hutch, to lie down in some frowsy straw, with a set of companions who are inured to dirt, and who pass half the night in instructing each other as to the most successful walks where they may pursue their occupation. A week of such a life breaks the health and destroys the energy of the best intentioned labourer; and although he may be glad to escape the first or even the second time, the final result will be that he gradually loses health and energy for work—that he will adopt the shifts of the class with which he is thrown, and cease altogether to be a productive member of the community. So, again, whilst skill can in many cases supply the want of strength, and we shall see that it has a constant tendency to do so—yet it may be taken as a rule that both are associated together, a feeble community being ignorant, not because they are deficient in natural intelligence, but because they have neither the means, nor the time, nor the energy, to acquire knowledge. In the agricultural labourer we have the best example of strength without intelligence. In the population of the East of London we have intelligence without strength or knowledge to supply its place.

Lastly, it is clearly possible to have knowledge and strength without honesty or the will to work—the want of which equally prevents the employment of the labourer and lead eventually to the destruction of his health.

We arrive, then, at the conclusion that power or physical ability forms the basis of all kinds of labour. No man can work who is physically incompetent, and, *cæteris paribus*, the degree of strength determines the quantity of labour which a man can perform and the wages he can earn. Some people, says Mr. J. Stuart Mill, are of opinion that human beings cannot be classed as wealth, because they are the purpose for which wealth exists. But, as it is admitted that skill and other qualifications, such as industry and the power to labour, are nevertheless the source of wealth, it is certain that whether human beings are wealth or not does not depend upon their nature, but whether or not they exercise their natural powers so as to add somewhat to the common stock. It is clear, therefore, that an idiot or a cripple from birth cannot become a source of wealth; but the man, however humble, who contributes more to society than his life costs for its maintenance, leaves the world richer than he found it, and is a benefactor to his species. Given the opportunity of employment, the question is not one of numbers, but of individual efficiency; and, just as the slave owner finds it his interest to rear his slaves in health—for the value of the individual slave depends upon what he can perform—so should society and the capitalist also take care that the labouring classes are well and healthily brought up, that they may individually contribute their quota to the common weal. Now, what is the effect of physical degeneration upon the labouring classes, whether produced by want of employment, want of proper dwellings, unhealthy habits, however acquired, or any other cause? Let us trace the history of the raw material in its simplest and roughest form, and see to what it comes; and even here we start with a gigantic difference. Compare the labourer of Dorsetshire with one of Lincolnshire or Yorkshire, and note particularly the intimate association between their physical powers and the wages they obtain. Compare their habits and their movements, and you will see the difference at once. The man of Dorset never tastes animal food, except a bit of bacon once a week. He and his family exist upon a scant supply of bread, eked out with a bit of lard and dripping, which scarcely keep body and soul together. And mark him at his work. He is exactly like a steam-engine with a short supply of fuel. He may go by fits and starts, but there is a constant tendency to halt upon the centres when the work is hardest. He goes on better when the gradient is falling, but he comes to a hopeless stand-still on the least ascent. Nothing is more curious than to watch his movements. There is an ingenious slowness about all he does. His very walk upon the turnpike gives you the impression that he is up to his knees in dirt, and one foot is put before the other as if they were made of lead. Every motion seems to require a separate effort of the will, and there is a mental doubt if the intention will be carried out. Do not suppose he is ignorant of philosophy; for with inborn wisdom he reserves his powers for grand occasions, as when the master comes, or an effort is inevitable. He never forgets that his store of energy is small, and that there is little prospect of renewal by the scanty supper when he arrives at home. And so the habit of idleness grows upon him until he is good for nothing. He has no such word as haste in his vocabulary: and if it were proposed to give him double wages on the condition of doing double work, he would probably give it up after a week's trial, because he has been brought to prefer idleness and privation to industry and the gratification of those healthy desires and appetites which from long neglect he has ceased to care for. Nor is the effect less marked upon the moral nature of the man. He learns frugality without result; his only prospect is the workhouse; and too often he goes to crime for the means of satisfying instincts which cannot be repressed, because, for want of educa-

tion, he has them under no control, and is little better than a brute.

A few days ago I was down in the country, and the universal testimony of the farmers in the district was that there is a dearth of labourers. The employers are at the present moment giving half-a-crown per day, with an allowance of beer and milk. I asked why they did not import some men from Dorsetshire, where plenty were to be had at half the price. They simply informed me that they would be good for nothing, and that they would prefer to go without. Some years ago the attempt was made to introduce Dorsetshire labourers into Yorkshire, but at the end of a week most of them wanted to go home, because they could not stand the work.

But in Yorkshire and Lincolnshire what a different case. The amount of healthy energy, work, and wages, are all doubled. The labourer is well fed, he has his pie and beer mostly twice a day. He is smart in all his movements, and his work is done with care and skill. I remember well the disgust of a Yorkshire labourer with the slovenly habits of a Midland farmer's household, and he began a village reformation by insisting that the farmers' boys should be better fed. He was "the chaser" of the harvest fields; and rebellion against his rule was only averted by increased wages and extra beer.

But the labourers are not in all cases wedded to the soil. Now, especially since the introduction of railways, do they migrate to the towns, and as, for the most part, their physical state is superior to that of the labourers reared in town, they enjoy advantages in obtaining employment depending almost exclusively on their physical ability to do more work. A species of exclusion, on the principle of natural selection now goes on—physical ability ousting debility and incompetence whenever they compete. And here let it be observed that the first question which presents itself immediately to the employer of labour is rarely one of wages, for these are very generally regulated by custom, or fixed by considerations of trade or combination which yield no option. The question is one of suitableness and profit. The employer looks at the labourer with a view to fitness, in order to see if he is physically qualified to do the work required with profitable result. Is the man young and strong, or is he old and feeble? Is he well nourished and healthy, or sickly and diseased? Can he earn the wages his master is compelled to give, or may the latter look for a better man elsewhere? For example, the wage of a dock labourer is fixed at half-a-crown a day for all alike who are employed. Of the thousands waiting at the doors the young and strong are taken first, the man of age and character comes next, and the decrepit and feeble are turned away. In ordinary times the latter do not earn their wages, and it is only when demand exceeds supply that they are taken on. Let a man have an attack of illness, and his power of labour is impaired; from that moment his wages become more precarious, and his yearly income less. It is the competition between health imported from the country and debility inseparable from towns, which is one of the chief causes of the physical degeneration of the lower orders in the metropolis particularly, and this degeneration is completed by the extra waste of adult male life by sickness, vice, unwholesome dwellings, and the poverty which these entail; and the result is that the occupations of the people irresistibly follow their physical capacity, and determine the wages they can earn. A stalwart countryman could no more make matchboxes or flower-sticks than a puny, feeble, and half-starved Londoner assist to make a railway. The latter cannot compete with healthy labourers; he is driven by necessity to those occupations which do not involve continuous labour, such as crossing-sweeping, shoe-blacking, costermongering, and many like. If a man be capable only of a child's employment, he must learn to be satisfied with child's wages and with child's food; but, as the latter is not adapted to his physical wants, he will, after a certain struggle, lose his health; and, having exhausted his little stock of vital energy, the value of his labour will be reduced to zero, and he will succumb to the inexorable necessity of depending on others for his bare existence.

In the next place it is necessary to trace the effect of this physical degradation on the class, and we can scarcely do better than illustrate it by reference to the metropolis, in which, notwithstanding the general superiority of wages over those of the country, the evils in question are most strongly marked.

Now the first effect of physical degradation is an augmentation of productive power. The poor have more children than the rich. For 1,000 persons in St. George's, Hanover-square, there are 25 births in a year; for 1,000 in the poverty-stricken district of St. George's-in-the-east there are 35 births to the same number. The more perfect the individual, the more refined his habits, the greater the difficulty in propagating the species. Nature makes up in numbers what she lacks in power; and so with inferior resources the poor have more mouths to feed. Forty per cent. of metropolitan pauperism consists of children under 14 years of age. As many as 60,000 children have on occasions been relieved by the guardians of the poor in a single week; and at a low estimate, there are 150,000 children whose parents have received parish assistance in the course of the year. Physically these children are less healthy than their parents, from whom they inherit the seeds of debility and disease. Moreover, the mothers often fail to suckle them, or if they do, the breast-milk is poor in quality. This, with other unhealthy circumstances, determines a very high mortality under five years of age, amounting in some of the poorer districts to one half of the entire mortality. Dr. Ballard has shown, by incontestable evidence, that the infantile mortality of the poor is double that of the rich. In the year 1864, 33,247 children died in London under five years of age. Of these—

437 died of want of breast-milk,
909 of teething,
1,236 of tabes mesenterica,
2,621 of convulsions,
2,842 of atrophy and debility,

making a total of 8,047 deaths mainly due to hereditary disease and want of care and food.

The poor have thus a burden which the rich are not called upon to bear; the former have to bring forth, tend, and bury a mass of infantile humanity, and the expense of doing so must be a serious tax upon their scanty resources, and materially interfere with the rearing of the surviving children.

And what is the state of those who survive? For the most part they become the victims of scrofula, consumption, and the thousand forms of disease which affect the feeble. They form the bulk of the thousands who crowd the doors of the dispensaries and fill the hospitals, and the few who reach to precocious maturity marry to generate a new race more numerous and more feeble than themselves. I have the written opinion of the most distinguished members of the medical profession, an opinion which must be endorsed by all practical philanthropists, that a very large proportion of the debility, deformity, disease, and premature death amongst the children of the London poor, as well as the want of stamina observed in after-life, is owing to insufficient, irregular, and unwholesome feeding during the period of growth. The chronic starvation to which the children of the poor are subject, is also attested by other astounding facts. There are 23,000 children who attend the ragged-schools. The masters and mistresses declare that the children cry with hunger and frequently fall exhausted from their seats from want of food, and that the weakened state of mind and body is one of the chief obstacles to the process of instruction. The superintendents and surgeons of the pauper schools state that the children are universally feeble and unhealthy when first admitted. Those from St. George

the Martyr, Southwark, are all of low stature, and every third child has had the fever, and every second suffers from skin disease. At Annerly, Mr. Wilkinson, the superintendent, reports that many of the children have been half starved, improperly fed, scantily clothed, exposed to the inclemency of the weather, and have suffered from bad hygienic conditions of every kind, many also suffer from struma and hereditary disease; and the same gentleman states that it is easy to distinguish the children brought from Croydon and the country round, because they are as tall and strong at nine years old as a Londoner at thirteen.

At Hanwell more than half the children are admitted in a diseased state, and all of them are small and feeble.

In every pauper school the children are not like other children; they are puny, pale, and pot-bellied; they are listless, shy, dull, and do not even care to play. They have frequently a positive dislike for wholesome food, which often makes them ill when first taken, because the stomach cannot digest the unaccustomed meal. The circulation of the children is so feeble that they are not permitted the use of cold water, and it is found necessary to warm the passages and bedrooms. In winter they suffer fearfully from chilblains, which the warmest clothing will not prevent. But in a month or two a wondrous change takes place. Food, warmth, and care work a miracle. The aspect of the children is soon entirely changed, they become ruddy, bright, sharp, happy, playful, and intelligent; and the only defect remaining is their permanently stunted growth, which forms indeed the chief obstacle to their future success in life.

Six thousand of the one hundred and fifty thousand children are thus rescued from a life of disease and misery, and some few hundreds more are to be found in Orphanage and Reformatory Schools, but whilst the children of the poor are fed on tea and garbage—whilst thousands are turned into the streets to get their living as they can—there can be no hope that they will ever earn their living by industry or even pay the small expense their rearing has necessarily entailed. Poverty educates children to be contented with unwholesome food. A good appetite, properly and habitually gratified in early life, at once constitutes the incentive and basis of honest labour. It is just as impossible to obtain profitable work from a feeble population as crops from an exhausted soil. It is as necessary to manure one as the other, and unless some effectual steps be taken to combat and arrest the process of degeneration amongst the labouring class which is evidently going on in the metropolis and all large towns, the evil will eventually reach proportions most difficult to deal with, and end in the permanent existence of a class who will be unable to earn what their lives cost.

Another fertile source of degraded physical health amongst the labouring class is the waste of adult male life incidental to the occupation, and more prevalent in large towns, where the children are even more dependent on the father than they are in the country districts. In London there are 10,000 widows and 25,000 orphans constantly on the books of the guardians of the poor. Compared with the country, the husbands die earlier in London; and the younger the children, the more care they require, and the more do they interfere with the mother's industry. Moreover, rents are dearer, and suitable food much harder to obtain, milk especially being dear and bad, and vegetables scarce. Sickness is more prevalent, more costly, more difficult to manage, and whenever it occurs it paralyses the mother's arm for work. All the cares of a family are greater in towns; for if the children are to be brought up honestly and well, they must be clothed respectably, and guarded from the contamination of the street. Now, if a widow misbehave herself, she is sent with her children, legitimate or otherwise, to the workhouse, and her children are then sent to one of the very best schools in England, where their clothing, feeding, and education will cost more than £29 per annum; but if she is honest and tries to be independent, she will at most get 1s. 6d. per week on which to keep them, besides providing for herself. As, however, no child can be kept in simple necessaries, to say nothing of rent and education, under 3s. per week, all these children are practically starved. Bread and treacle is the staple maintenance of this class, rags cover them, and the street is their school; it would be as unreasonable to expect that they should grow into healthy labourers as to look for grapes on thistles.

In the next place, let us trace the career of these children, and we shall observe that the necessities of the parents force them to employ the children at an improper age. We have all read of the young match-box maker of two years old. I have often seen a complete nurse at seven; and one of the chief obstacles to education is the fact that all children of that tender age are necessarily employed as nursemaids or domestics in the denser and poorer districts, where so little is done to assist the widows to bring up their children properly.

In the next place there is an entire absence of any system of apprenticeship amongst the lowest class of poor, the guardians paying no attention to this important subject. The poor children have no opportunity of learning useful occupations. They commence as errand boys, an occupation which does not tend to very settled or industrious habits. Brought up too often without principles of honesty, they lose their places, and the common resource is selling in the streets. There are, probably, at the present moment 50,000 costermongers, the very large majority being both morally and physically unfit for any other work. Besides this large class, there are many thousands who depend upon the most casual occupations for a living, simply because they have no energy left for continuous employment. No one can tax an Englishman with inherent idleness. There is no better established fact than that all who have the strength will prefer work, with plenty to eat, to idleness with hunger. Even amongst the most wretched the principle of industry cannot be eradicated, for after all it is a necessity from their earliest years. The struggle of bare existence is harder for the physically feeble than it is for others, and with an empty stomach and exhausted frame, the poor crossing-sweeper plies his occupation with an activity and perseverance prompted as much by habit as despair. Look at that ragged urchin turning somersaults; he works hard enough, God knows, for the scanty pittance thrown him by the passers-by. Watch the pertinacity of the newsboys and the sellers of fusees. Turn to the coster, and ask him how many miles he has to walk to realise a shilling. The more feeble he is, and the less his stock, the further he has to go. I once visited a widow whose husband died within a few hours of waiting to open carriage doors at the Olympic Theatre. He had attended there at night for more than a year, labouring all the time under a deep consumption, and staying all day in bed, that he might save his family from want. I say there is more will to work than power or knowledge, and that one of the sad features in the state of the lower orders is the prevalence of precarious occupations, which are liable to alternations between periods of slackness, and earnings which, at the best, are only just sufficient to maintain the individual or family in a greater or less degree of poverty. From this degree of dependance there is at present no escape, nor will there be, so long as the present trade regulations are enforced by the artisan class, who now enjoy the virtual monopoly of all the more profitable forms of labour. "The son of a costermonger has no chance," says Miss Cobbe, "of ever paying apprentice fees, even in the form of service, and he is driven to waste his strength and ingenuity in some miserable street traffic, already trebly overstocked by unfortunates like himself." Every year the price of skilled labour is rising, and every year the chance of the indigent man rising into the rank above above him becomes less and less. It is neither necessary

nor politic that the capitalist should interfere with the combination of skilled labourers or their freedom to strike if they choose to adopt so impolitic a course; but it is open to them to educate any number of the indigent class to take their place.

The proportion of the indigent class in London, says Miss Cobbe, is as one to three. We fear it is greatly more, but even if this be so, out of 4,000 men, 1,000 grovel all their days in poverty that 3,000 may extort higher wages from the public. Who can fail to see that it is a cruel injustice to the indigent class, and a general loss to the community, if A., an employer, pays B., an artisan, 4s. instead of 3s. for his work, and then is called upon to pay another shilling poor rate on behalf of C. (an indigent man) whom B. has kept from sharing in his labour.

Moreover, there are always a certain number of individuals who fall from the independent to the indigent class, for it is easier to fall than to rise, and if society takes no care to raise a certain number to supply the place of those who fall, the monopoly of the one class will be sustained, aud the misery of the other will be increased. The public ought, therefore, to provide industrial institutions that the entire labouring class might be participators in the advantages of skilled labour according to their intelligence and strength. In this advantage capital will derive a double benefit, first by diminishing the monopoly of the artisan, and then by diminishing the expense of the pauper class. It is proposed to form public schools for the technical education of the artizan class; much more is it necessary to have industrial schools for the indigent class; and to feed them whilst they learn. Any excessive power of production will right itself, since, as already noticed, an intelligent labourer will certainly emigrate to other lands if he fail to supply his reasonable wants here.

Having shown that physical health is the basis of individual labour, it remains only to observe that what is true of individuals is also true of communities and nations.

The slaves of one plantation may be worth double those of the next, simply because they have twice the power to work. *Cæteris paribus*, the labour of a feeble and fever-stricken people will never equal that of one which is healthy and robust. Just as the efficiency of an army depends upon the physical health of the individual soldiers, so does the prosperity of a nation depend upon the physical energies of the productive classes, of which labourers are the chief. Furthermore, just as the movements of an army are impeded by the sick and wounded, so is the advance of national prosperity impeded by the presence of an undue number of persons who are dependent on others for support. Pestilence may paralyse an army, and temporarily destroy the industry of a people. Who can estimate the cost of preventible disease, or the loss to society by its destruction of the power to work. The lives which fall in the exercise of labour, like those in battle, leave widows and children in their wake, who are a burden upon the community, and a drawback on the public wealth. National prosperity depends on the physical ability of the individuals engaged in labour, and in the economy of human life. The laws of physiology are inseparable from those of political economy, which latter cannot be interpreted without their aid. We have to learn that a debilitated people stand no more chance in the race of civilization than does a feeble individual in the race of power.

In conclusion, I will add a few remarks on the remedies for the state of things I have described:—

1st. A Review of the Poor Law System, with the object of replacing the present repressive measures by an active system of judicious help to those whom sickness and misfortune drag down to the class below them and eventually to pauperism.

2nd. A more perfect organization of charities, whereby the destitute and deserving poor may be supplied with what is necessary without having recourse to the system of begging, inseparable from the present multiplication of charitable institutions.

3rd. The necessity of supplying relief to the children of the indigent class in the shape of wholesome food.

4th. That industrial training should be a condition of all relief to the children of the poor, and that such training should occupy the first place in the education of a class which depends on labour for independence; moral and religious instruction being from the necessity of the case secondary thereto.

5th. By a system of seven years apprenticeship with food and clothing at the public cost, that a certain number of children may be raised from the indigent to the artisan class, with the view of breaking down the monopoly now enjoyed by the latter and filling up the *hiatus* which sickness and misfortune constantly make in the ranks of the artisan.

6th. By taking measures to transfer as many children, orphans and others, to the country districts where, as in Scotland and France, they may be cheaply and healthily brought up in the class to which they naturally belong. By this means the physical degeneration inseparable from town life would be combated, and the tendency to scarcity of labour in the country, now becoming general on account of the facilities of transit and the attractions of large towns, would be greatly diminished.

7th. That it is the duty of Government to provide a register of labour through the instrumentality of the Poor Law, and reform the tramp wards, that a stop may be put to vagrancy, and the destitute labourer may travel with safety, and with a reasonable expectation that he may obtain work.

Lastly. These objects can only be secured by a reform in the present system of doing charity by proxy, and the efforts of philanthropic persons require to be organised and superintended by a staff of officials, which might be properly provided at the public cost, with the certain result that charitable persons would give more liberally, because they would have confidence in the executive. The rates would then be only used to supplement benevolence when the latter fails, and the rich would thus relieve the lower order of ratepayers from the undue pressure to which they are now subject. In fact, State charity, to be efficient, must be kept as much as possible out of sight.

DISCUSSION.

Mr. Pearsall thought a very broad and comprehensive plan had been sketched out in the concluding portions of the very excellent paper which had been brought before the meeting, whereby a vast amount of technical education might be given to the youth of the poorer classes, which he was sure would be gratefully received by them. He fully agreed with the remarks which had been made with regard to skilled labour; those who were engaged in it were a proud class of men, and their feelings were constantly excited by the fear that their children might fall below the class in which they were themselves placed. At the same time there had been placed before them, in a very clear manner, the difficulties which surround the question. Undoubtedly, as fresh regions of the world were being rapidly developed, many of our best artisans and workmen would go there. What had been pointed out with regard to the poor man, whose only capital was the physical power to labour, was of the greatest importance to all classes. There was one point which had not been touched upon in the paper—that was the kindly feeling which had sprung up in the minds of large capitalists and employers of labour towards those whom they employed. Take the instances of this afforded by the Crossleys, of Halifax, and the proprietors of Saltaire. All who visited those establishments saw a glorious race of robust and happy-minded men, acting in concert with the master-spirits of capital and energy. With regard to the very poor of London, there could be no doubt that

the narrative given was only too truthful; at the same time any one inquiring into the subject would be astonished at the large sums of money which were expended by the employers of labour in many parts of the metropolis for the establishment of libraries, reading-rooms, and other institutions for the benefit of those in their employ. Nor was the physical condition of the workman uncared for. He could give an instance in which a large employer of labour, well known to many present, had provided a commodious house at Margate, whither the weak and sickly amongst those employed were drafted, in order that they might derive the benefit of a visit to the seaside. The social and physiological view of the subject which was presented in the paper was one which gave rise to serious and anxious considerations; and the great question which had been raised with regard to the very poor sinking lower and lower was one well worthy the attention of this Society.

Mr. James Shaw remarked that no one could be a member of the Society of Arts for any period without being grateful that it afforded the public so valuable a channel for the discussion of such important questions as that which was brought before them this evening. He regretted that the ameliorations suggested by the author for the evils depicted occupied so unimportant a place in the paper, being merely put forward in six or seven brief clauses at its conclusion. Connected as he was with a large iron manufacturing establishment, employing 2,000 of the best artizan class of the country, he could not but think that a great deal too much had been said with regard to the very poor, leaving the artizan class almost out of consideration. There was scarcely an employer who did not admit that the labour question was one of the most important of the day, and that into that question the operation of trades' unions very largely entered. Almost every employer of labour, at the present time asked the question, "How is it that I am obliged to pay such high wages for my labour when I can look round and see hundreds of men who are physically capable of doing the work, but whom I cannot employ because they do not belong to a trades' union?" It was not that there was scarcity of labour, but the thing was to get rid of the tyranny with which labour was beset. He could state of his own knowledge that there were men, simple shearers and rollers of plate iron—men who worked in torn shirts and scanty clothes, who earned £8 per week or £400 per annum, in what was a very poor class of skilled labour, and yet employers were not able to supersede those men by the numerous unemployed poor who had been spoken of, and this was owing to the trades' union system. The author of the paper had omitted to point out the process by which the employer of labour could overcome such difficulties as he (Mr. Shaw) had pointed out. If any gentleman could suggest a remedy for that state of things he should be very happy to hear it. He had, for the last three months, been travelling through America and Canada, and, on returning home, the thing which struck him most was the impoverished, ill-fed, wretched-looking condition of the poor of London. In this condition of things we were far behind America. He was sorry to say he thought one of the reasons was this, viz., that in this country we have a redundant population compared with the grand outlets which America affords for the skilled artizan, and even for the lower classes of labour. There was a grand outlet in America for every man who was willing to work for his living, and had the physical capacity for it. Those only who had been there knew the enormous extent and the vast resources of that country; and he believed England would find her poor flocking there, because she has not occupation for them at home. The poor had not a chance here; and we were suffering now from the difficulty of being surrounded by unemployed poor; but the chief difficulty was that the trades' unions prevented the really poor from taking that place in trade which they ought to occupy. To go to the poor-laws and to charitable institutions was beside the question. If we could not feed the poor apart from charitable institutions we should do better to encourage the spirit of emigration. He would conclude by urging the remarks he had ventured to offer upon the consideration of the author of the paper, who was evidently competent to treat this question in every point of view. He hoped his observations would be received in the spirit in which they were made; they might be erroneous, but they were perfectly sincere.

Mr. W. Botly said not only the Society, but the country at large was indebted to Dr. Stallard for the very able and interesting paper he had brought before them. He thought the fourth and fifth clauses of the summing-up were particularly adapted for the consideration of the Society and of the Legislature. Formerly, under the old Poor Law, there was a system of apprenticeship adopted. He regarded it as of the greatest consequence that the educational training of the youthful poor should be accompanied by employment in industrial pursuits. He begged to remark that there were many honourable exceptions to the low rates of wages which were said to be given in Dorsetshire. There were gentlemen there who paid wages equal to any other part of the country. Under the system of piece-work in agricultural operations the men earned very good wages—double and treble the general run of wages of 9s. or 10s. per week. With respect to the intelligence of the agricultural labourer, he thought they were not generally so ignorant as many people imagined.

Mr. Thresher observed it had been stated by a previous speaker that the great evil in this country was a redundancy of population, and the author of the paper seemed rather to incline to that view also. [Dr. Stallard—"No, no."] That was his impression; but it was suggested, as a remedy for the evils of trades' unions, that the state should take charge of the indigent class, and not only give them elementary education but industrial training as well, so as to enable us to counteract the pernicious operations of the trades' unions. But supposing the fact to be that the country was really over-populated, it appeared to him that a better use of the public funds would be to spend them in facilitating a large system of emigration. By that means, he conceived, if we had a surplus population we should get rid of a large portion of our indigent poor without reducing the actual rate of wages that now existed. Supposing there were 100,000 men in a particular trade who were now receiving a certain fixed amount of wages; and supposing the state educated 10,000 boys in the same trade, then, he presumed, the total amount of wages which the 100,000 received would be distributed amongst the 110,000, thus reducing the sum given to each individual. Instead of that, would it not be better to expend the money in sending this excess of 10,000 to countries where there was a larger demand for them?

Mr. Charles Bussell thought the remedies suggested were scarcely sufficient for the purpose in view. One gentleman suggested that wages should be lowered on the one hand and raised on the other. He believed the general opinion was that wages should be raised rather than reduced, inasmuch as by that means a class of men was produced who maintained the national character better, and had sufficient funds at their disposal to enable them to contribute to the increase of the trade of the country. The workman in receipt of good wages would desire to put good furniture into his house, and spend his money in other things which would contribute to the increase of trade, thus affording occupation for many of the poor, who at this moment were unable to find employment.

Mr. G. White said the paper was so able, and covered so vast a field, and was, as he thought, so generally correct in its views, that it became a matter of very great responsibility for a man to stand before the meeting unprepared, lest he should give a wrong complexion to the whole subject. He felt indebted to Dr. Stallard for the

lucid manner in which he had treated the subject of wages, of present distress amongst the lower classes and the apparent declension of the labouring population. He had come to this meeting from amongst the thousands of the East-end of London, the iron works at Millwall, where he had been during the day, and he could bear his testimony to the accuracy of the general views expressed in the paper, from his own particular experience. They were not overdrawn, but the facts were really modestly stated. Wages were either high, or low, or intermediate; and he thought when they looked at them in relation to disease, and crime, and deterioration of the human species, they must not estimate them by pounds, shillings, and pence, which were only a partial exponent of their value, but they must have regard to their relation to the wants of life and the comforts of civilisation—not how many shillings a man had per week, but how many loaves of bread, how much beef, how much shelter, and how much fuel, such an amount of labour as his physical condition could bear would secure to him, leaving him a fair opportunity for the exercise of his mental and moral nature. With regard to high wages, when applied to one type of our humanity, viz., the animal type, they tended to render that type more animal, and almost brutish. High feeding exerted an influence upon the lower nature of man, and produced results which favoured a certain class of diseases, with which, no doubt, the learned author of the paper was familiar. Then, the same wages, applied to the higher type of our nature—the intellectual and moral—sometimes resulted in crime and vice, which, again, produced a peculiar class of disease. There were those two classes of diseases which arose from the effects of high wages upon two types of our nature. Then we came to low wages—those which did not command for a man sufficient of the common necessaries of life and comforts of civilisation suitable to the grade which the man occupied. If the wage was not sufficient, it was a low wage; and when he looked at the wages in the East-end of London in that light, he was disposed to say they were low wages indeed. He was not about to endorse the sentiment that we have too much labour in this country. Though we have not the extent of land of America, we have that piece of triangular land called England, which was sufficient for all the men that could be produced upon it. It resulted from a want of proper arrangement, and from mistakes in some particular branches of legislation, that distress and evils came upon us. When we turned to the East-end of London, and saw the 10,000 artisans and labourers come out of the public works at Woolwich, looking at their faces we observed that the bulk of them were of the lower animal type; and if they were badly fed we should have all the diseases consequent upon that condition. Then, again, the lower wages were sometimes applied to the better type of our nature; for instance, in the long streets of Clerkenwell, or even at the back of the neighbourhood in which they met, he found men having intelligence without stamina, and when such men had not enough animal food on which to nourish the nervous tissues of the body, diseases of another kind resulted. Thus they had four great families of diseases arising from the influence of high and low wages on the two types of humanity to which he had referred. He remembered about 30 years ago living in the neighbourhood of Stepney; he found there a mass of people well fed, well clothed, and very well paid. He found them ready to receive education as far as they could get it, and he should say, by comparison, the district was better off then than now. He also recollected the district of Bethnal-green when the weavers were in the greatest distress. They were always on the verge of starvation and revolution, and ultimately they were starved out altogether; but in that neighbourhood, thirty years ago, there were some 60,000 or 70,000 of these poor weavers, and there they had a very high intellectual type, descended from the French—men with good notions of art, who cultivated a taste for pictures and flowers—but wages became depressed in comparison with the food they could obtain for the money, till they went down, and down, and became a race of little men with large heads; the whole community of them were discontented, and often seditious. This arose either from the action of bad legislation or the want of proper legislation, but it originated in the first instance from a great mistake that was made on the Continent of Europe. In speaking on this subject his fear was that he should give a false colouring to it, especially because he felt that when addressing this great Society, his words would have additional weight. The Society of Arts had done more than it took credit for. He knew a good deal about the educational movement in this country, and this Society had often achieved great objects by the offer of prizes, and by other methods tending to raise men into a condition superior to that which they previously occupied. He was glad to find that the Society was about to consider what was called industrial or technical education. He did not expect it would become a great apprenticing society, nor would he like to see the Government undertaking that work; but he regretted that the apprenticeship system was done away with. The great moral and political advantage of the apprenticeship was that the boy, during the period of adolescence, was settled down in a family, surrounded by domestic influences, and having a master over him with a will which he must obey. His advice was to encourage the apprenticeship system as much as possible, and let the boys be bound to some master of skill and responsibility for seven years; and though they might fail in some cases in producing clever workmen, they would not fail in producing good and useful men. He knew something about the operation of the Poor-law, being a guardian of a large metropolitan union, where he had seen the precise realities of the picture which had been drawn this evening, and he considered the observations that had been made upon the subject were in the right direction.

The Chairman, in rising to propose a vote of thanks to Dr. Stallard for this very valuable paper, said he would only make one or two remarks. The gentleman who favoured them with his experience in connexion with the iron trade thought Dr. Stallard had omitted to propose a remedy for the evils he had described. The Chairman having read the 4th clause of the propositions with which the paper concluded, went on to observe that he would not have quoted that paragraph, as no doubt Dr. Stallard would reply to the remarks made, nor would he have ventured an opinion as to the success of a great establishment for that object, unless he had been able to speak of what had come under his own immediate knowledge in a district where there was a great scarcity of boy-labour. In that instance boys were taken from pauper schools, and were educated into skilled workmen, and the plan was perfectly successful. Dr. Stallard had brought out the immense difference between men of energy and intelligence and their opposites. All present knew the enormous difference in their households between an energetic and intelligent servant and one the reverse; but it was only those who had seen a large number together who could judge of the effect of energy and intelligence acting upon and leavening the whole mass. The effect in the one case was small, but when they got a number together it was enormous. He thought, after the applause that had been given, there was no question that the vote of thanks would be most cordially accorded to Dr. Stallard for his most interesting and able paper.

The vote of thanks was then passed.

Dr. Stallard, having acknowledged the compliment paid him, said no one was more sensible than he was himself of the extremely imperfect mode in which he had brought this subject before them; in point of fact, it was a subject which had a thousand ramifications, and the difficulty was in presenting any one phase of it which would

arrest such an amount of attention as should show it to be deserving of the serious discussion of a society of this kind. He felt indebted to those who had taken part in the discussion. The first speaker alluded particularly to what he called the results of kindly feeling on the part of large employers of labour. He had not the least wish to cast the slightest reflection upon the justice of those remarks. He knew there were individual cases in which schools had been provided, and the physical and moral welfare of the workpeople had been looked after with an almost fatherly kindness beyond all praise; but he must say it was one of the characteristics of the present day, and one of the chief causes of the degradation of the working classes, that there was not that intimate connection between them and the employer which there used to be forty or fifty years ago. At that time the employer knew the circumstances and condition of every man in his employ, no matter how many they were: they dined together at least once every year, and at Christmas mutual congratulations passed between them. Now, on the contrary, the master too often lived in one place and the workpeople in another, so that, in fact, there were no relations between them, except services rendered and money given. In St. George's-in-the-East, out of twenty-one guardians, only three resided in the parish. The great dock owners knew nothing about the condition of the poor they employed. The wages were paid, and the connection was at an end. Although he was aware of the grand things that were done at Saltaire, Halifax, and other places, these were but exceptional cases. The poor did not receive that sympathy and advice from their employers that they wanted. He differed from the second speaker as to redundancy of labour in this country. The best evidence on that point was the fact that in the agricultural districts labour had gone up in all directions. He was in Leicestershire a short time ago, where a gentleman told him that on his small farm he could give employment to three more labourers than he had, but he was unable to get them, although he offered 13s. per week, a house to live in, a pint of beer per day, and as much milk as the family required night and morning, and vegetables to any extent, together with £1 for extra work in the summer. He had brought with him a letter which he received that morning from a gentleman who had had very large experience amongst the poor, Mr. Farnall, one of the inspectors of the Poor Law Board, in which he gave his own experience as to the difficulty of procuring labour, and the degeneration of the labouring classes in some districts. He said:—"Finding labour very dear, comparatively speaking, in Yorkshire, I sent into Dorsetshire, to Lyme Regis, where I am known, for a Dorset family; wages being, on an average, in Yorkshire, 18s. per week, and in Dorset 9s. They 'came and saw, and conquered' *me*, for I was soon obliged to raise their wages to the Yorkshire measure; and they, when thus paid, could not or would not do a Yorkshire day's work. Eventually, they petitioned me to send them back to uncomfortable and idle Dorset. I did so, and clearly made a bad bargain. The moral of this is that the Dorset men are not men; they have been starved out of their manhood." That (continued Dr. Stallard) was just the fact. If they brought up 150,000 children without the taste of meat, how could they be good for anything in the shape of labour? He would not say that meat was absolutely necessary to children living in healthy country air, and having an abundant supply of good milk, but for the youthful population of London and large towns he held meat to be an essential condition of health. The same speaker asked how they were to overcome the influence of trades' unions? To that he replied that the capitalists and employers of labour would be forced to take apprentices on their own account, and bring them up to their own work. They must be brought up for that special purpose to combat the influence which now excluded the lower class from taking superior work. The children could be educated to anything if they were taken young enough. It was as easy to educate them in industrious habits as to teach them to read and write. He held that the system in operation at Feltham was that which ought to be pursued. That system was plenty of work, and plenty of food. Only nine hours of schooling per week were sufficient for children of that class. If they educated a man's mind, and did not feed and train his body, they taught him to be a rogue, and that was the great mistake they made, viz., giving instruction, so called, without training the muscles, and bringing out the industrial powers. With regard to over-population, that was a point he strongly disputed. He believed it was a mistake to send people out of the country. Those to whom they were sent would send them home again if they were wise. What was the use of sending people out as emigrants who were brought up on all kinds of bad food in the East-end of London? He did not mean to assert that this state of things could be altered in a moment; but what was wanted was a gradual system of prevention. During the last seven years pauperism in London had doubled. There were 72,000 cases of relief on 1st January, 1859, and there were 140,000 persons relieved on one day in the present year. Having spoken in terms condemnatory of the repressive character of the existing Poor-law system, and the effect it had in increasing vagrancy and reliance upon charitable aid, Dr. Stallard called attention to the different state of things which obtained in France. In Paris vagrancy could not be practised to any extent, from the fact that it was known that at one place only in each district could that class of people get everything they legitimately wanted. They could not go begging because everybody knew there was but one place where they could go for relief. At the present time 6,000 children were educated in the pauper schools of the metropolis, and the best education he knew of was given in those schools; and with the exception of those who went into the bands of the army (stature there not being of importance), the great majority of them emigrated. He agreed with much that had been said by Mr. White with regard to the effect of wages. No doubt high wages in the case of an ignorant man did lead to their improper use. It was well known that if it was not insisted that the soldier should spend 8d. per day out of his 13d. on proper food, be would spend a large portion of it in beer and other things which would lead to physical deterioration, making him unfit for his duty. There was no doubt high wages sometimes did harm even to the educated classes, but, as a rule, people who could earn high wages, if they were educated in the principles of industry and frugality, would be the better for them. It seemed to him this was a question for capitalists to consider very seriously. Unless they set out upon the principle that wages were to give a man everything he reasonably wanted, not only during the time of his ability to work, but up to the time of his death, and leave sufficient to bury him, as well as provide to some extent for those he left behind—if they did not set out with that principle, they were wrong. The present principle was that the man was to have low wages during the period of his ability to work, and go to the workhouse to end his days. He wanted to see wages raised so as to give the people larger comforts, but he wished the principle to be kept in view that they were to provide out of wages everything they wanted from the beginning of their days to the end of them.

Proceedings of Institutions.

SOUTH-EASTERN RAILWAY MECHANICS' INSTITUTION.—The fortieth report, being for the half-year ending 30th September, 1867, says that the Institution is in a very flourishing condition. The falling-off in the num-

ber of members during the summer months has not been so great as formerly. There are at present 275 members of the Institution, which is an increase of thirty-five over the corresponding period of last year. The books in the library have been all carefully examined, and it was found necessary to rebind eighty volumes and entirely renew twenty-five volumes. The total number of volumes available for circulation among the members is 1,568. The vocal music class has been carried on during the whole of the half-year; the number of members in the first quarter being twenty-eight, and in the second quarter twenty-six. The attendance was very good throughout, and the teachers' report of the progress made by the members is highly satisfactory. Ten candidates were successful in obtaining certificates from the Society of Arts at the final examinations held in April last. These candidates are entitled to book prizes from the Institution amounting in the aggregate to £4. The system of giving local prizes to the successful candidates has been in operation in this Institution for several years, and it is worthy of notice that the Society of Arts is now strongly recommending a similar plan to be adopted in all institutions. Arrangements will be made to admit the members free to all lectures connected with the Ashford Mechanics' Institution during the winter months. The council are anxious to see the following classes in operation during the ensuing winter:—Arithmetic, writing, and dictation for adults; ditto, for juniors, drawing, vocal music, and French. They also hope that the chess club may be again revived. The financial statement for the half-year is favourable, the receipts having been £139 14s. 8½d., and the balance in hand £77 12s. 8½d. The sum of £72 5s. was realised by the excursion to the Crystal Palace, on the 1st of August last. The council desire to thank the Directors of the South-Eastern Railway for their kindness in allowing the profits of the excursion to be given to the Institution.

EAST LONDON MUSEUM OF SCIENCE AND ART.

The following circular, appealing for funds on behalf of this most important undertaking, from which the East-end of the metropolis will derive so much benefit, has just been issued. The Council of the Society of Arts, sympathising with the object of the promoters, have voted £100 in aid of the purchase of the site:—

The subject of industrial and art education has lately become of such vast importance to the nation as to have attracted the serious attention of the Legislature, and of all thoughtful men having the commercial interest of the country at heart.

The undersigned, impressed with the necessity of providing for this want at the East-end of London, have made a conditional purchase of 4½ acres of land at Bethnal-green, being part of the Green itself. This site they have offered to the Government for the purpose of erecting thereon a Museum of Science and Art, and it has been accepted by Government as admirably adapted for the purpose, being within an easy walk of upwards of a million of people, mostly of the artisan class.

This museum is intended to be educational in the widest sense of the word, and it is hoped that it may be the means of enabling our workmen to compete on more equal terms than at present with the skilled workmen of foreign countries, especially in matters of taste. Our workmen have no need to fear competition and free trade with the whole world, if only they have equal means of art education.

The Government has entered most heartily into this scheme. Parliament has voted the money. The plans of the buildings have been prepared, and the Government has already entered into a contract for their erection. A Bill is now before Parliament, clearing the title to the site of a technical difficulty; it has already passed its third reading in the House of Commons, and it is hoped, in a week or two, that it will have passed the House of Lords, and received the Royal assent. All that will then remain to be done to secure for ever this great blessing to the East-end of London is to pay for the land. The undersigned have undertaken to raise funds, by means of subscriptions, to enable them to do so. The Society of Arts and several friends have offered £100 each, but a further sum of about £2,000 is required, which it is hoped and believed will cover the cost of the land, all law, parliamentary, and other expenses,—a very trifling sum compared with the vast object to be obtained.

It is most desirable that the required amount should be collected within the next week or ten days, that no delay may occur in commencing this great work. All else is ready. The contractor and his workmen are anxious to begin; and in anticipation of the completion of the purchase the vendors have even permitted the materials to be placed on the ground, so anxious are they to facilitate matters. In one sense, therefore, we have possession of the land, but obviously not a brick can be laid upon it until it shall have been paid for.

In view of the approaching winter, and the desirability of finding employment for the poor, so many of whom are out of work, time is also an object. Under these circumstances we issue this appeal for funds, and we are sure that we shall not appeal in vain.

Subscriptions may be paid to the "East London Museum account" at the Bank of England, or they will be thankfully received and acknowledged by either of the undersigned trustees of the fund and promoters of the scheme.

Finally, we may mention that we have made it a condition with the Government that the land not actually occupied by the museum buildings is to be laid out and kept up as an ornamental garden, and that the museum be open every week-day until 10 o'clock in the evening.

Antonio Brady, J.P., F.G.S., Maryland Point, Stratford, Essex.
Septimus Hansard, M.A., Rectory, Bethnal-green.
John Moxon Clabon, 21, Great George-street, Westminster.
J. Millar, L.R.C.P. Ed., F.G.S., F.L.S., Bethnal-house, Cambridge-road.

TECHNICAL EDUCATION.

At the sitting of the Associated Chambers of Commerce on Wednesday, the 27th ult., a discussion was opened upon the subject of "Technical Education."

The following resolutions on the subject were propounded by the Chambers at Nottingham, Huddersfield, Kendal, and Leeds:—

Leeds—"That great advantages to the manufacturing interests of other countries have resulted from the technical education provided for artisans and others, in public schools instituted for that purpose. That the establishment of such institutions in this country is necessary to the maintenance of its manufacturing supremacy. That the earnest attention of Her Majesty's Ministers be called to this subject, and that they be requested to consider how such schools may be best provided, by the state or by local bodies, or by both conjointly. That such schools should in any case be under the supervision of inspectors appointed by Government."

Kendal—"That this Association resolve to submit to Government the importance and desirability of technical education in arts, manufactures, and science; and to suggest that the time is now arrived for the Government to promote such education by the establishment of polytechnic schools, or the appointment of a system of voluntary examination for students in public and private schools; or the adoption of other measures calculated to aid the technical education of the people

of this country, similar to those in operation in other countries."

Huddersfield—"That the rapid progress and high excellence of continental manufactures are, in the opinion of this Association, mainly attributable to the schools for technical education which have for many years been established in Germany and other parts of the Continent, and by means of which the art of design and other valuable scientific knowledge have been very generally acquired, to the great advantage of industrial pursuits; and that, in order to enable our manufacturers to maintain the pre-eminence they have so long enjoyed, the Government be urged to appoint a commission, or adopt other means for obtaining the fullest information respecting such schools, with the view of establishing in this country institutions of a similar character."

Nottingham—"That the importance of more extended education in relation to the various arts and manufactures of this country being recognised by this Association, it is recommended that an inquiry should be made, at the instance of the Government, as to the state of education abroad, as it affects the industries of various nations; and that a committee be appointed by the Associated Chambers to assist in the promotion of art and industrial education."

The subjoined report of the discussion is extracted from the *Daily News* of Thursday, November 28th, 1867:—

Mr. Mundella, the president of the Nottingham Chamber of Commerce, in an able speech described the state of primary and technical education in Germany, especially in Saxony, where his firm had a branch establishment. As to primary instruction, he found the poorest Saxonian children familiar with the elements of education, with all kinds of foreign moneys, and acquainted with English and French to an extent that was most surprising. During his last visit to that country he paid particular attention to the question of education, and it was impossible, even in the poorest districts, to find a child ten years of age who could not read and write well. In fact the Germans knew that by-and-bye it would be they, and not the French, who would be the great competitors with England, and hence the children were being trained up in just such a manner as would fit them to engage in commercial pursuits with England, France, and America. But for the disadvantages under which this country laboured, it would be before all other countries in its manufactures. As to technical education, the people had the fullest facilities for receiving a thoroughly scientific training; not the playing at science of an English mechanics' institute class but a severe and regular teaching from the beginning. A German workman could tell you not only that the colour of a fabric was wrong, but why it was so; and that was more than many of our middle-class masters could do. As an English manufacturer, he was bound to say the ignorance of our working population surpassed belief; and he implored his hearers to pay but little attention to statistics on education. He himself not long ago spoke with a boy, fourteen years of age, who did not know the name of the Queen, and who was ignorant of the names of God and Jesus Christ, except as he used them in swearing; yet that boy had been to a national school, and was no doubt put down in the statistical returns as "educated." Unfortunately, as a nation, we were, upon commercial matters, resting on our old prestige, which we were spending fast; and unless we took up this subject of technical and primary education we should be left far behind foreign countries. Whatever South Kensington might be, our schools of design were the best things we had ever done in this country for the cause of technical education. While deploring the vast superiority of the German over the English workman, he knew, from long experience, that we had the most splendid raw material in the world in our own working men, who, if properly trained, could manage a machine so as to get 30 per cent. more results than either a French or German workman. Both the cause and consequence of the present crass ignorance of our working classes lay entirely with ourselves. Education would have the effect of lifting from the country a great load of pauperism, vice, and drunkenness, which at present existed in consequence of the state of ignorance in which the workpeople were left. He concluded by moving the following resolution, which was an amalgamation of motions standing in the names of Huddersfield and Nottingham:—"That the rapid progress and high excellence of continental manufactures are, in the opinion of this association, mainly attributable to the schools for technical education which have for many years been established in Germany and other parts of the Continent, and by means of which the art of design and other valuable scientific knowledge have been very generally acquired, to the great advantage of industrial pursuits; and that, in order to enable our manufacturers to maintain the pre-eminence they have so long enjoyed, the Government be urged to appoint a commission, or adopt other means for obtaining the fullest information respecting such schools, with the view of establishing in this country institutions of a similar character; and that a committee be appointed by the associated chambers, to assist in the promotion of art and industrial education."

Mr. Whitwell, of Kendal, in seconding the resolution, said his firm had made it a point to have no lads in their works who could not read and write, and the number of boys over fourteen years of age turned away in consequence was lamentably great. It was the duty and policy of the state to do more than they had done in the direction of primary education, and then technical education would soon follow. He often looked for places where he might send young men in his own works to obtain a scientific education, but in vain.

Mr. Freeman, of Huddersfield, said the large manufacturing towns ought to join together in a united effort to establish an institution worthy of the object in view. That object was a national one, and not one for individual enterprise, and it was high time that our government provided some more extended means of education; and payment by results was the best course to adopt.

Mr. Blemer, of Birmingham, had long been convinced that Germany since the Exhibition of 1851 had made a most marvellous advance in industrial enterprise; while the disgraceful state of our primary education and the want of means of obtaining technical education in this country were threatening to leave us far behind in the race of competition.

Mr. Baines, M.P., was very glad that the Paris Exhibition had taken place, for it was held just in time to inform us how much faster continental nations were growing in proficiency in science and art than we were. The association was quite right in going to the Committee of Council, and he hoped they would persevere until they were completely successful. Mechanics' institutes had done a great deal for technical education, and it should not be forgotten that science and art had made some progress. He hoped the manufacturers themselves would not let the matter drop, and would send their own sons to technical schools when they were established. Many persons thought that the extreme deficiency of scientific education in all our middle class schools arose from the lack of appreciation of art in our universities. Those centres of learning were so devoted to classics and mathematics in their higher branches, that science, as applied to practical purposes, had been entirely shut out. It was beginning to be taught now, but not so as to influence the rewards and degrees, as in Germany.

The resolution was unanimously adopted.

Mr. W. E. Forster, M.P., referred to the course adopted by the Schools Inquiry Commission in reference to technical education, and doubted whether it would be wise to move for a commission just now, because the secretaries of legation in countries where technical

education was taught, and Mr. Samuelson, M.P., who had been on the Continent, were about to present information to Parliament upon the subject. He hoped the gentlemen present would study that information. The fact that it would be soon forthcoming made him doubt whether they ought to push for a commission at the present moment. Many of them knew to their cost what the position of the foreigner was in comparison to ourselves upon this question, and they would have to wait a long time before any action could be taken if a commission were appointed. He did not wish to discourage a commission so much as the notion of action being postponed until the report of a commission was brought forward. There was no question more worthy of the attention of chambers of commerce than this, but we should not expect to recover our lost ground rapidly when foreign countries had obtained such a start by means of these technical schools, and also because they had so admirable a groundwork in their thorough system of primary education. However complete our technical schools might be, until we had a more systematic and informing state of primary education it could not have its full effect. While he would persevere in attempting to establish technical schools, he would be equally earnest in endeavouring to obtain a solid groundwork, without which everything else would be of comparatively little service. Of course mechanics' institutes deserved every encouragement, for it was a great advantage that a taste for science and arts, and a desire for obtaining information that would help people in promoting industrial enterprises, should be developed as far as possible by these institutions. But it was not by them we could hope to match the systematic technical schools on the Continent. We must above all things avoid the idea that we can keep up our commercial and trading *prestige* by any merely *dilettanti* efforts; for we had to contend with schools in Switzerland and Germany that were established and conducted upon a thorough system, and where the best teaching that the government and the country could procure was given. The association could not possibly do better than appoint a committee to keep the question constantly before the Government, and he believed the Government were very anxious to meet the need that they felt existed. What the allusion to education in the Queen's Speech meant precisely he was unable to say, but no doubt the Government were aware of the present state of education. The truth was—the general question of education was now possessing the public mind so fully and strongly, that neither this nor any other Government would be able to do long without doing their best to grapple with the question, and what the Government did with respect to technical education ought to be a part of the scheme that must come; but that, probably, we should not obtain until the first session of the reformed Parliament. The chief thing to remember was, that we had to strive to obtain the strong combination and system adopted on the Continent, joined to the local enterprise that England could so fully produce.

Mr. Dixon, M.P., doubted whether the people to be affected by the scheme mooted would fully appreciate it.

A discussion followed, and, at the suggestion of Mr. Forster, M.P., the recommendation in the resolution to the Government to appoint a commission, and the remaining sentences were struck out, and the following substituted:—"And that the necessity of the establishment of institutions of a similar character be urged upon the Government, and that for this purpose a committee be appointed by the Associated Chambers." This was unanimously agreed to, and the amended resolution was adopted.

Mr. Forster, M.P., stated that the report of the Schools Inquiry Commission would be published probably in the middle of January, and he hoped it would be extensively read, as it bore largely upon the question of technical education.

Comparative Statement, showing the Present State of Scientific Instruction in Lancashire and Yorkshire.

At the last Educational Conference at the Society of Arts, the failure of the Science Schools in Yorkshire was brought forward by Mr. Sales, Visiting Officer of the Yorkshire Union. A comparison of the working of the system in the neighbouring county of Lancashire, which approximates in numbers and manufactures, is appended. It may be seen from this if the system itself, or the local administration of it, is in fault. Perhaps something may be due to an alleged inferiority in the state of elementary education in Yorkshire as compared with Lancashire.

	United Kingdom.	Lancashire.	*Yorkshire.
Number of science schools in 1866-7	212	47	12
Number of separate classes taught in them	560	149	18
Individual students under instruction December 31, 1866	9,529	1,845	220
Subjects taught:—			
Geometrical drawing	1,602	668	12
Machine drawing	1,320	550	...
Building construction	796	345	...
Elementary mathematics	1,183	91	27
Theoretical mechanics	727	147	...
Applied mechanics	112	48	...
Acoustics, light and heat	1,406	285	4
Magnetism and electricity	1,487	81	...
Inorganic chemistry	2,466	741	163
Organic chemistry	699	97	24
Geology	382	104	...
Animal physiology	1,130	233	19
Zoology	584	6	...
Structural and economic botany	252	20	...
Mining	23	11	...
Metallurgy	117	20	...
Physical geography	1,132	173	...
Individual students in science schools examined May, 1867	4,520	912	105
Who obtained of			
1st class Queen's prizes	735	103	7
2nd ,, ,,	1,177	155	10
3rd ,, ,,	1,634	306	16
4th ,, ,,	981	192	21
5th ,, ,,	1,593	271	28
Number of certificated teachers employed	208	34	8
Amount paid to teachers	£7,800 0 0	£1,390 12 6	£110 10 0

Towns possessing Science Schools in 1866–7.

Lancashire.

Accrington.
Ashton-under-Lyne.
Bacup.
Blackburn (two schools).
Bolton (four schools).
Burnley (five schools).
Bury.
Chorley.
Clitheroe.
Darwen.
Denton, near Manchester.
Droylsden.
Haslingden.
Heywood.
Lancaster.
Liverpool (two schools).
Manchester (six schools).
Middleton.
Nelson-in-Marsden.
Newton Heath, near Manchester.
Oldham (four schools).
Padiham.
Pendleton (two schools).
Preston.
Rhodes, near Middleton.
St. Helens.
Salford (two schools).
Wigan.

* The Hull Navigation School is not included among the Yorkshire Science Schools in this list. It had under instruction 73 individual students in mathematics, navigation, &c. They obtained at the Science Examination of May, 1867, 33 first-classes, 57 seconds, 39 thirds, 16 fourths, and 54 fifths; also three gold medals, two silver, and four bronze. One teacher was employed in it; his payment from the Department of Science and Art being £141 10s.

Yorkshire.

Almondbury, near Huddersfield.	Hull (Navigation School).
Barnsley.	Leeds.
Elland, near Halifax.	Middlesbro'-on-Tees (two schools).
Guisborough.	North Ormesby.
Halifax.	Stillington, near York.
Huddersfield.	York.

NEW SCHOOLS FORMED SINCE THE EXAMINATIONS OF MAY, 1867.

Lancashire.

Compstall, nr. Manchester.	Ramsbottom.
Eagley, near Bolton.	Rawtenstall.
Failsworth, nr. Manchester.	Royton.
Mossley, near Manchester.	Southport.
Newton Heath.	Warrington.
Patricroft.	

Yorkshire.

Bingley.	Thorne.
Birstal, near Leeds.	

On the 8th November, Mr. Hugh C. E. Childers, M.P., addressed the electors of Pontefract; and in the course of his speech expressed his opinion of the state of education generally, in Great Britain and Ireland, as follows:—

"Other things must be made to fit in with reform. The first great question to be considered will be the state of education. I unhesitatingly say that the state of education in the three kingdoms is unsatisfactory. The controversy with respect to the revised code is not ended. An impartial commission has reported the state of education in Scotland to be unsatisfactory; a commission has been appointed to inquire fully into the condition and principles of education in Ireland. Whatever arrangements are made in this country to enable education to co-exist with the fullest religious teaching—for I look upon that as of the most primary importance—whatever facilities for this you give, you must, with respect to the moral and secular education of our poor, carry out at once, and thoroughly, a great reform. It is absolutely necessary that we should have a national system which will embrace within it all the children of our poor. I do not use the word compulsory, it is an offensive word; but if we do not have that, we must have that which is equal to it—an education which will reach the whole of our people, down to the children of the most dangerous part of our community. To go up a little higher, within the last fifteen years we have had many bills for university reform, and for the reform of our grammar schools. It is absolutely necessary that some better arrangement should be made in respect of the enormous endowments of those institutions. Almost the whole of these endowments in our universities, and a large amount in our grammar schools, are applied to the classes who are able to pay for their own education. Many years ago education meant learning Latin, Greek, pure mathematics, and theology—the only professions for young men being then the church, the law, and perhaps medicine; but of late years a great change has taken place. Now you must make provision for the education not only of lawyers, churchmen, and physicians, but of those who will be employed in utilising to the utmost those applications of science to labour upon which the progress of a nation so much depends. If an advance be not made in what is called technical education, ten years may bring this country behind some of the rivals which are now close upon her track."

Fine Arts.

ARCHITECTURAL PHOTOGRAPHIC ASSOCIATION.—This society has in the present year entered on new fields: in previous seasons it was devoted to France, it now passes to Germany, and illustrates, in a series of twenty-two photographs, the cathedrals and churches of the Rhine, the Moselle, &c. For the entire work, or for selections therefrom, application is to be made to Messrs. Cundall and Fleming.

ARCHITECTURE ON THE RHINE AND MOSELLE. — Messrs. Murray have issued the prospectus of an illustrated work, "Rambles in the Rhine Provinces." The illustrations, consisting of twenty large and seventy smaller plates, consist of photographs, chromolithographs, and woodcuts. Mr. Seddon has supplied some of the drawings from which these plates are executed.

GUSTAVE DORÉ.—Original drawings by this artist, in illustration of Tennyson's "Vivian" and "Guinevere," are on view at Messrs. Moxon's rooms, Dover-street. The engravings published by Messrs. Moxon are placed side by side with the originals for comparison.

NATIONAL GALLERY.—"The Raising of Lazarus," by Haydon, has been acquired by the National Gallery. The picture, which for many years was on view at the Pantheon, Oxford-street, has always been counted as one of the artist's master-works. The figure of Lazarus Haydon deemed among his most successful efforts. In the painter's "Life" is related an interesting incident as to the conception of this strikingly original figure.

Manufactures.

GROWTH OF THE SWISS WATCH TRADE. — This industry only dates back to the middle of last century, when it was introduced into Switzerland by Daniel Jean Richard, whose name is naturally held in great estimation by the working population, whose condition has been so much improved by the creation of so important a trade. The development of the business was slow, for it was not until about 1848 that it assumed anything like the importance it has since presented. From that date it has grown rapidly, and the value of the export trade is stated to amount, at present, to about £1,400,000 per ann., divided as follows:—The United States of America, £540,000; France, £200,000; England, £180,000; Germany, £200,000; and other nations, £280,000. The canton of Berne alone is said to send abroad annually 500,000 watches. Wherever the watch trade has assumed any importance, a complete transformation has taken place in the condition of the working classes, who, by their industry and economy, have become comparatively rich, while the populations increase and the habits of the people have improved to a very remarkable extent.

THE MANUFACTURE OF PAPER.—The *New York Times* says:—"The high cost of rags for the manufacture of paper has led to long continued and costly attempts to substitute other articles, such as wood, straw, bamboo, cornstalks, husks, &c., but owing to the great expense for chemicals and the machinery necessary for converting the materials into pulp, the cost of paper has not to any considerable extent been reduced. It is now alleged that the okra plant, which grows luxuriantly in all parts of the United States, possesses all the requisites for making every description of paper, from the common wrapping to the finest book or bank-note paper, either sized or non-sized, without the addition of any other material whatever. It is claimed that this has been practically demonstrated; that the discoverer has within the past few months manufactured, by the most simple and economical process, in different mills, a variety of samples of papers which, although made under very unfavourable circumstances, possess all the characteristics of paper made from linen rags and Manilla rope. If this should turn out to be true, it cannot fail very greatly to affect the price of paper, as the okra can be raised cheaply and abundantly. We understand that arrangements have been made for commencing the manufacture of okra paper this season."

Commerce.

The Wheat Crop of the United States for the present year is estimated at from 220,000,000 to 225,000,000 bushels. This is from 40,000,000 to 50,000,000 bushels more than the crop of 1866, and is by far the largest wheat crop ever gathered in the United States.

Agricultural Exhibitions in France.—From the report of the Minister of Agriculture, Commerce, and Public Works, on the exhibitions of farm stock, implements, and produce held in 1867, it appears that there are in France 874 local associations by which these competitive shows are organised, in addition to 20 general exhibitions, 8 cattle shows, and 12 of agricultural produce instituted by Government, each comprising a certain number of departments. The Minister bears witness to the great progress obtained by aid of these institutions.

Commerce of the Island of Martinique.—During the first nine months of the present year the imports amounted to 21,271,956 frs., or 507,258 frs. more than during the corresponding period in 1866, whilst the exports amounted to 16,648,259 frs. being 255,375 frs. under that of last year. This decrease in exportation is exclusively in produce of the Island. In fact this year only 25,919,775 kils. of sugar were sent off against 30,905,256 kils. in 1866, and 4,259,592 litres of rum against 5,040,673 litres last year. Exports of other produce decrease in a like proportion. Fortunately the approaching harvest promises to be a good one, and to compensate for the inferiority of the last. Guadaloupe was only slightly visited by the hurricane of the 8th October; with the exception of that storm the weather has been most favourable for the crops, and there is every prospect that the harvest of 1868 will prove a good one. That of the present year is very inferior to that of 1866, and the exports of sugar from Guadaloupe are at present only 22,413,888 kils. as compared with 33,018,161 kils. last year.

Colonies.

The Labour Question in Queensland seems likely to assume a new aspect. Large quantities of land are being taken up for the cultivation of sugar and cotton, and some growers are trying the experiment of introducing South Sea Islanders to work on the plantations, on the coolie system adopted at the Mauritius and other places. The men are engaged for three years, at about £6 per annum and rations; but as the regulations with respect to the importation of coolies do not apply to these men, they are entirely unprotected by legislative enactment, and already it is rumoured that some irregularities have taken place, both as to the manner in which they were procured, and their treatment on arrival in Queensland, by one or two of the masters to whom they were consigned. The Islanders can scarcely be called civilised, and very few of them are sufficiently acquainted with the English language to make such a statement of their grievances, real or supposed, as could be accepted as evidence in a court of law.

Supply of Food from the Colonies.—A Queensland paper says:—"Some attention has been drawn of late to the desirability of making the meat-curing business in this colony much more extensive than it is at present. Indeed, the question of meat-curing is attracting notice in all the colonies where fat cattle are bred to any extent; and it is being considered whether it would not be more profitable to convert the surplus stock into cured beef than to boil it down for tallow."

Queensland Cotton.—The Government of Queensland have fostered the growth of cotton by granting a bonus of £5 for every bale of 300lbs. of clean cotton, either wholly seed or Sea Island. The struggle to establish the cotton plant has been severe, but it is now over, that is to say, all uncertainty about its being a paying crop is at an end. Land for cotton growing or other agricultural purposes, can be taken up from 20 to 320 acres on any agricultural reserves. Land already offered for sale, and not bought, may also be taken up. The terms of payment are, 2s. 6d. per acre per annum for eight years, or £1 per acre in all. When the amount is paid up a title is granted, and the land becomes the *boná-fide* property of the settler. The cotton crop of the season, however, has not altogether been the success that was anticipated several months ago. Nevertheless, the growers are so far satisfied that they are extending their operations, and much land has lately been taken up for the purpose of cultivating cotton. With anything like a favourable season next year, very great increase in the exports of this staple may be expected in this colony next year.

Publications Issued.

Cassell's Popular Educator *(Cassell, Petter, and Galpin)*.—A new edition, revised to the present time. Twenty years ago the "Popular Educator" first issued from the press, and during that period considerable advances have been made in many of the departments of knowledge. The proprietors have been desirous of perfecting the work and bringing it up to the requirements of the present day. A large number of additions have been made, and many new headings have been introduced. The great aim and object of the work is to enable an individual to educate himself. The three great departments of knowledge which it embraces are History, Science, and Languages.

Notes.

A New Thames Tunnel.—An important engineering project, which has excited but little public attention, and for which the necessary parliamentary sanction has not yet been obtained, is already in process of execution, namely, the tunnel or subway intended to be driven under the Thames between London-bridge and the Tower. This work is the third mode of communication below London-bridge which has been brought forward by the same company. The first project, for which application was made to parliament in 1863, was a bridge below the Tower, which was opposed by the Conservators of the Thames. The next was by a subway immediately above the Tower, which was, in its turn, opposed by the Tower authorities, on account of the position of the shaft on the north side of the river, the approach to which would have interfered with the traffic by the Tower-stairs. The present project has the sanction of the Tower authorities, and arrangements for the small portion of land on the Surrey side necessary for the approach have been already made. The new tunnel project presents, in some respects, a curious contrast with Brunel's great work at Wapping, which occupied nearly twenty years in its execution. The existing tunnel, now the property of the East London Railway Company, is about 1,250 feet between the shafts; the proposed subway will be about 1,320 feet; the one cost above £450,000, the other is estimated to cost the comparative trifle of £16,000. Dividend was utterly hopeless in the one case; in the other, with only the same traffic receipts as those of the old tunnel, a dividend of 20 per cent. upon the capital is calculated on. If the estimate be not exceeded it is possible that, with moderate tolls, the traffic receipts will be much greater. Mr. Peter Barlow, F.R.S., who is the engineer of this project, proposes that the descent and ascent to the tunnel shall be by hydraulic lifts similar to those in use in the

large new hotels, and that the passengers shall be conveyed from one shaft to the other in light steel omnibuses of perfect workmanship, and driven by man-power upon a system of accumulating force. The friction will, it is expected, be so much reduced by the exactitude of the fittings and the excellence of the materials and workmanship employed, as to make the power of one man amply sufficient for working an omnibus. The bottoms of the shafts will be on the same level, and the subway will dip in the centre to give speed, and to accumulate force for the last half of the journey. Mr. Barlow recommends his scheme as applicable to the relief of the crowded streets.

DRAINAGE WORKS IN HUNGARY.—The lake of Neuseild, in Hungary, on the confines of Austria, is now completely drained and dried, and the land so obtained is about to be placed under cultivation. It contains eight square miles of virgin soil, and the belief is that it will prove to be extremely fertile. A canal has been made across it, to carry off whatever water may accumulate. The land is given to the neighbouring proprietors, and Prince Esterhazy and the convent of Heiligenkreuz will receive the largest share of it. This extensive tract of land reclaimed from nature, lies close by the lines of railway from Vienna to Raab, and from Vienna to Oedenberg, and a projected line from the latter town to Presburg will run still nearer to it.

Correspondence.

THE MONETARY CONFERENCES.—SIR,—I regret exceedingly that I was not able to be present at your last meeting, when Professor Levi read his very interesting paper on the monetary conferences at Paris. Having paid some attention to the subject, and having attended the conferences as representative of the Liverpool Chamber of Commerce, may I beg permission to offer a few remarks in your *Journal* on the subject of the paper, and the discussion which followed. Unfortunately, in discussions on coinage disputes arise owing to the vagueness and ambiguity of the terms used, which serve only to perplex the question, and I think this was very apparent at your meeting. One is astonished to find a gentleman of the scientific attainments of Professor Levi speaking of the ducat of 100 pence, or 8s. 4d., as the equivalent of the gold piece of ten francs, 7s. 11¼d., and stating that the present penny is practically the same in value as the ten centimes. This confusion of thought, probably arising from the similarity in appearance of the penny and the ten-centimes piece, laid him open to the very just criticism of Mr. Fellows. That gentleman truly remarked that, whether we adopt the ducat or the 25-francs as our unit, we must make the change of about 2d. in the £ sterling in order to bring our monetary system into simple relation with the monetary system of the Convention, and that the two questions of making our system international and making it decimal are quite distinct. But, apart from the theoretical imperfections and general vagueness of Professor Levi's ducat scheme, he seems to believe that the issue of one new coin, without any definite relation to our present coinage, will tend to bring about the desired change. "Let this coin," he says, "be put in circulation as a token only, and let every encouragement be given to use this 100-pence piece as a unit. Should it prove popular and convenient, then," &c. Now if by "this coin" he means a piece the equivalent of ten francs, we have the experiment made for us without going to the expense of coinage, for in the bullion and exchange offices in London are to be found numbers of these pieces, which, however, as they bear no simple relation to our present coins, immediately disappear from circulation when brought into the country by travellers. If, on the other hand, he means a piece the equivalent of eight shillings and four pence of our present money, every practical man will at once say we have no need of such a piece, as our half-sovereign is much more convenient. The only other scheme for an approach to international coinage is that supported by Mr. Hendriks, for, from an international point of view, it matters little whether we call the twenty-five francs a pound or 1,000 farthings, as suggested by Mr. Fellows. Mr. Browne very concisely stated what had to be done, and pointed out that in order to render our coinage international we must alter our pound sterling, so as to make it the exact equivalent of 25 francs. When this is done the question of decimalisation still remains unsolved, but I think becomes more easy of solution. Suppose the new pound sterling and the ducat of 10 francs be issued at the same time, and that the shilling and sixpence be gradually withdrawn and replaced by tenpenny pieces and five-penny pieces, the equivalents of the franc and half-franc. These being the coins under the new system, I would leave to the people themselves to adopt a system of decimalisation of their moneys of account. It is probable that those engaged in commerce would retain the pound sterling in their accounts, and the poorer classes would keep their accounts in ducats and pence. But the conversion of the coins in daily use into decimals of a pound would be comparatively easy to any person in a counting house. To familiarise the public with the relative value of the coins, and to facilitate the introduction of the decimal system into accounts, the new pound might bear the inscription, 250 pence or 1,000 farthings, the florin one-tenth of a pound, or 25 pence, the tenpenny piece, 40 farthings, &c. By this means the two apparently incompatible schemes of decimalisation will be reconciled, and our monetary system, while retaining the pound sterling, will be perfectly international both in its unit and its sub-divisions. The table given by Mr. Hendriks shows what an immense step would be made towards international coinage if England and her colonies and the United States make the slight changes necessary in the pound sterling and the dollar. I think it will best serve the purpose we all have in view if we recognise, instead of disguising from ourselves, as Professor Levi appears to do, that a change in value of our units of money is necessary, and the immense advantage to be gained must be set against the trivial alteration of the standard of value. If foreign nations concur in the change, we need not fear, as Mr. Urquhart indicated, that we shall sacrifice our good name amongst the nations of the earth, or that our credit will in any degree suffer.—I am, &c., EDMUND R. MUSPRATT.

Liverpool, December 2nd, 1867.

MEETINGS FOR THE ENSUING WEEK.

MON......R. Geographical, 8½. Mr. A. S. Bickmore, "Journey through Central China from Canton."

TUES ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1. Discussion on Mr. Wilson's paper, "Description of the Victoria Bridge on the line of the Victoria Station and Pimlico Railway." 2. Mr. Charles Douglas Fox, "On New Railways at Battersea; with the Widening of the Victoria Bridge and Approaches to the Victoria Station."
Photographic, 8.
Ethnological, 8. 1. Mr. H. H. Howorth, "On the Origines of the Norsemen." 2. Mr. H. C. Criswick, "Life amongst the Veys."

WED ...Society of Arts, 8. Mr. Ellis A. Davidson, "On Industrial and Scientific Education; with Notes on the Systems pursued, and the Works produced, in Continental Schools, as exemplified in the Paris Exhibition, and Suggestions for the Establishment of Trade Schools in England."
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
Archæological Assoc., 8½.

THUR ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.

FRI ......Society of Arts, 8. (Cantor Lectures.) Professor Richard Westmacott, "On Art; especially including the History and Theory of Sculpture."
Astronomical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 2nd November*, 1867.

46. (ix.) Trade and Navigation Accounts (30th September, 1867).
443. (i.) Sea Coast Fisheries (Ireland) Bill—Index to Report.
578. Blackwater River Oyster Fisheries—Mr. Pennell's Report.

Delivered on 11th November, 1867.

477. Metropolitan Cemeteries—Returns.
509. Railways—Supplementary Statement.
533. Dog Licenses—Returns.

Delivered on 16th November, 1867.

335. (ii.) East India (Bengal and Orissa Famine), Part III.—Return.
410. Woods, Forests, and Land Revenues—Forty-fifth Report of Commissioners.
583. Election Petitions—Alphabetical List.

Delivered on 20th November, 1867.

The Queen's Speech.
Abyssinian Expedition—Papers.

Session 1867.

431. (A v.) Poor Rates and Pauperism—Return (A), September, 1866 and 1867.

Delivered on 21st November, 1867.

Abyssinian Papers—Corrected Pages.

Session 1867.

482. (i.) Army (System of Retirement)—Index to Report.

Session 1866.

422. (e.) Poor Rates and Pauperism—Return (E).

Delivered on 22nd November, 1867.

1. Mail Services (India and China)—Further Correspondence.
Established Church (Ireland)—Copy of the Commission.

Delivered on 23rd November, 1867.

2. Bill—Metropolitan Streets Act (1867) Amendment.
2. Peninsular and Oriental Steam Navigation Company's Contract —Treasury Minute.

Session 1867.

552. Isle of Man—Account.

Delivered on 25th November, 1867.

3. Greenock, Ardrishaig, and Rothesay Mails Contract—Copy of Contract.
The Lords Address.

Delivered on 26th November, 1867.

3. Bill—Libel.
4. ,, Drainage and Improvement of Lands (Ireland) (Supplemental.
8. Abyssinian Expedition (Vote of Credit)—Estimate.

Session 1867.

530. Revenue (Ireland)—Accounts.

Delivered on 28th November, 1867.

8. Bill—Sales of Reversions.
5. Broadmoor Criminal Lunatic Asylum—Report.
Manufactures, Commerce, &c.—Reports.
Public Petitions—First Report.

Delivered on 29th November, 1867.

11. Bill—Mines Assessment.
12. Queen's College (Cork)—Return.

Delivered on 30th November, 1867.

14. Bill—Grand Jury Cess (Ireland).
16. ,, Income Tax.

Session 1867.

46. (x.) Trade and Navigation Accounts (31st October, 1867).

Patents.

From Commissioners of Patents' Journal, November 29.

Grants of Provisional Protection.

Bottles, &c., ornamenting—3250—C. E. Brooman.
Buckles, &c., coating with gutta-percha, &c.—3258—W. R. Lake.
Calico, &c., machines for printing—3257—J. M. Napier.
Carriages, closing the heads of open—3203—A. McKenzie.
Cask stands—3253—F. W. Russell.
Casks—3207—J. D. Scally.
Clocks, hydraulic—3238—A. Airiau.
Copper, refining—3243—A. M. Clark.
Copper, &c., decomposing the sulphides of—3232—J. Clark and A. Esilman.
Cops, machinery for making—3227—J. Combe.
Doors or windows, closing—3111—A. Verdalle.
Engines and pumps, rotary—3304—E. W. Hughes.
Engines, gas—3237—W. E. Gedge.
Engines, locomotive—3221—R. F. Fairlie.
Engines, rotary—3219—A. V. Newton.
Engines, traction—3280—E. T. Trenery.
Engines, &c., attenuating the effect of shocks between—3223—P. De Bavay.
Envelopes—3252—A. V. Newton.
Fabrics, pile, &c.—3292—J. Owens.
Fabrics, &c., dyeing, &c.—3290—W. Brewster.
Fire-arms, breech-loading—3256—J. E. Richter.
Fire-arms, &c, breech-loading—3211—T. Wilson.
Fire-lighters—3244—J. Templeman.
Fire-lighting material—3233—R. G. Harcourt.
Fuel, artificial—3203—A. F. Gaidan.
Furnaces, gas—3245—R. Howson.
Governors—3142—W. J. M. Rankine.
Granite, artificial—3234—P. M. Parsons.
Hair, brushing, &c.—3254—C. Ritchie.
Harmonium and piano, combined—3165—J. E. Castex.
Hats—3262—R. Husband.
Iron and steel—3226—W. H. Richardson.
Iron and steel—3282—W. H. Richardson.
Iron crystals, reduction of sulphate of—3217—E. Madge.
Keys—3239—R. Morson.
Kneading machines—3224—G. Kent.
Lamps—3272—T. Wood.
Lamps—3296—C. Butler.
Lamps, safety—3209—J. W. Lowther and T. Bennett.
Looms—3236—J. Crossley.
Looms—3276—H. English and J. Farndon.
Manure, artificial—3270—G. Fitt.
Mattresses, &c.—3104—N. Birkenruth.
Metal, manufacturing direct from the ore—3264—C. E. Brooman.
Metallic plates, compound—3205—J. Humby.
Minerals, &c., treating and separating when pulverised—3248—I. Swindells.
Nails, manufacturing cut—3246—R. Heathfield.
Neck-ties, &c., fastenings for—2933—S. S. Maurice.
Ordnance, mounting and working—3278—R. A. E. Scott.
Paper, &c., applying bronze, &c., powders on—3229—A. M. Clark.
Paper-hangings, ornamenting—3259—W. Bailey.
Pasty matters, preserving—3129—H. A. Bonneville.
Paving—3294—G. F. Redfern.
Pianofortes, &c.—3255—R. W. Pearse.
Railway carriage wheels—3274—E. Reynolds.
Railway carriages, means of communication applied to—3284—H. H. Lloyd.
Sewing machines—3222—J. Morrison.
Ships, propelling—3247—H. A. Bonneville.
Ships, &c., hauling into deep water—2204—A. Murray.
Slate, &c., tunnelling and quarrying—2580—W. F. Cooke.
Steering apparatus—3231—W. R. Lake.
Taps—3225—R. Harrison.
Telegraph posts, &c.—3286—J. Oppenheimer.
Ticket registers—3235—G. R. Solomon, jun., and M. Bebro.
Tobacco pipes—3240—L. B. Bertram.
Warping, &c.—3099—J. Clarke, jun., and T. Holt.
Washing machines—3230—J. P. L. Heckmans and F. J. Nunney.
Water, apparatus for raising—3228—L. A. Wainman.
Wines, &c., ageing and refining—3260—J. G. Tongue.
Wire, coating—3157—G. W. R. Pigott.
Wool, preparing—3266—W., J., and J. Busfield.
Wool, &c., cleansing—3249—R. Holliday.
Yarns, twisting—3268—J. V. Thornton and C. Abercrombie.

Inventions with Complete Specifications Filed.

Fire-arms, &c., breech-loading—3301—W. J. Murphy.
Fire-arms, &c., breech-loading—3345—W. R. Lake.
Railway trains, &c., preventing damage from concussion, applicable to—3302—W. G. McIvor.
Telegraphs—3346—W. R. Lake.
Tubes, producing seamless—3333—T. Chalmers.

Patents Sealed.

1610. T. Petitjean.	1720. J. C. Fuller.
1614. J. Scott.	1731. A. C. Lion.
1629. F. B. Houghton.	1832. J. H. Kearns.
1632. T. Horrex.	1858. J. Human.
1634. E. McClean.	1860. W. E. Newton.
1635. W. H. Richardson.	1874. C. E. Brooman.
1637. C. L. J. Carville, sen.	2081. J. Fleming.
1646. E. Meldrum.	2748. C. P. Jones.
1650. D. Hanson.	2758. H. A. Bonneville.
1671. A. L. Bricknell.	2859. J. Brönner.
1676. J. Petrzywalski.	

From Commissioners of Patents' Journal, December 3.

Patents Sealed.

1652. N. Rausch and E. L. Darlet.	1707. W. Orr.
1654. C. Boulay.	1708. R. Logan.
1657. I. Evans.	1714. J. H. Johnson.
1661. E. Bland.	1718. J. Fletcher.
1674. E. S. Atkinson.	1747. J. Onions.
1677. E. T. Hughes.	2482. H. O. W. and E. F. Cooper.
1680. A. Barry.	2879. W. R. Lake.
1691. J. Hargreaves.	

Patents on which the Stamp Duty of £50 has been Paid.

2959. L. A. W. Lund.	3029. W. E. Newton.
2962. W. E. Carrett, J. Warrington, & J. Sturgeon.	3004. S. P. Kittle.
	321. C. R. Markham.

Patents on which the Stamp Duty of £100 has been Paid.

2947. A. Jackson.	2959. W. Pilkington.
2952. J. Ronald.	

Journal of the Society of Arts.

FRIDAY, DECEMBER 13, 1867.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings at Eight o'clock :—

December 18.—" On the Principles that Govern the Future Development of the Marine Boiler, Engine, and Screw Propeller." By N. P. Burgh, Esq., C.E.

Cantor Lectures.

The first course for the present session is " On Art, especially including the History and Theory of Sculpture," and is being delivered by by Richard Westmacott, Esq., R.A., F.R.S., Professor of Sculpture in the Royal Academy, as follows :—

December 13th.—Lecture II.—The subject of the Introductory Lecture illustrated, by a general survey of the history and practice of Sculpture in ancient times, especially among the Greeks.

December 20th.—Lecture III.—The subject continued, including a review of the mediæval and more modern schools, to the close of the eighteenth century.

The lectures commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now in the press, and will be published in a few days.

Technical Education.

The Council feeling the great importance of this subject, have resolved to hold a Conference at the Society's house, on the 23rd and 24th January next, the particulars of which are explained in the following circular :—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., 9th December, 1867.

Technical Education.

Sir,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to invite your (Chamber of Commerce or other body) to appoint its President or other representative, to attend a Conference which is to be held here, on Thursday and Friday, the 23rd and 24th of January next, to consider and suggest what measures may be taken to promote the industrial and scientific education of the various classes of the community.

The Conference will commence its sittings on Thursday, the 23rd of January, 1868. The Chairman of Council will take the chair at 12 o'clock precisely.

At as early a period as possible, the Council will issue to each gentleman who accepts their invitation to the Conference a programme of the probable course of its proceedings; and, to enable the Council to do this in a satisfactory manner, I am to request you to inform me, with the least possible delay, whether a representative from your [ ] will be able to attend the Conference ; whether your [ ] has any special resolutions to suggest, or any particular points to which it desires to direct attention ; what general measures for the promotion of education it may conceive to be requisite ; and what institutions of a specific character are needed in your own neighbourhood to give the greatest practicable facilities for the acquisition of knowledge applicable to your local industries.

The object of the Conference is to ascertain, not merely what the Society of Arts, Manufactures, and Commerce, but what the nation at large can do to promote technical education among the workmen, the foremen, the overlookers, and the employers in Arts, Manufactures, and Commerce ; and it is hoped that an expression of opinion by this Conference may tend in some degree to diminish the difficulties with which the solution of this vital question of national education is at present confessedly surrounded.

I am, your obedient servant,
P. Le Neve Foster, Secretary.

The foregoing circular has been forwarded to :—

- The Mayors of the Towns which are the principal seats of manufacture in the United Kingdom.
- The Presidents of the Chambers of Commerce and Agriculture.
- The Presidents of all Societies and City Companies which have co-operated with the Society in respect of Education or Art-workmanship.
- The Presidents of Institutions in Union with the Society of Arts.
- Her Majesty's Inspectors of Schools, Factories, Mines, and Collieries.
- Professors at University, King's and other Colleges.
- The Examiners of the London University.
- The English Jurors at the Paris Exhibition of 1867.
- The Society's Judges in Art-Workmanship.
- The Society's Examiners in Education.
- The Society's Visiting Officers.
- The writers of letters to the Schools' Inquiry Commission.

And many other gentlemen connected with education.

Members of the Society taking a special interest in this subject are invited to attend.

Examinations, 1868.

In addition to the prizes announced in the Programme of Examinations, the following are offered : —

The Worshipful Company of Coach and Coach Harness Makers offer as prizes—

1. A Silver Medal in Freehand Drawing; and
2. A Bronze Medal in Practical Mechanics;

To any candidate, being a workman or apprentice employed in the coach-making trade, who obtains the highest number of marks, with a certificate, in these subjects respectively.

The medals will be presented by the Master of the Company in open court.

Institutions.

The following Institution has been received into Union since the last announcement :—

Portsea Island Young Men's Christian Association.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met at three o'clock on Wednesday afternoon, the 20th of November, when were present—the Right Hon. Henry Austin Bruce, M.P. (in the chair), Mr. W. Ewart, M.P., Mr. Harry Chester, Mr. Samuel Gurney, M.P., Mr. Bagshaw, Mr. J. T. Ware, Mr. C. S. Read, M.P., Mr. McLagan, M.P., Mr. G. F. Wilson, F.R.S., Mr. E. C. Tufnell, Mr. W. H. Michael, Mr. E. Wilson, and Mr. E. W. Hollond.

Captain Warren, R.N., brought before the notice of the Committee a cooking apparatus, on the plan which had been adopted by him, and practised for the last two years, in cooking for the army at Aldershot camp, &c., in which great economy of fuel and saving in the meat cooked were claimed. It was stated by Captain Warren that rations for 120 men were cooked by this apparatus, on a large scale, at a cost of 3d. per day for fuel; whilst he alleged there was a saving of two ounces in the pound of the meat cooked. The weight of one of these cooking apparatuses, as they were in practical use for the Abyssinian expedition, was only 146lbs., and they could be transported on the backs of horses or mules. He considered this a good method of preparing food already cooked for distribution to the poor, to whom the cost of fuel was an object. He added that he could construct an apparatus of this kind weighing not more than 4 cwt., placed upon wheels, which would be capable of cooking food for 500 persons.

In reply to inquiries by the Committee, Captain Warren stated that the apparatus was equally efficient on a smaller scale, and was adapted for private use in houses, particularly where boilers were already fitted, from which steam could be supplied, or where hot plates existed. He did not regard it so much as a plan of which the poorer classes could avail themselves; but for unions or workhouses the saving would be great.

The principle of the apparatus having been minutely explained by Captain Warren and Mr. Michael, and commented upon by various members of the Committee, the Chairman thanked Captain Warren, on behalf of the Committee, for his interesting communication.

Dr. Medlock, accompanied by Mr. Bailey and Mr. J. Graham, attended to give information to the Committee, relative to the preservation of meat, poultry, fish, &c., by the application of bi-sulphite of lime.

Dr. Medlock said the process was a very simple one. For the last two or three years he had devoted a good deal of time and attention to the preservation of meat, and the result of his experiments was, that the bi-sulphite of lime was the best preservative he had hitherto found. His experiments were made principally during the hottest weather of last summer; and he found by treating joints of meat with bi-sulphite of lime they kept sweet two or three times longer than they would do under ordinary circumstances. Mutton, which would not have kept for three days in summer, remained good for a fortnight after this treatment. The cost of the process was a mere bagatelle. To preserve meat in the carcass, it was necessary to inject the bi-sulphite into the arteries through the aorta, immediately after the animal was slaughtered and the blood expelled. A carcass so treated would keep five or six times longer than if not so treated, and there was no taste or flavour whatever imparted to the meat by the preparation; and by this means they could hang meat in summer as long as they could in winter. By many persons it was considered the appearance of the meat was improved by this treatment. He stated that the operation could be performed by unskilled persons; and nothing was easier than the manipulation of the process. There was no tendency in the material to solidify, unless the preparation was made of the greatest strength, and then it deposited the neutral sulphite of lime. In the treatment of a joint of meat it was simply necessary to dip it into the solution of half bi-sulphate of lime of 1·050 specific gravity and half water. It was not at all necessary to remove the preparation from the joint before cooking. There was a certain amount of penetration of the liquid into the joint, but it was perfectly harmless, and there was no perceptible taint or taste of the bi-sulphite when the meat so treated was eaten. He had eaten poultry and joints of meat at his own table, and there was not the slightest taste of lime.

Mr. McLagan inquired what was the difference between this process and that by means of sulphurous acid gas.

Dr. Medlock replied that the preservative agent was sulphurous acid gas, and bi-sulphite of lime was the most convenient practical mode of applying the gas. The quantity of lime that would be eaten in dining off a joint treated by this process would be wholly inappreciable; probably not more than a quarter of a grain.

The Chairman said the committee would be glad to have Dr. Medlock's views with regard to the applicability of this process to the preservation of meat coming from long distances to this country.

Dr. Medlock said as yet he had had no opportunity of testing the efficiency of his process in the case of meat sent from foreign parts; but he had no doubt whatever as to its practicability. He had kept a piece of neck of mutton from the end of May last till the present time. The meat remained perfectly sweet, but the fat had a strong odour of tallow. He had from time to time cooked portions of joints treated by this process, and they were perfectly sweet. Those joints were soaked in the preparation for twelve hours.

Mr. E. Wilson inquired whether Dr. Medlock had given consideration to the difficulty which at present exists in transporting meat in a fresh state from South America and other distant parts of the world to this country.

Dr. Medlock replied he had not done so at present. Last year, during the hottest summer weather, a number of turkeys, fowls, and joints of lamb were sent to him from Canada. They were six weeks in coming, and when the casks were opened, the contents were perfectly sweet and good. That was in July last year. The various articles were packed in the casks and covered with the liquor; and he need not say the appearance of the poultry was not improved thereby; but when they were wiped dry and dusted over with flour, they would have been perfectly saleable in a poulterer's shop.

The Chairman inquired at what cost the turkeys, &c., reached Dr. Medlock.

Dr. Medlock replied that the turkeys averaged ten or twelve pounds weight each, and the cost of them in Canada was about 2s. 6d. each. The cost of conveyance he did not know. He thought if the turkeys, &c., had been soaked for a time in the preparation, and packed dry, it was probable they would have had a better appearance when they arrived. By this means he had no doubt that a large trade in poultry might be established between this country and Canada.

Mr. Bailey said he believed the cost of treatment by this process, and freight from Canada, would be covered by a farthing per lb. for joints and poultry.

Dr. Medlock thought that was an extravagant scale.

Mr. Bailey replied that included freight from Canada.

If a turkey weighing 9 lbs. cost 2s. 6d., it could be sent to this country for 2s. 6d. plus 9 farthings.

Dr. Medlock went on to say that its largest application had hitherto been to the preservation of butchers' meat. It often happened that a butcher had a quantity of meat left unsold on a Saturday night, and it was a great boon if, by a simple and ready process, he was able to preserve the meat sweet till the Monday. He held testimonials from many of the largest butchers in London and other places. He apprehended this process might be applied to the transporting of meat from distant parts of the kingdom, and from foreign countries where large supplies exist, and also to domestic purposes at home, for preserving meat, &c., which in the hot weather soon became tainted and bad. He was not aware that the process had been adopted with respect to provisions on board ship, but that was, in his opinion, another direction in which it would be highly beneficial. It was his intention, he added, to try experiments with joints of meat from foreign countries as soon as possible.

Mr. J. Graham, the commercial agent for the process, gave information as to the practical results of the process as far as it had been yet introduced. He stated that, as a test of its efficiency, casks of beef had been sent overland from London (after being treated with bi-sulphite of lime) to Australia, South America, and Constantinople. They could not tell the result yet, but the experiment was intended to show that if meat could be sent there from this country in a fresh state fit for food, it could be sent from those countries here in the same condition.

Mr. Michael inquired whether any experiments had been tried by the injection of carcases with the bi-sulphite.

Dr. Medlock replied, it was tried with some lambs last spring. It had not yet been tried on a carcass so large as an ox. He added that no salt was necessary, though he thought the addition of a small quantity of salt to the liquor would improve the flavour of the meat. In the cases of injection he had mentioned he fancied he detected some slight taste of the lime in eating the meat. He thought the admixture of a little salt would tend to get rid of that flavour; but the quantity of salt would be so small as in no way to impart the character of salted meat. About half-a-pound of salt to four gallons of the liquor would be sufficient in the process of injection, the taste of which would be scarcely perceptible. Some friends who partook of the lamb which had been injected did not detect anything different in the flavour of the meat. He had pieces of mutton which had been preserved since last May, and there was not the least taint beyond a tallowy odour. The pieces were soaked in the solution for about twelve hours, and then hung up without being re-dipped. There was no necessity, he said, to dip if injection were adopted. He had eaten meat, three months after it had been killed, preserved by this process, and it was perfectly sweet and good, and retained its flavour in a remarkable manner. In hot climates, and in this country in hot weather, it was desirable to apply the process as soon after the meat was killed as possible, as the effect of the treatment was to keep the meat in a sound condition. He did not say that it would stop putrefaction when once it had commenced.

Mr. Tufnell inquired if he had estimated the amount of lime which a leg of mutton would take up by this process?

Dr. Medlock replied that the meat, steeped in the solution for ten minutes and then hung up, would not absorb more than three or four grains of actual lime.

The Chairman inquired whether, if this system was as successful as was anticipated, it might supersede the necessity of sending meat from Australia and other colonies in a cooked state, such as was now exported?

Mr. Graham replied that there had been no results of experiments upon meat brought from a very long distance as yet; he was not therefore in a position to answer the question just put. He could state more particularly what had taken place among the butchers of England. When he first took this matter up, there was the usual amount of prejudice to be overcome. The first objection raised by the butchers was that it would impart a soddened appearance to the meat. On his rebutting that objection, it was urged again that the solution would give a limy taste to the meat; and many butchers refused to try the experiment on a large scale till they had tested the result by eating a joint so treated at their own tables. One West-end butcher, doing a very large trade amongst the aristocracy, at his (Mr. Graham's) solicitation, had one of his large tanks emptied for the purpose of experimenting upon the process, which he continued for three weeks, testing the results very carefully. Legs of mutton, pieces of beef, &c., were put into the solution by the dozen, and that was continued for some time without any complaint that there was anything different in the meat on the part of the customers. During the whole of the three weeks there was no complaint either as to the appearance or the flavour of the meat. The experiments were made in the month of July last, immediately after the Sultan's departure from London. On one occasion the same butcher said to him "I will put it to another test. Here is a piece of the best quality of beef, which I know will not remain sweet till Sunday; I will have it steeped in the liquor, and have it cooked for my own table on Sunday. If it is all right then, I will give you my testimonial." He did not let his family know that the meat had been treated with the bi-sulphite; but the joint was cooked and eaten by his wife and family, who stated that they made an excellent dinner, and did not notice anything different in the meat. The same person, on a subsequent occasion, on Mr. Graham calling to ascertain further results, said, "My foreman is the best advocate of your system that you can have;" and the foreman assured him that he applied the solution every day to joints which he thought would not keep good till the morrow. With regard to the appearance of the meat, it was the fact that the week before last he visited a butcher who had taken out a license for this system, and found him applying the bi-sulphite to beef by means of a painting brush, which he said gave a better appearance to beef, but that it did not to mutton. With regard to mutton, the same person told him that he had had but one complaint, that a shoulder of mutton tasted a little tallowy. He had seen them rubbing over the outside of beef with the liquor, to improve, as was said, the appearance of the meat. He had received a testimonial from a large butcher in Scotland, stating that he considered by this process the meat was improved in respect of appearance and made tender eating. His object at an early stage of the discovery was to get the system introduced extensively in Newgate-market; and finding a large wholesale carcass butcher who was not prejudiced against a new thing, he asked him to give the plan a thorough trial. The experiment was made in the first instance upon kidneys alone for a fortnight, and afterwards upon sweet-breads and joints of lamb. The opinion of the salesman expressed to him was, "I believe your liquor will do all you propose; I will use it, and will allow you to make reference to me." Mr. Graham went on to state that during the hot weather of last summer he went into the market every day. He went there on Wednesday, the 14th of August, when the thermometer rose to 121 degrees in the sun, and great quantities of meat were spoilt by the excessive heat on that day. In the same month a Scotch butcher, who sent for a sample of the solution to experiment with, hesitated to apply it to some carcases of lamb which he was about to send to London, but he tried it upon some joints of lamb he had in his shop, and which he sent up with the carcases. These joints were packed up in hampers with the other meat which had not been touched with the bi-sulphite, and when they arrived in London on Monday morning the

carcases of lamb were all bad, whilst the joints that had been brushed over with the bi-sulphite were perfectly sweet and good, and were readily saleable. He had one of those joints of lamb for dinner on the following Tuesday, and everyone who partook of it pronounced it to be excellent eating lamb. About the same time he paid a visit to a wholesale dealer, whose business consisted entirely in the sale of carcases of veal. On the 14th August, that remarkably hot day, the dealer said to him, "Here are eight sides of veal; do you think your preparation would keep them good till to-morrow?" He replied that was something for a man to undertake with the thermometer at 121 degrees; however, a cloth was procured, and the sides of veal were treated with the solution, and the next morning the meat was as sweet and sound as possible. After that result the salesman in question authorised him to make use of his name as a reference to the efficacy of the treatment in a very critical case. A few days subsequently the same dealer sent a number of calves' heads to Aberdeen. In summer time they could be sent there at a profit, for the purpose of being cured for making mock-turtle soup. Having covered twenty-five heads with the solution, he said he was quite confident they would reach their destination quite sweet; but he had some doubts with regard to the effect it might have upon the scalding of the heads to remove the hair from the skin. He subsequently saw the person in Aberdeen to whom the twenty-five heads were consigned, and he stated that he cured them in the usual manner, and that he noticed no difference in their appearance in any respect, the whole of them having reached him in perfectly good condition. Another curer, who received fifty heads untreated from London about the same time, informed him that the whole were condemned, and were obliged to be buried. On the 12th August last there was an immense quantity of *green* meat in the market. In one instance a gallon of this preparation was sent for and applied to a quantity of necks, shoulders, and legs of mutton, and the joints so treated kept sweet and good, whilst those which were not so treated were obliged to be thrown away the next day. There was, he said, one point of importance in connection with this preparation, viz., that the meat should be sweet at the time the solution was applied, for if decomposition had commenced in the interior of the joint it was impossible for the solution to arrest it. Meat was so precarious an article that he had been told by a venison dealer that on some occasions one haunch would arrive perfectly sweet, while the fellow haunch would be tainted and bad. The difficulty was to get a quantity of meat always in the same condition. With reference to the question put by one of the Committee, as to the length of time after slaughtering at which the solution should be applied, he would state that it did not matter what time elapsed between the killing of the meat and its being treated with the solution so long as the meat was sound at the time the bi-sulphite was applied. He had no doubt the process of injecting the whole carcass was the surest method of preservation. He thought injection would be preferable, especially in hot weather, to meet the requirements of the wholesale dealers.

A conversation took place with respect to the altered appearance that was imparted to the meat by the use of sulphurous acid gas, and Dr. Medlock stated that, in the case of the turkeys and lamb, the legs of the former were, when cooked, of a slightly higher red colour than usual, but the breasts retained their whiteness; the appearance of the lamb he saw was unaltered. When it was not practical to inject the meat in the carcass in the case of meat coming from a long distance, he proposed that the process of soaking in joints should be adopted. It was necessary that the solution should be of the temperature of 100 degrees, or at blood-heat, at the time of injection. The quantity of lime that would be eaten on dining off a joint of meat, either injected with or dipped into the bi-sulphite, would be quite inappreciable, and could not possibly produce any injury to health.

Mr. E. W. Hollond inquired whether this process was not adopted for bringing Canadian partridges to this country.

Dr. Medlock replied that he was not aware of it. The bi-sulphite had not been known in its practical application to these purposes more than two or three years.

The Chairman having thanked Dr. Medlock, Mr. Graham and Mr. Bailey for the information they had given, the committee adjourned.

On Tuesday, the 26th of November, a Sub-Committee met and witnessed experiments with Medlock and Bailey's Preservative Fluid, of which the following is a minute. The experiments took place in a slaughter-house of Mr. John Evans, butcher, 61, Southampton-row, Russell-square, London.

There were present Messrs. James T. Ware, C. S. Read, M.P., P. McClagan, M.P., W. H. Michael, Members of the Food Committee of the Society of Arts; P. Le Neve Foster, Secretary; Messrs. A. B. Northcote, F.C.S., &c., Wentworth L. Scott, F.C.S., F.A.S.L., &c., Dr. C. Pryce, Dr. Henry Medlock, Ph.D., F.C.S., &c., Messrs. Vincent Bailey and J. Graham.

The times of meeting were Tuesday, November 26th, 10.30 a.m., and Wednesday, November 27th, 9 a.m.

The temperature of slaughtering-house on Tuesday, was 46·5, and on Wednesday, 43·0.

The representatives of the Society of Arts Food Committee and of the patentees having met at Mr. Evans's slaughter-house as above stated, the animals (viz., four wether sheep) were killed in the usual manner, by one of Mr. Evans's slaughtermen, assisted by another experienced butcher in the employment of Mr. Nicklinson, salesman, of Newgate-market.

The operations were conducted in the manner set forth in the accompanying table, the flesh, hides, and viscera being throughout subjected to the scrutiny and observation of the gentlemen present.

Two of the sheep were injected by two competent operators from the Middlesex Hospital, under the immediate superintendence of Dr. C. Price, of 46, Mornington-road, Regent's-park. A small quantity of water, at the normal blood temperature, was first injected, in order to cleanse the vessels from any remaining blood; afterwards the bisulphite was used, as set forth in the table.

The other two sheep were simply skinned and hung up, each carcase being distinctively labelled.

The hides of the animals were subsequently bisulphitised on the inner surface only.

At the conclusion of these operations the slaughter-house was locked up, and the key handed to Mr. J. T. Ware, Member of the Food Committee.

On Wednesday, November 27th, at 9 a.m., Mr. Ware, Dr. Medlock, Mr. Vincent Bailey, Mr. Wentworth Scott, and Mr. J. Graham, met at the slaughter-house, when the first-named gentleman unlocked the door, and the whole injected carcase, No. 1, was washed over with the solution A.

The injected carcase, No. 2, was divided in halves, the first half (experiment No. 2) being cut up into joints, dipped in solution A, and hung up.

A similar plan was adopted with the second half (experiment No. 3), except that the joints were closely packed in a cask, which had been previously rinsed out with solution A, an imperial pint of which was added before heading up the same.

The carcase of the third sheep, which heretofore had remained intact, was divided into halves. The first half (experiment No. 4) was cut up into joints, which were soaked for ten minutes in solution A, and then severally hung up. The remainder (experiment No. 5) was hung up, undivided, being first treated in a similar manner.

The fourth sheep was likewise divided in halves, each half being cut up into joints:—Those of the first half (experiment No. 6), having been soaked ten minutes in

No. of Animal.	Time of Coagulation of blood.	Weight of Carcass.	Weight of Hide.	Weight of Offal.	No. of experiment.	Parts of animal operated upon.	MODE OF TREATMENT. November 26th.	MODE OF TREATMENT. November 27th.	In what state left.	OBSERVATIONS.
	Min.	lbs.	lbs.	lbs.						
1	2	77	14	39	1	Whole carcass.	Injected with solution B.	Washed over with solution A.	Hung up.	Eleven pints of the solution B were injected into the aorta. A considerable quantity of the liquid escaped from the vena cava, showing perfect injection.
2	$1\frac{3}{4}$	92	15	47	2	Half carcass, cut up.	Injected with solution C.	Dipped in solution A.	Hung up.	No. 2 sheep similarly injected with solution C.
					3	Half carcass, cut up.	Injected with solution C.	Dipped in solution A.	Packed in cask marked No. 3, with addition of a pint of solution A.	
3	$2\frac{1}{4}$	86	15	45	4	Half carcass, cut up.	Skinned and hung up.	Cut up, and joints soaked 10 min. in solution A 24 hours after slaughter.	Joints.	
					5	Half carcass.	Ditto.	Soaked 10 min. in solution A.	Hung up (half carcass).	
4	$1\frac{3}{4}$	100	15	44	6	Half carcass.	Ditto.	Cut up, and joints soaked 10 min. in solution A 24 hours after slaughter.	Joints packed in cask mark'd No. 6, with addition of a pint of solution A.	NOTE.—The livers and kidneys of the injected sheep were partially blanched, but after hanging up twenty-four hours regained, in a great measure, their natural colour.
					7	Half carcass, except leg and neck.	Ditto.	Steeped $2\frac{1}{2}$ min. in solution A, being first cut up in joints.	Joints packed in cask mark'd No. 7, with addition of a pint of solution A.	
					8	Leg.	...	Wetted all over by means of a cloth saturated in solution A.	Hung up.	
					9	Neck.	...	Hung up in its natural state, untreated in any way	Hung up.	

Note.—Solution A means Medlock and Bailey's patent bisulphite, undiluted. B means solution of ditto—bisulph, 1 quart; water, 1 quart; salt, 2 ozs. C means solution of ditto—bisulph, 1 quart; water, 3 quarts; salt, 4 ozs.

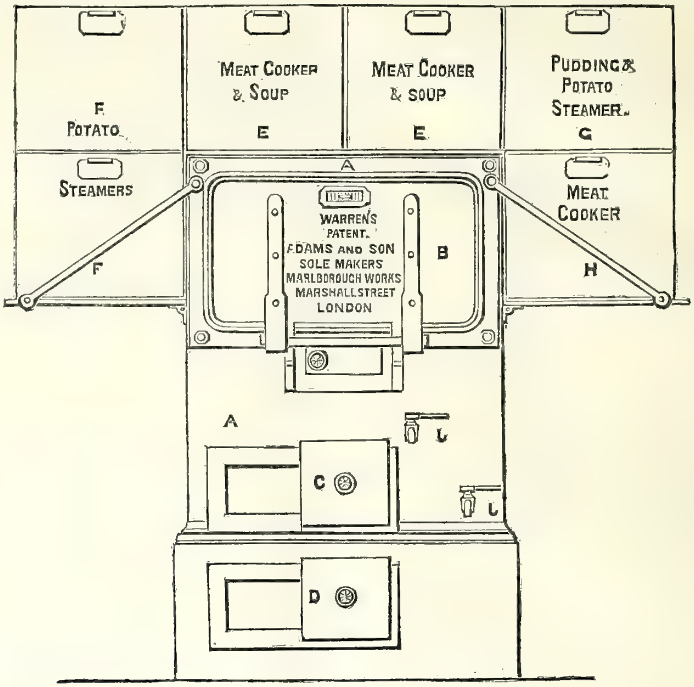
solution A, were packed in a cask in the same manner as experiment No. 3. The joints of the other half (experiment No. 7), with the exception of the leg and neck, were steeped in bisulphite A for $2\frac{1}{2}$ minutes, and put into a cask as before. The leg of mutton (experiment No. 8) was thoroughly wetted all over, by means of a cloth saturated in solution A, the operation being repeated about ten minutes after the first application, and the joint then hung up. The neck of mutton (experiment No. 9) was hung up in its natural state, untreated in any way.

The operations being completed, the whole of the meat specimens were conveyed in a cart to the residence of Mr. Samuel Gurney, M.P., No. 20, Hanover-terrace, Regent's-park, where they were placed in an out-house, kindly lent for their reception, under the superintendence of Mr. J. Graham, the door being locked, and the key left in the charge of Mr. Gurney. The meat was subsequently removed to the Society of Arts, where it now remains.

On Friday, the 29th of November, the members of the Committee attended, by invitation of Captain Warren, at Messrs. Adams, of Marshall-street, Golden-square, to witness a trial of Captain Warren's apparatus for cooking for the army and other large bodies of persons.

The apparatus consists of two parts; first, the stove proper, and, secondly, the hot air and steaming vessels in connection with it. A (p. 56) is the stove, constructed of wrought iron, and containing two boilers, for supplying boiling water for breakfasts, teas, and washing-up purposes, and for furnishing steam to the cooking vessels; these boilers are so constructed that the fire acts directly on the water contained in them, no brick-work whatever being required either in their construction or in the fixing.

The fire, after passing through the boilers (which by their peculiar shape form the flues), is then conducted entirely round a roaster or oven, B, placed over the lower part of the boilers, one of which is continued up behind the back of the oven to the top of the stove. C is the door of the furnace, which is made to slide either to right or left. D is the ash-door, which also regulates the draught into the furnace, the ashpit being partly filled with water—the boilers are supplied with water from behind; the filling-pipes forming also vents, and being furnished with whistles at the top to announce, if necessary, a deficient suuply of water. J J the draw-off cocks. E E are two of the patent cookers, having inner linings; the bottom of the outer cases communicate with the steam-boiler below by means of brass ferrules and cones fitting closely to prevent any escape of steam. The covers of the cookers are made hollow so as to contain the steam which passes up through the case of the cooker, leaving the interior free from steam, so that the meat is cooked by hot air only. Soup is also prepared in these cookers; the meat is placed on a perforated tray above the water or stock, and not in it; and the soup receives the droppings of the meat. Thus the meat loses less in weight than by the ordinary method of boiling, and the soup is improved in quality and flavour. F F is the potato cooker, and is fitted inside with six potato cans or pots, holding 20lbs. each, or in all 120lbs. The potatoes are cooked by steam from the lower boiler (the upper one being reserved for the other cookers), the whole beiug thoroughly done within 45 to 60 minutes, according to the kind of potato. H is a cooker similar to E and E, in which meat is generally cooked without soup; and on testing the weight of the meat cooked in this pot it was found, by weighing it together with the gravy that had run from it, that scarcely any appreciable loss had resulted, a joint weighing 14lbs. not having lost 4oz. G is a steamer for steaming puddings, and is constructed to hold twelve or fourteen meat puddings or dinners for twenty-four men. It can also be used for steaming carrots, parsnips, and other vegetables. The oven B is thoroughly ventilated,



and will roast full rations for twenty-two men, including potatoes browned under the meat. It will also bake bread; 12lbs. to 16lbs. being thoroughly baked in two hours.

When the apparatus is not in use, the cookers and kettles can be taken off, and placed upon a shelf, the side-plates lowered, the stove then occupies a space of 2 feet 2 inches wide, 3 feet 7 inches high, and 1 foot 10 inches deep.

The following is a statement of what was done :—

Army Cooking Apparatus.

Fire lighted . . . . 10·30 a.m.

Fuel used, 1 lb. wood and 18 lb. coals.

Abyssinian Apparatus.

Fire lighted . . . . 11·30 a.m.

Fuel used, 16lbs. wood and 2lbs. camels' dung.

	Weight.		Put in.	Taken out.	Weighed.	
	lb.	oz.			lb.	oz.
Leg of mutton Warrenized (Pat. cooker)	9	11	10·55	2 p.m.	9	6
Do. same sheep (boiled in water)...............	9	13	10·55	,,	7	8
Do. (roasted in oven) .	8	14	11·30	,,	5	12
Bacon (Warrenized)...	4	9	12·15	1·45 p.m.		
Turbot, ditto	5	0	12·30	,,		
Two fowls (boiled) ...	...	...	12·35	,,		
Two do. (Warrenized)	...	...	12·30	,,		
Two ditto (roasted in oven)	...	...	12·50	,,		
Potatoes (steamed) ...	...	...	12·50	,,		
Sprouts & cauliflower	...	...	1·0 p.m.	,,		

The time specified by Captain Warren for dishing-up was 1·30. Everything was ready at that time, but was not dished-up until two o'clock, which will account for the time in cooking, &c.

Cantor Lectures.

"On Art; especially including the History and Theory of Sculpture." By Richard Westmacott, Esq., R.A., F.R.S.

Lecture I.—Friday, December 6.

The lecturer expressed the pleasure it afforded him to accept the invitation of the Council to deliver a few lectures before the members of the Society of Arts. He had had but a short time to consider the subjects he should select, and he had decided to adopt one suggested by the address of the Chairman of the Council, at the opening of the session. It was the want of general education in art; and he (Mr. Westmacott) hoped to show the extreme importance and value to the public of this acquisition. The fallacy of the opinion that any one unacquainted with the true principles of art can be a competent judge of works of art was gradually gaining ground. It was admitted that, to judge of the merits and value of any of the ordinary products of industry, required some education in the particular branch of science or skill to which the object belonged; but in the matter of art every one thought himself capable of forming a correct judgment. It appeared to be the opinion of some that if a picture or statue afforded pleasure to, or satisfied its admirer, and possessed qualities that hit his peculiar liking or fancy, such a work was to him a work of beauty and merit. There could not be a greater mistake. It was a distinct question. It was one of liking—not of merit or beauty. A vulgar, commonplace work of art could not be other than vulgar, however and by whomsoever it might be admired or preferred. But knowledge added to enjoyment. For instance—a musical work might be performed in a mixed company, and nearly all would listen to it with a certain amount of pleasure; but how much greater would be the gratification, and how much higher the enjoyment, to educated musicians, who could not only listen to the melody, but enter into the train of thought, and appreciate the power of combination, evidenced by the com-

poser, in producing a work of character, expression, and beauty. If this were true of music it must be equally true of painting or sculpture—for, what words and rhythm were to the poet, and sounds to the musician, colour and lines were to the painter, and form to the sculptor. To attain to anything like a just appreciation of art required education; and none but true artists (he meant those who really understood the true principles of art), whether professional or amateur, could be considered as trustworthy judges and guides in matters of art; for it was not sufficient that the object should afford pleasure to constitute it beautiful or worthy. This was illustrated by the affection of a mother for her child, which was utterly irrespective of its beauty. No one could look around him and see the multitude of miserable little objects, which were so naturally the objects of affection to their parents, and say that, because they were loved (or, as in art, liked and admired), the poor, afflicted children were therefore beautiful. It was not only the deficiency of art education in this country, but the want of efficient encouragement for the production of high and noble works of art, that was to be regretted. Artists in England did not seem to aspire to anything heroic and noble in their works, as did those of Greece and the great artists of Italy in times past, but they appeared rather to work down to the present low standard of public taste. In England how few works showing really high aspirations were to be met with among the thousands of pictures produced every year. This, doubtless, was in a great measure due to their non-appreciation by the public when produced. In Greece and Italy the reverse was the case. The people had the natural sensibility which made them capable of appreciating the noble, the beautiful, and the heroic in conception; and the artists of those countries were obliged to work up to the standard of public knowledge and public taste; and the result was the great works which happily had been preserved, not only for our instruction and study, but also for the delight of cultivated minds through all ages. The lecturer adverted to a feeling some persons entertained that we had no subjects calculated, like the myths and poetry of the Greeks, to afford opportunities for high and beautiful art. This he denied, and spoke of the splendid sources of inspiration to be found in the Bible, both the Old and New Testaments; grander, he thought, than anything in the mythologies of ancient Greece and Rome; and he hoped that as the public taste improved, these subjects would become more and more studied by the higher class of artists. One advantage to be derived from education in the principles of art would be to enable people to judge for themselves, and to free them from the dictation of self-elected critics—too often very incompetent to act as guides of public taste. They would then not feel bound to believe a thing to be good or bad simply because they had seen it so stated in print; but, having knowledge themselves, they would understand the true principles upon which to judge the works produced. He was glad that the wish to possess such knowledge appeared to be a growing desire on the part of the public, and he hoped to assist those who favoured him with their presence to attain a knowledge of why some of the works of the great masters, particularly in sculpture, were truly beautiful, and worthy of the admiration that had been so universally accorded to them.

Fourth Ordinary Meeting.

Wednesday, December 11th, 1867; William Hawes, Esq., F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Cox, Frederick, 100, Newgate-street, E.C.
Crewe-Read, Commander Offley Malcolm, R.N., Llandinam, Montgomeryshire.
David, Charles W., Cardiff.
Garrett, Richard, Carleton-hall, Saxmundham.
Haysmar, David, Portway-house, Weston, Bath.
Headlam, Alfred, Wavertree, Tunbridge Wells, Kent.
Humbley, Michael, Gwersyllt, Wrexham.
Jay, Captain William Chickhall, 33, Cavendish-sq., W.
Levett, Robert, Packington-hall, Lichfield.
Llewellen, Thomas, M., Newport, Monmouthshire.
Lloyd, John, Huntington-court, Hereford.
Payne, W., 6, Salisbury-court, E.C.
Prideaux, Charles Grevile, Q.C., Brick-ct., Temple, E.C.
Scarborough, Thomas H., 5, Bloomsbury-square, W.C.
Smith, David, Siddal, Halifax, Yorkshire.
Wilson, Charles Thomas, Brynnewydd, Swansea.

The following candidates were balloted for, and duly elected members of the Society:—

Cox, William Sands, F.R.S., Dosthill-house, Wilnecote, near Tamworth.
Flavelle, Henry, 14, St. Stephen's-rd. Westbourne-pk., W.
France, James Robert, 98, Rotherfield-street, N.
Hendriks, Frederick, 30, Palace-gardens-terrace, Kensington, W.
Morris, Augustus, 118, Cannon-street, E.C.
Pagliardini, Tito, Portman-street, W.
Rabbeth, George, Edinburgh-house, 13, Cornwall-road, Paddington, W.
Robert, Dr. C. Russell, Park-house, Hampton-wick.
Tindal, C. G., Marchfield-house, Bracknell, Berks.

The Paper read was—

ON INDUSTRIAL AND SCIENTIFIC EDUCATION; WITH NOTES ON THE SYSTEMS PURSUED, AND THE WORKS PRODUCED, IN CONTINENTAL SCHOOLS, AS EXEMPLIFIED IN THE PARIS EXHIBITION, AND SUGGESTIONS FOR THE ESTABLISHMENT OF TRADE SCHOOLS IN ENGLAND.

By Ellis A. Davidson, Esq.

Lecturer on Natural History, Engineering Drawing, and Architecture, in the City Middle Class Schools; late Head Master of the Government Schools of Science and Art, Chester and Crewe.

Dr. Lyon Playfair, in a most important communication which he recently addressed to Lord Taunton, on the Industrial Arts of Great Britain, as exemplified in the Paris Exhibition, states that "with very few exceptions, a singular accordance of opinion prevailed that our country had shown but little inventiveness, and made but little progress in the peaceful arts of industry since 1862." All who are sensible of Dr. Playfair's comprehensive knowledge of the subject, his warm interest in everything that concerns the intellectual development of our country, and his unswerving truth, must thank him for thus calling public attention to a great national deficiency, and so enabling us at once to devise means which shall prevent our being intellectually lowered in the scale of nations, and which shall bring about a system of education so healthy as to have a practical bearing on the trade, manufactures, and commerce of this country.

The Exhibition of 1851 showed us that in ornamental art, as applied to manufactures, we were behind other nations, and the notion obtained that we were essentially a nation of shopkeepers, a nation devoid of taste; but on investigation, it soon became evident that we were not without taste, but without art education. The Department of Practical Art was established, teachers were trained and spread far and wide over the country, art was made popular; and it will no doubt be admitted that the seeds thus broadly sown have fructified fairly, and that in the comparatively short period that has elapsed great and permanent improvement has been made. But it would now appear that a corresponding progress has

not taken place in the scientific and mechanical branches of industry. Whether this is the result of the utterly unpractical character of most of our schools is a question now requiring solution; and it is with the hope of eliciting opinions, far more important than my own, that I have ventured on these remarks, based upon an attentive study of the systems pursued, and the works produced in some of the schools of the Continent, as shown in the Paris Exhibition of 1867.

Before, however, adverting to the training a workman receives abroad, it may be advisable to glance at the early education and apprenticeship of an English artisan. As a boy, he attends a national or British school, where he *may* be, and in most cases *is*, well taught. Still, the subjects and the standards for examination being fixed by the Council office, the master cannot afford that time should be devoted to other branches; in fact, some find a difficulty in allowing even one hour per week for drawing; neither is the master always qualified to give, nor do the pupils as a rule remain in the school long enough to receive, even the elements of technical education: so that, excepting in the cases of some of the ragged and industrial schools, where gardening, shoemaking, wood-chopping, and perhaps carpentering, are practised, the boys leave school without having received any notions of practical work, or of the sciences on which the mechanical arts are based—thinking of chemistry as a mysterious art, by which the druggist compounds medicine; of a locomotive as a machine which somehow or other draws the train along; and of architecture as the ordinary work of the bricklayer and carpenter.

As a rule, chance, not talent or predisposition, guides the placing of the boy in some occupation by which he is subsequently to gain a livelihood, parents being naturally anxious to send their sons "out" so that their earnings may contribute to their support.

Let us follow the boy, and see him placed in an engineer's or railway works—he is at first a mere sort of errand boy or fag, being, in fact, fit for little else—he is subsequently placed in one of the departments, his instructor being the man under whom he works; but this man has his own work to attend to, and has not time to teach, and even if he had, could only teach the merely manual part, his whole knowledge having been picked up from the man under whom he had worked when an apprentice, and from the men with whom he has since been associated. When the work is finished it has to pass the foreman of the department, who is in many cases uneducated in the scientific principles on which the machines around are constructed, and whose duties certainly leave him no time (even if he were competent) to give instruction to the apprentices or men. The apprentice becomes in time a journeyman—by dint of sobriety and good conduct he may even become a foreman to guide others; and thus we have had what has been called the "rule of thumb," namely, one man learning from the other, carried on from generation to generation.

But let us take the case of a young "gentleman apprentice," who is to be an engineer, and who has had what is termed a "good education" in a private or perhaps in one of our public schools. He has spent many hours in classics, has learnt mechanics and chemistry from books—as he learnt Euclid—and his powers of drawing have been cultivated to the extent of manufacturing "views on the Rhine," "ruined castles," &c. In a few instances he may have drawn a steam-engine from a copy, but of the whole subject of solid geometry and projection, which form the very foundation of mechanical drawing, he is totally ignorant, as, indeed, he is of practical mechanics and the allied studies. Chemistry is scarcely better taught—but of this subject, not being my speciality, I must speak with diffidence, yet, I think, it may be safely asserted that a proper laboratory is as yet a feature in but few of our private or even public schools—and that unless a lad receives his chemistry lessons in the laboratory, and is allowed to work out experiments there, the time spent on book learning is almost wasted.

Happily, these remarks do not apply to all our public schools. The London University, King's College, the Scientific School in the College at Chester, Rugby, and recently, I believe, Harrow (and no doubt some others), form exceptions, which serve the more to show the prevailing deficiency.

The instruction in architecture which our youths, as a rule, receive whilst at school, is of much the same character, the ultimatum being a measured drawing of some complete elevation, without the slightest knowledge of architectural construction. Subsequently, on entering the office of either an architect or civil engineer, he has to attend to various office duties, to make tracings, &c., and to get knowledge in the best way he can, for in the office it is not as a rule any one's especial business to teach him, nor would the draughtsmen and clerks, even if they were qualified, have time for his instruction, so that he, like the young artisan, grows up to repeat only what has been done by others before him—not daring to invent, and, in fact, deficient of the necessary materials for invention.

But it was scarcely possible, in the Paris Exhibition, to represent adequately the progress which architecture has recently made in this country, which, it must be admitted, has been very great. Our architects have nobly followed in the track of human advancement, and availed themselves of the materials at their command. Our architectural requirements are different from those of any previous period. Our museums, our railways, our stations, and our bridges, have all rendered necessary the application of iron, hitherto but sparingly used in building, and our architects and civil engineers have in a short time achieved results which have conferred the greatest benefits on the community.

The Evening Classes for Science, which have been established under the auspices of the Department of Science and Art, are doing a great and useful work in offering to young men sound instruction, by properly certificated teachers. But it is scarcely the purpose of these classes to teach the elementary portions of the various subjects. These should form a part of the work of primary schools for all classes of society, and the science schools should take up the studies at a higher stage; when the pupils, more advanced in years, and with intellect improved by previous training, feeling in their daily avocations the use of the education they have received, and the necessity for extended knowledge, enter into the lessons with earnestness and appreciation; whereas to the adult, totally uninitiated, the necessary ruggedness of the first few steps of the road to learning, however much the tact and power of a clever teacher may enable him to smooth it, is still irksome, causing many to droop by the way, and to discontinue their attendance.

On the continent, under the heads of "Gewerb-Schulen," "Real-Schulen," and "Ecoles Polytechniques," institutions for practical studies have been in operation for many years past, and it is proposed to give in this paper a brief account of some of the results obtained, as exemplified in the Paris Exhibition; and subsequently to offer suggestions as to the promulgation of technical education in this country.

The respective sets of works executed by the pupils in the numerous schools of Germany and France show the great value attached to scientific drawing, and I intend to confine my remarks principally to the various branches of that study, devoting only a brief section of this paper to the consideration of the apparatus used in teaching animal and vegetable physiology. In the schools referred to, the studies are, as their names imply, of a real or practical character. The students learn, not only to make a drawing of a machine, but to prepare the working drawings from which a machine may be constructed; and, in many cases, to make the objects from the drawings. This must tend to show them the importance of accurate measurement and correct delineation. They learn, not only that the drawing must be exact, or it would be useless, but in turning or put-

ting together the various parts, they do so with more readiness from having studied the construction on paper.

The collective exhibition of the Austrian Imperial Ministry of State contained numerous works and models, illustrating the courses of various studies carried on in this group of schools. The models will be referred to further on, and the scientific drawings mentioned here. The leading set of studies shows an excellent mode of combining several elementary manual processes with scientific instruction, thus avoiding a difficulty often experienced when instructing persons whose minds are in advance of their hands—who can "think out" a subject, but who cannot execute it. Many practical teachers will have observed the diffidence with which a student, who has been allowed to continue his geometrical drawing in pencil for a long period, begins to work in ink, and how frequently a drawing, scientifically correct, is spoiled by the tinting, either with the draw-pen or the brush. The system pursued in the Austrian schools seems calculated to overcome the manual difficulties contemporaneously with the elementary scientific instruction. When the geometrical figures have been correctly done in pencil, they are from the first inked, great neatness of line and accuracy of intersection being insisted upon. They are then coloured with flat washes, or sectioned over variously with the draw pen; the inscribed and containing figures being tinted with complementary colours. Where parts of circles cover each other, each circle is coloured with a primary, so that the part overlapped becomes of a secondary colour, &c. This system is thoroughly worked out, and thus, at the same time, the student is learning practical geometry, shading with the pen, the use of the brush, and elementary colouring; so that, by the time he reaches the studies of mechanical or architectural construction, he is able to draw and colour with tolerable correctness.

In these studies, too, the shading is scientifically worked out; all the shadows on the sphere are projected in circles, each circle separately tinted, according to its position, and so accurately, that at but a short distance the separate circles are not observable, but a beautiful rotundity of form is the result.

An excellent collection of scientific drawings was exhibited by the Industrial Union of the Grand Duchy of Hesse (Grossherzoglich Hessischer Gewerb-Verein), being the works of the pupils in schools for workmen of the duchy. These sets of works were the more valuable as it was evident that they had not been specially executed for exhibition, but seemed to have been taken from the daily studies of the pupils. They indicated, as indeed did all the works of the continental schools, an absolute connection between the scientific and artistic studies; and all the science students seem to learn free-hand and ornamental drawing and shading, &c., as well as mechanical drawing.

The whole subject of technical drawing, whilst it has been much neglected in this country, has been thoroughly systematized on the Continent; and the foreign schools possess completely organized sets of examples, combining the study of drawing with that of construction, adapted to the various branches of industry, of which we are very deficient. Thus there was exhibited by Wilhelm Beyerle, executed by the Gewerb-Verein, a work in eight parts, quarto imperial, with folding plates, called "Pattern drawing for artizans, adapted for the various trades;" each part containing numerous plates of working drawings, to scale, of the work of the engineer, builder, tinplate worker, bricklayer and mason, cabinet maker, upholsterer, slater, and staircase builder, in stone, wood, and iron. These plates, which are exceedingly good and are accompanied by complete text, would prove most useful in our science classes. Another set by the same publisher, designed by Hekter Rössler, is called "copies for workmen's schools." It is in seven parts and contains geometrical construction, descriptive geometry, stonework, roofs and joints, stoves and heating apparatus, locksmiths' and cabinet-makers' work.

Still better, because larger and bolder, are the sets of diagrams and examples exhibited by the Royal Commission for parish workmen's schools in Wurtemburg. These are large (royal) lithographs of the most practical character, and all drawn on the scientific principles adapted for almost every branch of construction and ornamental work, with details to a larger scale, and broadly coloured. The work is issued in parts of 48 plates and one sheet of text to each. Works in plaster, metals, and wood, by pupils of forty-four of the parish workmen's schools of Wurtemberg, were exhibited. These consisted of models of machines, buildings, roofs, scientific apparatus, furniture, &c., either to the real size or to a scale, whilst in the art division there were fine drawings from the round, plaster casts of ornament and figure, chased and hammered metal work, carving in wood, &c., all exceedingly good in character, and all showing the results of a sound system of technical education.

From the printed documents it seems that the first step towards the establishment of the series of technical and workmen's schools in Wurtemberg was made in 1818, by the introduction of drawing-classes into Sunday-schools, already established, for youths above fourteen years, who had left the primary schools.

Steps were afterwards taken by the Board of Education for extending the principle, but in 1848, the actual organization of working men's schools, as they are at present, was inaugurated by the then newly created Board of Trade and Industry, which was charged with the care of providing good instruction for youths engaged in trades and workshops. To effect this purpose, a special commission was appointed; but this commission had not the legal power to *order* parishes to establish the schools required, but could only proceed by way of *recommendation* and by treating with such parishes as had shown interest in the subject. They were, however, much aided in their efforts by the circumstance that pecuniary means were liberally granted by the state in the form of subsidies to such schools as had been organized in conformity with the conditions fixed by the commission—the sums granted in this way amounting in general to half the expenditure made by the parishes themselves for the support of the said schools. The conditions chiefly insisted upon by the commission in the organization of the schools were, in the first place, the voluntary principle with respect to the frequenting of the schools; and the demand that fees should be paid by the scholars—a demand which, however small the fee might be, was considered of importance with regard to the well-known fact, that what is paid for is much more appreciated than what is obtained gratuitously.

The principal task of the commission is to take measures that suitable localities are selected, and that all necessary appliances for education, such as good books, models, diagrams, &c., are provided for the schools; to control the appointment of the managing bodies and inspectors, as well as the training up of good teachers of drawing, &c. The commission did not, however, deem it advisable to organize all the schools after a uniform system, but had regard to the various local circumstances and necessities. The 101 schools, numbering about 8,000 scholars, present, therefore, very different phases of development.

The four largest schools in the towns of Heilbronn, Stuttgart, Ulm, and Reutlingen, containing unitedly 2,500 pupils, have Sunday and evening classes offering all the different branches of instruction for mechanics, tradesmen, and young merchants; whilst the drawing-classes may be frequented throughout the day. At Stuttgart and Reutlingen there are also classes for young females who have left the primary schools, and which are attended by 130 scholars.

Thirteen schools established in the towns of Esslingen, Ludwigsburg, Gmund, Hall, Ravensburg, Biberach, Rot-

tenburg, Canstatt, Tübingen, Geislingen, Ellwangen, Calw, and Ebingen, with conjointly 1,600 scholars, have likewise Sunday and evening classes, as well as drawing-classes, open throughout the day, but no mercantile classes. There are, moreover, 60 towns and 12 villages, having together 72 schools, and about 3,500 scholars, with regular classes on Sundays and on the evenings of the week. Of these five schools, numbering together about 250 scholars, have Sunday classes only. Three schools, with about 100 scholars, have Sunday classes combining scientific instruction with drawing; whilst four others, with about 100 scholars, confine themselves entirely to drawing.

In the Swiss department of the Paris Exhibition were several excellent works, illustrating the course of studies in architecture, engineering, and surveying. No novel features were, however, presented, the works being based on, or copied from, the German system; but this serves to prove the efficient and successful working of the Ecole Polytechnique Féderale.

Years of observation, study, and practical teaching, have shown me that, however good the diagrams and examples used may be, no real conception of forms can be obtained without the aid of solid models; for even though the pupils thoroughly understand the diagram, the form there given is only such as would be correct in *one* position; and in projection, it is in some cases almost impossible from that one view to form an idea of what shape may be presented by the smallest rotation, depression, or elevation of the model. In this, projection differs from perspective, the one rendering the object as it *is*, the other as it *appears;* and here the imagination or observation generally offers some assistance; but in projection it is not so; point by point has to be obtained, which, when united by lines, develop forms which to the student are often surprising; and if the subject has only been worked out on the blackboard, and followed line by line by the students, they get the diagram *copied*, but they have not had the lesson which might have been given by the aid of a block or two of wood or a sheet of cardboard. This is very observable in that branch of mechanical drawing called development of surfaces. For instance, let it be required to teach a class of artisans to construct of sheet iron a pipe with two elbow-joints; these students would most likely have been accustomed to cut, file, and alter the separate pieces of piping so as to get the joints at the angles: and it would be difficult to convince them that the flat metal might at once be cut on properly constructed curves, so that the parts, on being rolled into cylindrical form, would fit each other at the required angles without any waste of metal or time. But if a cardboard model has been prepared and exhibited in the course of the lesson, flat, and when the blackboard-construction has been followed, separated into three pieces and then placed in the required form, the interest of the pupils will not only be kept up, but they will be encouraged to think out similar developments adapted to their respective trades. Again, in the development of a cylinder penetrating a square prism, the forms of the aperture in the prism and the projecting portions of the cylinder are so different from what the uninitiated might suppose, that ocular demonstration becomes necessary, and the scientific construction of the curves may save the workman a great amount of time and labour.

The most complete collection of apparatus for teaching the sciences in connection with the mechanical arts was that exhibited by the Polytechnisches Arbeits Institut und Machinenfabrik in Darmstadt, the author of which is Professor Schröder. The first part of the series consists of models for teaching descriptive geometry, penetrations and sections of solids, and developments of surfaces. These models are placed on wooden planes at right angles to each other, thus realising the vertical and horizontal planes of projection—the plans and elevations being drawn under and at the back of the objects. These models are not new to this country; a set of them was exhibited in London some years ago, and they have now been admirably reproduced by Messrs. A. & J. Rigg, of Chester. The great accuracy of their construction, and their number, renders the set necessarily expensive; but it is to be hoped that some aid or encouragement may at no distant time be given for the production of a selection of these models of a larger size, and in a somewhat simplified form, so that they may become more generally known and used. By the kindness of Mr. J. Rigg I am enabled to exhibit some of these models.

The same Institute also exhibited a set of mechanical combinations and models, designed by Professors Redtenbacher and Weisbach; they are made principally of iron, painted and bright, and are of the average height of eighteen inches; amongst them are the various escapements, shafts for the transmission of motion at various angles, turbines, water-wheels, various systems of spur, cog, annular, crown, face, and bevel wheels; plummer blocks, square, and elliptical wheels and cams, the various modes of coupling and disengaging shafts, Watt's parallelogram and a sectional model of part of a steam engine, showing the interior of the cylinder, valves, the action of the governor, &c. All these are actual working models, and would be invaluable in our science classes, as they comprise actual illustrations of most of the diagrams in Goodeve's and Baker's elements of mechanism.

The Trade Association of the Grand Duchy of Hesse Darmstadt (Grossherzoglich Hessischer Gewerb-Verein), exhibited also a series of eight tables or platforms, for teaching orthographic projection, designed for the use of the workmen's schools of the duchy. These realise the idea I have hinted at; being, for the most part, selections from Schröder's set, but much larger, and better adapted for class teaching. Accompanying these models is a set of diagrams, entitled, "Orthographic Drawing Examples for Workmen's Schools," which are calculated to give great assistance to teacher and student.

I have already referred to the exceedingly useful collection exhibited by the Imperial Ministry of State of Austria. I now return to that group, in order to notice a set of cardboard planes, showing the developments of various solids. They are called Stereometriche Tafeln, by Dr. Hillardt. These planes have the development of various geometrical solids drawn on them, and some of the lines being cut half, and others entirely through, each solid can be, as it were, raised out of the flat surface and restored to its original position. I have imitated a few for exhibition this evening. They are all so simple in construction, that any intelligent teacher can make them, and the pupils will always be glad to discover for themselves the developments of other forms. These planes are not quite original, as some of a similar character appeared in a work by Cowley, published in London in 1787.

In the Belgian department, Gaspard de Munter exhibited an extensive set of models for architectural and constructive science; they consisted of 186 models, in white wood, of the scarfs and joints used in carpentry, 13 models of staircases, arches, niches, &c. Nearly all of them may be taken to pieces, to show the mutual connection of the various parts, and are adapted not only for scientific instruction, but also for models for drawing and shading.

In the department of the Exhibition organized under the auspices of the Minister of Public Instruction of France, was exhibited a system of scientific drawing, which will, no doubt, be admitted to be an improvement even on those by Schröder. This system, designed by Frère Victoris, the professor in the Institut des Frères des Ecoles Chrétiennes in Paris, has deservedly received the gold medal of the Exposition. The whole scheme is fully carried out, there being, firstly, text books for the pupil, and others for the teacher, adapted to each of the two years over which the course extends. 2ndly. Large

diagrams, for schools where the class is so numerous that the master cannot spare time to work out the lesson on the black-board. 3rdly. The models, which are still further developed by Frère Victoris, by the addition of a plane at right angles to the other two—this third plane, on which the side or end elevation is projected, moves on hinges; and as the lines are made to work into each other, the paper which covers the planes will, when laid out flat, show how the heights and widths have been obtained from the object. Amongst the models is a niche under a pediment in plaster of Paris, which is cut vertically and horizontally so as to show sections of the niche, cornice, and pedestal, and is a good study for artistic as well as for scientific drawing. The other models comprise several arches and staircases, with movable parts, three large planes with objects, such as capitals of orders, cornices, &c., to be used as studies for the projection of shadows, also numerous roof-timbers, not merely as trusses, but as portions of roofs showing the whole assemblage of timbers. These, if reproduced on a larger scale, would be of the greatest use to our science teachers. The set also comprises columns and entablatures of the orders of architecture made of hard wood; these divide so as to exhibit the entases of the columns and numerous sections of capital, cornice and base, all the parts fitting together in the most exquisite manner. There are also wooden cornices made up of various mouldings, which, being open at the ends, show how the members are made up. The models I have mentioned are but types of the whole system, which is more fully described in the documents before the meeting.

The institution referred to is—firstly, a normal school for training teachers, and has connected with it in various parts of France schools representing 12,000 pupils; secondly, a hospital for decayed members. I had the privilege of visiting the establishment, and Frère Victoris, with the utmost urbanity and liberality, devoted much time to the explanation of the details of the system of teaching, and kindly supplied me with some of the models and text-books which are on the table, together with a report on the whole system.

It is obviously impossible, in the limits of a paper such as this, to describe all the numerous sets of works exhibited by the municipal, communal, and professional schools of France. The exhibits of the professional school of Ivry-sur-Seine, the central school of Lyons, the Paris school of commerce, and the professional school of Vincennes, the municipal school of industrial art at St. Quentin, of the Ecole Speciale de Cluny, of the professional school of Mulhouse, the Ecole Impériale des Arts-et-Métiers at Chalon, and the Ecole Centrale Lyonnaise, &c., can only be cursorily mentioned, in order to show the universality of technical teaching throughout the length and breadth of France. I am, however, prepared with notes of the works exhibited by most of these schools, and which can be referred to when required.

Leaving the geometrical, mechanical, and architectural branches of scientific instruction, I now proceed to give a brief account of some of the collections of models and subjects for teaching animal and vegetable physiology which were shown in the Paris Exhibition; and foremost amongst these rank the "clastic" anatomical models by Dr. Auzoux. The author explains in his catalogue that he derives his term clastic from the Greek word κλάω, to break—as each of his models is composed of several pieces, which can be separated, as in a real dissection, and can be again replaced.

Thus, there is a complete model of the human body, size of life, composed of 130 parts, all of which may be detached, exhibiting upwards of 1,700 objects, comprising the leading features of the muscular, arterial, and nervous, systems—the heart, lungs, viscera, brain, &c. (£120). The eye, greatly enlarged, with part of the orbit, the muscles, vessels, nerves, membranes, vitreous humour, crystalline lens, &c. (£3). A large model for teaching physiology in colleges and other establishments, where general notions only of natural history are required, representing on one side the muscles and vessels of the superficial layer, and on the other the muscles, vessels, and nerves of the inner layer, &c., &c. The price of this model is £40; its size, 5ft. 9in. A horse, size of life, separable into 200 pieces, comprising more than 3,000 minutiæ (£160). The boa constrictor, 7ft. in length, with its complete anatomy (£12). The silkworm, 2ft. 6in. in length, showing the alimentary canal, muscles, nerves, trachea, and the apparatus for the formation of the silk (£10). Bees, magnified to about 3in. in length, showing the four varieties—queen, male, honey, and wax bees—the honey-cells, the development of the larvæ, &c. (£8). Also, a collection of models, exhibiting the principal functions of mammals, birds, reptiles, fishes, mollusca, insecta, and radiata (£40). Dr. Auzoux also exhibited very large models of plants, showing the seed, flower, and fruit, separable into numerous parts, with the most minute portions of vegetable organisation in the various stages of development. The whole collection, the descriptive catalogues of which are on the table, is one of infinite interest, beauty, and instruction; whilst the size of the models is such as to enable a lecturer to show even the smallest organ to a class; but the prices would, it is feared, militate against their general adoption. A number of them might, however, be purchased by a central institution, and circulated amongst science schools, under the system by which pictures, books, &c., are now lent to schools of art by the Science and Art department. It is impossible to understand clearly the action of any machine without a knowledge of its construction, and, as the animal and vegetable structures are far more complex, and contain more minute parts, each having its especial function, physiology cannot be thoroughly taught without taking the pupils through a course of constructive anatomy. The use of these models thus becomes evident, as they are second only to absolute dissection, which is neither practicable nor desirable in classes or schools.

A few more elementary subjects might perhaps be added with advantage to the set, such as longitudinal and cross sections of bones, showing how they are nourished by means of the vessels in the Haversian canals; a joint, showing the mode of lubrication by the synovial burser; sections of the skin with perspiratory glands, exhibiting the ill-effects of allowing the pores to become stopped up.

Another exceedingly useful set of models for teaching botany was exhibited by Mr. Robert Brendel, of Breslau. They consist of buds, flowers, fruit, &c., made of thin metal, coloured to nature, and mounted on stands, and arranged both according to the Linnæan and natural classification. Amongst the models in the first series are plants exemplifying the difference between *Monocotyledons* and *Dicotyledons*, &c. The second series shows the germination and development of various leading families of plants; and in a set which Mr. Brendel mentions as being in preparation, we are promised models of the leading plants used in trade, which will materially aid the lecturer in the important subject of economic botany.

Mr. Fric, naturalist, of Prague, exhibited a series of collections for teaching natural history on an extended scale. Amongst these subjects are animals preserved in spirit, such as the squirrel, mussel, &c., the animal being laid open, so as to show the entire internal construction.

Mr. Fric has also produced a set of 100 models, in plaster, of *Foramenifera* and *Polycystina;* these are all about five or six inches high; which would prove very useful in class-teaching, being absolute realizations of microscopic observation of these minute organisms.

The series also comprises models of *Radiata*, partly cut away, to show their structure:—a collection of 30 corals mounted on stands; a set of 63 specimens of *Actinia*, in coloured glass, mounted and classified, and also numerous collections of fossils and minerals, skeletons, shells, insects, &c. Catalogues of this and Mr. Brendel's collection are on the table.

Of all the polytechnic schools the systems of which I have had under consideration, the Royal Polytechnic School at Hanover seems the most comprehensive in its working, and I therefore select it as a type. The detailed prospectus, with arrangement of hours of study, fees, &c., is on the table; and it is only necessary for me to give a rough outline of the system pursued. The institution is divided into the lower and higher school. The subjects taught in the lower school are mathematics, zoology, and botany, the instruction in both these subjects being arranged with especial reference to the animal and vegetable products used in trade; mineralogy and free-hand and linear drawing. The course in the upper school embraces higher mathematics, descriptive geometry, theoretical and applied mechanics, architecture, theoretical, constructive, and historical, in relation to private and public buildings, bridges, railways, and waterworks; geognosy, geology, practical and technical chemistry and analysis, mechanical technology, including works in metal, wood, weaving, modelling, ornament and figure, and the construction of architectural and mechanical models.

These studies are divided into courses for chemists, land-surveyors and proprietors, civil and mechanical engineers, architects, &c., &c.

From the prospectus of the Polytechnic School it will be seen that special text-books, adapted for each course of study, are used, and this leads me to mention the great scarcity not only of authorised text-books, but of books of questions in relation to the now known laws of physical science. On this subject the Rev. Arthur Rigg, Principal of the Training College and Scientific School at Chester, writes:—"No technical instruction can be valued as it ought to be, unless the laws of the technicality are not only known, but can be readily and confidently applied as we do our own weights and measures. To attempt otherwise seems much like undertaking to calculate 'exchanges' without a knowledge of the relative values of the monies involved, or like selling by weight without the ability to convert one weight into another. Our difficulties in this respect have been immense; indeed, we have been driven to print sheets of questions which serve, as it were, for a technical arithmetic, and which are worked as exercises. In practical engineering and chemistry, text-books and questions are to be met with; these remarks therefore apply more especially to heat and voltaic electricity; others might be named, but these have been most required here."

Mr. Rigg has kindly sent me specimens of the papers, and they are laid on the table.

As before stated, the remarks in this paper must be confined principally to the series of studies comprehended under the head of Scientific Drawing, which study pervades more or less the entire curriculum of technical education on the Continent. All the other branches of study seem, however, to be taught with equal exhaustiveness, and the excellent mechanical works exhibited prove that efficient workshops exist in numerous schools. How the various studies are made each to subserve the other, how the workshops are conducted, and how the laboratories are carried on, will be reserved for future investigation, when the whole question of the establishment of technical schools in England shall be practically considered. And I venture to express the opinion, that before we can benefit by the results of the continental schools, they must be visited, not by diplomatic agents only, but by practical educationists and teachers of the various subjects, so that the systems may be seen in actual operation, and that a plan, adapted to the wants of this country, may be devised by a conference, which I am glad to hear has been organised by the Council of this society, in which the leading professional teachers, engineers, architects, and manufacturers will, I presume, be invited to take part. The inauguration of such a movement as this comes especially within the sphere of the Society of Arts, to which this country already owes so much, and which has for more than a century been actively engaged in the promotion, not only of arts, manufactures, and commerce, but of every scheme tending to the physical, social, and moral well-being of the people, and which, recognising the great fact that education must be the foundation of all progress, has for many years organised examinations throughout the country, thus proving its ability and its desire to carry out any great measure which shall tend to the improvement of the human family.

After careful study of the complete sets of scientific drawings exhibited by the numerous continental schools, and from other data, I have come to the conclusion that the following is the basis of the system pursued; the studies being in some instances divided into two, and in others into three courses. I have thought it best to adopt three, prefacing that each of the heads I give are divisible into numerous branches at the discretion of the teacher, and according to the requirements of the locality.

1st Course:—Practical plane geometry, elementary freehand drawing, flat tinting with pen and brush, elementary colouring, solid geometry, perspective, model drawing, and projection of rectangular objects to a given scale.

2nd Course:—Advanced practical geometry—embracing the higher curves and figures used in machinery and architecture—such as the conic sections, the cycloid, the epicycloid, the helix, conchoid, cissoid, spiral, &c. Orthographic and geometrical projection, penetrations and sections of solids, development of surfaces, and the projection of shadows, advanced perspective, freehand, and model drawing and shading.

3rd Course:—Machine drawing—including the construction of the teeth of wheels, screws, &c., from black-board lessons; rough sketches, and actual measurement to scale and given data; tinting and broad shading. Building construction, practical and historic architecture, ornamental and architectural drawing. Construction of technical working-drawings to scale, adapted for the various branches of industry.

Turning now from continental schools to the consideration of some plan for the promotion of technical and scientific education in England, the necessity of training efficient teachers at once becomes apparent. I venture, therefore, to suggest a plan which will, in my opinion, not only meet this requirement, but which can be brought into action without any delay, and at a comparatively small outlay. There are now in operation about twenty-four training colleges, in which masters for National and British Schools are educated; and these buildings, which are not all, I believe, as fully occupied now as they were formerly, might, with but little reorganization, be converted into centres of industrial, as they are already of general, instruction, viz:—by adding to them good laboratories and workshops, such as have, for many years past, been in operation in the Chester Training College. The laboratory should be under the charge of a thoroughly practical chemist, and the workshops superintended by skilled workmen, who should teach the students to carry out the design, plan, or mechanical construction, the scientific principles of which they have been taught in the class-rooms, and of which they present working drawings made under the superintendence of the drawing professor. Each student in training should, during his first year's residence, pass a certain time in each of the workshops, in order to acquire a general insight into the various practical arts, and might, in his second year, select a speciality. Third year free studentships might be awarded, to allow of higher cultivation, in order to enable the students, on leaving the training college, to carry on, in the national schools of which they may subsequently become masters, a preparatory system of scientific and technical instruction, which would be developed according to the resources at their command. These classes, consisting of the senior boys, would have the effect,—firstly, of inducing the parents to allow their sons to remain longer

at school; secondly, of enabling the boys to obtain such a fundamental and practical knowledge of various branches of industry, that they would, at once, on being apprenticed, be found too useful to be put to drudgery, but would enter on their term with interest, prepared to learn the higher branches of their trade; thirdly, the boys, having been taught to think of work as something higher than mere manual labour, would become elevated mentally and morally, with benefit to themselves and to society at large.

The great difficulty I anticipate is the arrangement of time; and this point is far too scholastic to come within the range of this paper, involving, as it does, the balancing of the relative importance of each study, in order to the curtailment of some, and possibly the entire omission of others. Such discussions would at this moment be premature, and will no doubt be satisfactorily settled when the whole grand principle shall have been agreed upon.

In addition to this proposed increased sphere of action of the training colleges, there might be established in London a central technical college — an absolutely polytechnic school, such as those of Hanover and Darmstadt, &c., to which students should be admitted on payment of fees, graduated according to their position in life, and to which each training college might have presentations for scholarships.

Appended to each college for the preparation of teachers might be a school for youths of a higher class, in which science should be taught theoretically and practically, and that, too, not in the elementary form sometimes called science-teaching, but even to those branches which involve the application of mathematical formulæ; as, for example, the processes of chemistry and its allied sciences, heat, light, electricity, magnetism, &c. Of course engineering, and the sciences in connection with it, necessitate mathematical knowledge, and there are many reasons why this, which gives solidity to the practice of engineering, should not be so much disregarded as it usually is in equally important departments.

At such a school, the pupils would, as a rule, remain much longer than the students previously referred to, consequently their technical instruction might be more fully carried out, whilst the fees paid by them would contribute to the maintenance of the establishment.

Having been for nearly fifteen years associated with a school arranged upon this plan, I venture, with some confidence, to quote it as a type. Connected with the Training College at Chester is a scientific and technical school, which is provided with a large laboratory, supplied with every requirement in the shape of apparatus, chemicals, &c.; and instruction (mathematical, theoretical, and practical) is daily given in it. There is also a mechanism department, in which are many of the various component parts of machinery, arranged so that the shafts, wheels, &c., fit the respective pieces; thus machines may be built up from given data, and motion of one kind changed into motion of another. There are workshops with lathes, forge, &c., in which the boys work whenever their studies permit. Practical instruction is given in trigonometrical land surveying; and the apparatus for instruction in the principles of acoustics, light, heat, magnetism, electricity, is very extensive, and in daily use.

Papers in relation to this school are on the table, and I am quite sure that the principal, the Rev. Arthur Rigg, would give to any one interested in technical education the results of his long experience. Believing that to those present, whatever relates to industrial education would be of interest, I have obtained some printed copies of a letter which appeared in a local paper in 1850, giving a clear insight into the technical character of the instruction in the school I refer to seventeen years ago. The progress of science has now, in some measure, altered what is there described; but whilst the subject on which the teaching power is exerted may, from time to time, change, the spirit and purport of the whole working confirm the views put forth in this paper.

Whatever has been said of the unpractical character of most of our schools for boys, refers equally to those for girls; and when the whole question is taken into consideration, there is no doubt that the plan I have proposed might, in a modified form, be extended to the 21 colleges for the training of schoolmistresses, so that the future teachers of the female children of the working classes might be taught domestic economy, the physiology and chemistry of common life, cooking on scientific principles, general household management, making and mending, together with nursing the sick, and the elements of domestic medicine. In all these subjects the education of most of the young women of our age is very defective, and if it be desired to elevate the men of the future generation, we must efficiently educate those who, as wives and mothers, will exercise over them an influence which it is impossible to over-rate.

I would further propose the establishment of evening technical classes, with which should be connected workshops and laboratories for artisans, adapted to different industries, and supplementary to the science classes. Each of these should be under the superintendence of thoroughly skilled teachers, who should practically demonstrate the principles of construction.

Each artisan should be allowed to work out his own inventions, or try experiments under the guidance of the superintendent, which would, I believe, tend to encourage invention, for it must be remembered that in the present state of things a workman, even if he were to invent any machine, or make any discovery, has neither time nor opportunity at "the shop" to carry out his ideas, and, not possessing laboratory, forge, lathe, or bench, he is prevented working at home.

These national workshops should be aided by Government grants towards the salaries of the superintendents and the purchase of examples.

Associated with these technical classes should be museums—such as the Economic and Sanitary Museum at Twickenham, established and supported by the munificence of a gentleman, long and deservedly well known for his enlightened views and his devotion to the promotion of the well-being of his fellow-creatures—a vice-president of the Society of Arts, Mr. Thomas Twining. To describe this unique museum would occupy more than one complete evening; but a number of copies of the synopsis of the chief classes of the objects illustrated is on the table. To read this synopsis is in itself a lesson —not only on technical education as applied to trade, but to the alleviation of "all the ills that flesh is heir to." This museum has a library of works having reference to the subject.

Mr. Twining, too, has written a series of familiar lectures on the application of science to the requirements of daily life, which Mr. Freeman, the curator of his museum, aided by Mr. Whipple, of the Royal Kew Observatory, is delivering in the neighbourhood of London; and, such is the appreciation of these lectures, that Mr. Freeman informs me that he has engagements to deliver them twice a week until next March, the complete apparatus and diagrams being provided at the expense of Mr. Twining.

The whole of the plan I have thus roughly sketched might, I think, be efficiently carried out by the Committee of Council on Education, by adding to the Department of Science and Art a technical and industrial branch, in the conduct of which men eminent in science, engineering, architecture, chemistry, and manufactures, should be associated as a board. The Department of Science and Art has already accomplished good results in bringing about a healthy system of art education, has promoted the establishment of science classes, and founded one of the finest museums in the world. The already existing machinery could, with but small additions, become competent to inaugurate and supervise

trade-schools, which the comparison of our educational system with those of many continental nations. and the opinion of some of our leading men, declare to be necessary for the welfare and progress of this country.

I have dwelt specially on the subjects of architecture and engineering, but I wish it to be understood that I include *all* practical arts that require technical knowledge, including the entire range of manufactures, and this will perhaps explain why I have said that science and art should be closely combined, so that we may have scientific construction artistically ornamented. The manufacturers of this country have ever been foremost in the march of civilisation and enlightenment, and I am convinced that they will unanimously support any movement tending to the mental elevation of their employés. Thus this great country, universally quoted for its munificence and for its liberality of sentiment, will, by the united efforts of her people, be able to hold her own against the world; and thus also will those who work, whether at the forge or at the bench, at the loom or in the laboratory, be thought of, not only as so many *hands* but as so many *brains*—as beings into whose nostrils an omnipotent Creator has breathed the breath of life; and as He has never said to the sea of human intellect "thus far shalt thou go and no further;" as His light penetrates the pitman's hovel as brightly as the nobleman's mansion, it will be felt to be the duty of the State, and all under its sway, to develope to the utmost the minds of the people, to the glory of His name and the honour of our native land.

DISCUSSION.

Dr. Hyde Clarke said they were much indebted to Mr. Davidson for bringing this subject before them, more particularly as he had a practical acquaintance with teaching in science and training schools; but while the subject was one of great importance, they ought not to exaggerate this on the one hand, or underrate it on the other. Although they had the authority of Dr. Lyon Playfair in this matter, he thought there was a tendency, on the part of professors of education more particularly, to underrate the position of English manufacturers as compared with those of the Continent. With regard to the period at which we began to observe our deficiencies and apply the remedy, he understood Mr. Davidson to look back more particularly te the Exhibition of 1851. He (Dr. Hyde Clarke), however, remembered being on a Committee on this very subject no less than thirty years ago, which was under the auspices of the present Lord Taunton, of which Mr. Ewart and himself, he believed, were almost the only other surviving members. He recollected, at the period he referred to, there was laid before Parliament and before the public precisely the same kind of information as they had had from the author of the paper this evening; and they succeeded on that occasion in obtaining a general promise from the Government that a remedy should be applied. The state of technical education on the Continent at that time was fully ascertained, and our own deficiency in that respect pointed out. That committee succeeded in getting the schools of design put into operation; and fully assured that the rest of technical education would follow in the same course, they gave up the agitation. The result, however, had shown that they were too sanguine, and ought not to have ceased in their efforts. Feeling, as he did, a strong personal interest in the subject, it was a gratification to find that the Council of this Society had proposed to call together a conference to discuss the question, and he trusted they would not cease from agitation till the whole object had been accomplished. Let them profit by the experience of the past, for the moment they ceased to agitate, notwithstanding the promises of any Government, there was danger of the subject sleeping, as on the former occasion he had referred to. He left it to others to determine what the particular mode of action should be. The choice of a man's special trade in most countries was left almost entirely to chance. It was only under unusual circumstances that the trade of a boy was fixed from the moment of his birth by the particular position of his father, therefore practically they had to ascertain what was the sort of instruction they would give him that would be of use to him in future life, whatever employment he might adopt. They had the experience of the excellence of the continental system of education; but there came the practical question—was it the fact that the workmen turned out from the continental schools so absolutely carried the day against us? He was satisfied that was not the case. There were other things besides instruction in chemistry, mechanics, or drawing, which were essential for the manufacturer and for the workman. It had been well said by the author of the paper that the manufacturers of England had never been deficient in intelligence, enterprise, and public spirit; and he was sure, under these circumstances, the difficulty they had to meet was far less than had been on many hands represented; but that could only be adequately met by practical remedies; and we must be cautious not to over-school our people, and not to go to too great expense to establish schools or professorships which might be agreeable to those who held the appointments, but would not result in practical good to the community at large.

Mr. George White said he endorsed a considerable number of the sentiments expressed by the gentleman who had just spoken. During the last thirty years he had had opportunities of seeing what the real state of the education of the workmen of this country was. It seemed to him the paper was devoted rather to the practical details of how teaching should be carried on in these technical subjects, than to what chiefly concerned us at present—namely, the means we should use, and on what priuciples we should use those means, so that technical and industrial instruction might be made more general in the country. He remembered, as far back as 1839, going into a school, and seeing the master teaching the boys from a bunch of turnips; in another school seeing him cut washing-tubs in half to show the section; in a third he had seen the scholars drawing from the chairs and forms, and other matters simple and ready to hand, without an elaborate apparatus. He considered that there was work to be done by these simple means. Some twenty years ago he put himself under the instruction of Butler Williams, who taught under the auspices of the government, and had a very fine series of models, and he put himself through a course somewhat more practical than was taught in the ordinary schools. They were indebted for the introduction of those models and apparatus to Sir James Kay Shuttleworth, to whom also they owed much of the progress of education generally. He thought the system of teaching, and the apparatus employed, could not be too simple. Some years ago he attended a course of lectures by Dr. Reid, but he was probably more taken with the illustrative and experimental apparatus than with the great principles themselves which were taught in the lectures. He had been at a school held in a cellar in Regent-street, in which the lecturer began his address with a blacking-bottle, which appeared to be more successful than spending a great deal of money in fine apparatus and instruments. The author of the paper had hit upon the real difficulty, viz., what portion of the time were they to steal from the ordinary school instruction, when children left school for the most part at twelve years of age? And whether under such circumstances it was possible to teach them science and the arts? Was it possible to do so at this early age? Was not the clay too soft to retain the impression? He dissented from the view that the training colleges should be converted into science schools, not because he did not approve of technical instruction, but he was fearful lest anything should be taken from the instrumentality for general education,

which was at present not sufficient for the country. Another point was the industrial training of the apprentice class of youth. He was in favour of apprentice schools apart from the primary schools. Mr. White then referred to the degradation of Mechanics' Institutes, in most cases, throughout the country, from the objects for which they were originally established into places of mere amusement, and expressed an opinion that the action of the Society might be brought to bear beneficially in endeavouring to bring back those Institutions to the legitimate objects for which they were intended. He was favourable to what might be called technical teaching in such Institutions, and said he was convinced, from his own practical experience, that lectures illustrative of various branches of manufactures would be well attended.

Mr. Thomas Webster, Q.C., agreed very much with many of the observations of the last speaker, because he could not but conceive that the hope of educating the people, by making lectures entertaining and merely recreative, was not a sound principle to go upon. He did not believe that a greater subject, or a more important one, could occupy the attention of this Society than the industrial and scientific education of the people. But what did we mean by that? He thought we meant what was so well expressed in the last paragraph of the paper—that we had to deal with brains rather than with hands—that was to say, we were to afford to those whom Providence had endowed with a capacity beyond the mere exercise of handicraft, the means of exercising their talents to the best advantage; and he believed we should be wrong if we did not limit their education to a very few subjects. We were not now dealing with the education of the masses in the ordinary elements of knowledge, but with a class intended to receive something in the nature of scientific instruction. He thought we were in danger of losing ourselves in too great diffusion. If we were beginning to teach the subject of mathematics, and if we found there were pupils amongst the number who were unable to pass from geometry of two dimensions to geometry of three, or, in other words, solid geometry—if they did not know the difference between a plan and a section—which many did not—we might reject such men as incompetent to advance towards mathematical knowledge. That was one test which appeared to him valuable for dividing men into two classes; but he did not mean to say that a man who could not deal with any particular class of knowledge, such as he had just referred to, would necessarily fail in other branches. There were some who might excel in chemistry, natural science, and physiology, who, nevertheless, had no capacity to deal with geometry of three dimensions. In the matter of education we were in danger of running wild, and trying to teach too much. Though he did not sanction the appropriation of Mechanics' and kindred Institutions to merely recreative purposes, though he would refer with gratification to what Birkbeck and Brougham did forty years ago in regard to popular education — yet, dealing as we did with the education of the people, we should endeavour to lay down what were the elements of education really essential for them. We should not attempt too much, being assured that if we had them well grounded in first principles, they would afterwards diverge into the particular departments of knowledge for which their several tastes and capacities adapted them. He thought the difficulty of the day was that we were in danger of being too diffuse in education, and of attempting too much.

Mr. Hartley remarked that technical education, on the system suggested in the paper, was useful to those who had funds to pay for it; but that which was more important was the education to be afforded to the working-classes. He regarded the apprenticeship system which formerly obtained in this country as the chief means of industrial training of the operative classes; and for the last twenty-five years he had taken advantage of every opportunity afforded him to advocate a return to that system, from a conviction that it was the most beneficial one that could be adopted by the employers of skilled labour, and he hoped the Society would take up the subject.

Mr. Jones thought there was no necessity to resort to legislation on the matter of affording a better practical education to the working-classes, inasmuch as, especially in the City of London, there already existed an organisation adequate to the purpose, if it were properly worked out. There was there an aggregation of chartered companies to take care of the interests of seventy or eighty different trades; and he apprehended it was one of the functions of these guilds to see that the apprentices to the trades were properly grounded in those forms of education which pertained to the business or manufacture in which they were engaged. He considered those functions could be as well exercised at the present time as when the guilds were first called into existence; but their original purpose had been completely lost sight of of late years: and it might be that this defect was not felt until the competition which came upon us from the educated artisans of the Continent, set us thinking what should be done to enable us to hold our position in the race of arts and manufactures throughout the world. In his own company, that of clockmakers, he would state that, so far as the funds admitted, they had done their best to stimulate education in their own branch by giving apprentice prizes for which there had been considerable competition. In this same trade there was also an apprentice school, or Institute, in which technical instruction was given, and it was attended by youths who came as far as from Deptford to spend an hour there after their day's work. He thought in other trades schools for intermediate pupils might be opened, in which competent men, practically engaged in the trade, might bring before the minds of the apprentices as much of the science of their avocation as was necessary for the thorough understanding of the work they were daily engaged in.

Mr. Fazakerley submitted that the progress of this country, in artistic and mechanical skill, as well as in inventiveness, could not be judged of by the results of the recent Paris Exhibition, in which the great proportion of space was monopolised by the French exhibitors. The result of a great deal of practical experience on his part, in teaching in villages, was to show that the plan of education proposed by the author of the paper—while it might be applicable to towns—would not reach the wants of the thinly-populated rural districts.

The Rev. William Rogers said, with regard to what had been said on this subject, it appeared to him to be a question of time. Those who had had experience in schools knew how completely the time was already occupied with necessary subjects. It was, as Mr. Lowe had recently called it, a "ponderation" system. What were the most useful subjects for the children to learn in the time at their disposal. He agreed with Mr. Davidson, that if we introduced a system of technical teaching, which, while it exercised the brains, might, at the same time, exercise the hands, children would be more interested in these subjects of a practical nature than they were in the dry details of English history, for instance, as usually taught in the primary schools, always commencing with those traditionary individuals "the Picts and Scots," in which the children could not be supposed to take very great interest. He thought it was a matter which this Society might take up, to suggest what would be the most interesting subjects of a practical nature to be taught in the primary schools in the event of the plan now brought forward being to any extent adopted. He thought they could not look for any very great amount of co-operation in this movement from the guilds or City companies of London as at present constituted.

Mr. Atkins regarded this subject as one of the most vital of the age, so much so, that some years ago he expended a large sum of money in endeavouring to estab-

lish a system for the more extended application of industrial education throughout the country. He was quite convinced, that in mechanical engineering and other branches of manufacture, the education of the artizan must be very different in the next ten years to what it had been in the last. He believed England had now arrived at a position in which the establishment of an extended system of industrial and scientific education, would form an excellent investment for capital.

The Chairman said that before asking the meeting to thank Mr. Davidson for his valuable paper, he would make one or two remarks upon it. The first paragraph, which seemed to be the text of the whole paper, alluded to a statement of Dr. Lyon Playfair, that "with very few exceptions, a singular accordance of opinion prevailed that our country had shown but little inventiveness, and made but little progress in the peaceful arts of industry, since 1862." He begged to say he entirely took exception to the tone and meaning of that paragraph. In the first place he did not admit it was in the power of any man to say that a country like England did not take its proper place in inventive arts and in manufactures, judging merely from its progress in five years, especially when that judgment was formed upon an exhibition in a foreign country at which it was notorious that many of the most eminent of our manufacturers in various branches had not exhibited. Whether our manufacturers were right or wrong in not exhibiting, it was not for him to say. They looked to their own interests and objects; but when a gentleman in Dr. Lyon Playfair's position, writing with the authority of an official person, declared this country had shown little or no progress, he thought it was casting an unfair stigma on the inventive genius and talent of this country. Dr. Playfair hardly ventured to say that we had not made a rapid stride since 1851, because in the interval between 1851 and 1862 we astonished foreigners—the French in particular—by the progress we made, not only in our manufactures, but in our artistic taste. So great was that advance, that the French Government appointed a commission to visit this country to inquire into the means by which that progress had been attained. Therefore Dr. Playfair limited his observation to a period so short, that it was hardly possible to form a correct judgment one way or the other. Let them look at the facts. His friend, Dr. Hyde Clarke, had said that there was a tendency in the present day to exaggeration on this subject. We were treating the matter as though every workman must necessarily be educated in every branch of science, but we overlooked the fact that the large manufactories of this country were, for the most part, under the immediate superintendence of men of high scientific attainments in their respective branches, who directed those under them, and he thought the effect of that superintendence of the master mind was more beneficial to the advancement of those industries than if each of the workmen themselves had dabbled a little in the sciences bearing upon the manufacture in which they were engaged. He did not undervalue the importance of giving the most intelligent of the workmen a practical or technical education; but to suppose we could teach boys in Government workshops, supported by government grants, and superintended by government officers—to suppose that in such shops we should instil into boys that ability for hard work which they could only acquire as apprentices, was, he thought, a fallacy. To make good workmen, they must do it step by step in the workshop, and we must not look to government funds for the purpose. He thought that one distinction between the English workman and his brethren on the Continent was that the foreign workman was always seeking for pleasure rather than work, whereas the English artisan took pride and pleasure in his work. Reference had been made by one speaker to his connection with one of the great guilds of the City of London. He (the Chairman) belonged to a company which had large educational funds, and up to this time he confessed they had not been so efficiently administered as he could have desired; but he hoped the time was coming when this state of things would be changed. The corporation he referred to were endeavouring to establish a school on a scale commensurate to the funds they had in hand, in which he hoped there would be introduced, in addition to the ordinary branches of education, a certain amount of technical instruction. With regard to the opportunity afforded to workmen to obtain a knowledge of the state of their particular trades on the Continent, the Society of Arts, as they were aware, had sent a number of workmen to Paris, to report upon the Exhibition, and their reports were now in the press. So successful had this movement been, that the council proposed in future years to send workmen to other seats of industry abroad, so as to bring them into contact with foreign workmen, to give them additional opportunities to ascertain in what particular points they excelled. Moreover, he believed this would conduce more than anything else to show to the more intelligent of the working classes that trades' unions, as a means of raising wages and coercing employers, would ultimately tend to their ruin by driving the trade away from the country. If free-labour could now be thoroughly established, he believed that, notwithstanding all the temporary disadvantages of the want of schools of art and industry, English perseverance would overcome all difficulties which stood in their way. The alleged more rapid advances of foreign manufacturers arose from their having started from a lower standard, and from their having the best English works to copy. Still he was prepared to maintain that in the manufacture of machinery, England still stood pre-eminent. Our work was still superior, and was done with a finer finish and much greater accuracy; and though the foreign work might perhaps be good enough for present purposes, there was no doubt which machine would be the best after ten years' wear. He did not, however, in these remarks, mean in any degree to depreciate the importance of technical education, but merely to point out that the despairing tone taken by some writers and speakers, as to the decadence of some of our manufacturing industries, was really not warranted by facts. If England was still to maintain her position, she must not neglect to give her artisans the same facilities for acquiring knowledge and improving their taste that were enjoyed by their foreign brethren. He was sure the meeting would accord its best thanks to Mr. Davidson for the very interesting paper he had read.

The vote of thanks having been passed,

Mr. Davidson, in acknowledging the compliment, said he was very much relieved in his task of replying to the observations made, by the circumstance that so few of the arguments brought forward had been absolutely directed to the question of technical schools, for he regarded mechanics' and literary institutions as beside the question. He would, therefore, in the first place, address himself to the observations which had just fallen from the chairman, which he regarded as the most important that had been made that evening. They were directed more against Dr. Lyon Playfair than against himself, and he was not there as that gentleman's advocate, nor to back up all he had said; but he thought they would admit we were not doing all we should in regard to technical education in this country. Any other text would have suited his purpose equally well, such as — "What is the best way of promoting elementary technical education in this country?" and he might then have escaped the criticism of the chairman. But when we found that large numbers of locomotives were sent to this country from Belgium, and that so many of the large engineering works in this country were glad to get workmen from Hanover, Carlsruhe, and other places in Germany, he said it was manifestly wrong that foreigners should

take away the work which the English population ought to do. The chairman seemed to misunderstand what he had said about workshops. He never said that Government workshops should be provided for boys, but that they should be open to workmen in order to afford them facilities for carrying out any new idea they conceived, and which they had no means of doing, from the want of proper appliances at their own homes. One gentleman had remarked that the City companies had ceased to be educating bodies. He (Mr. Davidson) would be glad to know upon whom it was to devolve to convert those corporations to their original purposes. He thought we should rather look to a public movement on this subject, considering that the guilds were never intended to educate the members of the trades, but rather to promote the interests of the trades. Some of them, however, did not entirely neglect the question of education. There was a school belonging to the Haberdashers' Company (with which he believed the chairman was connected); and though for fifteen years he had been in the habit of teaching in and visiting schools, he never in his experience met with one where there was a better system of instruction. The school he alluded to was the Aldersey Grammar School, at Bunbury. With regard to what had fallen from Mr. White, he thought that gentleman was fortunate in meeting with good teachers, who could instruct a class with imperfect appliances. It was said that a good workman could work with indifferent tools, but he would work better with good tools; and he thought that adage applied to proper educational appliances being provided, as great aids to practical education. They were not dealing with a measure for the City of London alone, but they were addressing themselves to the wants of a whole nation—to our vast Indian empire, and our colonial possessions. Nearly the whole world was looking to England in these matters, and it was our duty, not to follow Germany or France, but to take our own educational standard; and we should strive to be as much quoted for our educational as we were for our monetary and commercial position.

Mr. George Wallis writes:—As I rose at so late a period of the discussion on Mr. Davidson's very suggestive paper, and was unwilling to delay the chairman in his admirable closing remarks, perhaps I may be permitted to allude to a few points bearing upon the subject of technical education as applied to manufactures, as the subject is rather an old one with myself. Like all new ideas or inventions, this question has its three stages:—1. It cannot be done. 2. If it can be done, *cui bono*? 3. There is "something in it:" And 4. Nobody ever doubted that it was the "right sort of thing" to do. We have at last arrived at the "something in it" stage, and the question immediately at issue is "what to do?" I have no doubt that in 1847, after five years' experience of the Spitalfields and Manchester schools of design, as head-master, I should have been equally confident in a system of education such as Mr. Davidson has sketched out as he is now; but twenty years' subsequent experience in Birmingham and London, and rather exceptional opportunities of judging of the value of mere systems, has led me to look rather to the special circumstances of individual cases or nations. It must never be forgotten that the English manufacturing system was established long before any attempt was made to bring special education to bear upon it by the establishment of Schools of Design, or Schools of Art, as they are now more properly called; whilst, on the Continent, the special teaching applicable to industry grew up side by side with it. The silk trade of Lyons grew up and flourished so as practically to defy all competition, because its great technical school was established and grew with it, and each acted and reacted upon the other over a period of some 150 years. Again, the bronze trade of France, which has developed so enormously since 1844, at which period I visited nearly every bronze foundry then existing in Paris, has rather grown out of the art schools of that city than from those latter being engrafted upon a manufacture already established, with its traditions, rules of thumb, and the noted ignorance of unscientific and inartistic foremen and managers. When the Germans took up this question of developing manufactures after the great war (about 1818), they had the advantage of being able to engraft on their systems of national education those polytechnic schools which have done so much for the subsequently developed industries; and their systems of manufacture grew rather out of their system of education than, as with us, where our system of education, such as it is, has always been hampered by our industrial operations. I know it is always as disagreeable, as it is contrary to "true British" taste, to quote the United States in these matters; but the only conclusion at which my friend Mr. Whitworth and myself could arrive in 1853, after examining the machine shops, and manufactories in that country, and reporting to Parliament thereon, was, that the education of the artisan being carried so much beyond the point of "the Picts and Scots,"—so graphically quoted by the Rev. Mr. Rogers—as well as in other directions, the growth of intellectual managers and foremen became a matter of course, for these men brought their elementary knowledge of science to bear upon their trades, developing and increasing their knowledge by its practical application in the ingenious inventions and improved technicalities of their respective industries. Now, all this is not said in opposition to direct technical instruction in schools or colleges; on the contrary, no one desires to see this matter gone into earnestly and intelligently more than myself; but I desire to see the question considered from an English stand-point, and the facts borne in mind that we have to supplement our industrial with scientific and technical training, and not begin *de novo*. The question still remains to be settled how far our manufacturers will avail themselves of the services of well-trained youths when they are trained. In a former discussion (in 1856) on an analogous subject, I quoted instances of the opposition of managers and foremen—even manufacturers, to the proper employment and encouragement of students from our Schools of Art. I have seen no reason to think that matters are greatly changed, especially in regard to science. Doubtlessly this must and will be overcome; but let us look the real difficulty in the face. I had intended to have illustrated to the audience last night, had time permitted, the action of a certain "Ecole des Tissues" near a frontier German city, in which youths and young men from all nations, and even English, are to be found learning the technicalities of weaving; as also how our German friends utilise certain manufactories at Manchester as technical schools for these young men; whilst no English youth, except those employed on the premises, ever avails himself of them; but this must be now reserved for another opportunity. As regards the late Exhibition at Paris, I am not disposed to take an alarmist view of the matter, though agreeing in the main with my old friend, Dr. Lyon Playfair, while industries, pursued successfully in Great Britain, were practically unrepresented, or so miserably illustrated as to be more vexatious than anything else. This arose partly from want of space, but chiefly, I fear, from apathy, or lack of public spirit on the part of our manufacturers. Many important intending exhibitors withdrew from the inadequacy of the space allotted to them. They could afford to be unrepresented rather than misrepresented. The great lesson to us, as derived from this Exhibition, is the enormous progress made by our continental neighbours, and their advance towards ourselves in things in which we have hitherto been supreme. The problem to be solved is, how to keep the foremost position in the race of improvement in all honourable rivalry? If this leads us to revise our system of primary education, and establish a sound system of scientific and

artistic training, it will have been proved to be a great national boon. To stand still, or move slowly, is to be left behind.

INDUSTRIAL EDUCATION OF FOREIGN AND ENGLISH WORKMEN.

The following speech was delivered by Samuel Smiles, Esq., C.E., at the annual soirée of the Huddersfield Mechanics' Institute, held on October 31st, 1867; the Earl de Grey and Ripon in the chair:—

My Lord, Ladies, and Gentlemen,—The subject on which I propose to offer a few observations is that of technical education, and its application to the arts and manufactures. It is a very large and important subject. Great masses of our population, especially in these northern districts—which are the hives of manufacturing industry—depend for daily bread upon their employment in the arts and manufactures; and if it should turn out that their instruction as workmen, as foremen, or as masters is technically inferior to that of other nations, the consequences must eventually prove of a very serious character indeed. But is it the case that we have any reason to fear the competition of rival manufacturers in the markets of the world? Is it really so, that we, who have effected the most important mechanical inventions of the past century—who have given to the world the steam-engine, the locomotive, the spinning-jenny, the power-loom, the self-acting mule, the planing-machine, the steam-hammer, and a multitude of machines and tools calculated to facilitate production and expedite labour—is it possible that we can have any real grounds for fear from continental or other rivals? There can be no doubt that the impression is growing—rapidly growing—that this is really the case. It must, of course, be acknowledged that we possess the very best practical schools for workmen in our excellent workshops and manufactories. That is unquestionably an immense advantage. But although no technical education, however complete, will enable the artisan to dispense with the education of the workshop, without which no practical art can be thoroughly learnt—just as no amount of theoretical instruction in the art of riding will teach a man to ride so well as the back of a horse—yet it is every year becoming more clear that it is not only in the school of practice, but also in the school of science, that the advanced workmen must be trained. It is believed by those who have given the matter their careful attention, and are in the best position to form an unbiassed opinion upon it, that unless we make haste to educate our population at least up to the continental standard, our position as a manufacturing nation must before long become very seriously imperilled. Do not suppose that I am conjuring up an imaginary danger. I ask you to look the facts fairly in the face, and see how we now actually stand. Recollect that all the great inventions which I have cursorily mentioned—the steam-engine and its modifications—all our tools and machines—are now common to the world. Though mostly of English origin, they have become the property of the human race, and they are in use in nearly all civilised countries. For a long course of years past, during the last century at least, we have enjoyed certain special and local advantages. We were separated from Europe by many miles of deep sea, and enjoyed the blessings of peace within our borders, while most of the continental nations were worrying each other and ruining each other by war. We have had abundance of coal, iron, and hard-working men; and we have had the advantage of the first use of the great inventions of the last century, which gave us a start in the race that we have kept till now. But it must be confessed that those special and local advantages which we have heretofore enjoyed have in a great measure ceased. Other countries have enjoyed the benefits of a long peace. Belgium, France, and Germany, like us, possess coal, iron, and hard-working men. They, too, make use of all our tools, engines, and machines, which they are constantly improving upon; and it is tolerably clear that unless we bring up our industry by dint of speed, superior skill, and superior science, our advantages will in a great measure cease. England having adopted free trade, and thrown her ports open to the world, has at the same time thrown her various branches of industry open to the competition of the world; and if the manufacturers of Belgium, France, and Germany can make cheaper machines, or cloth of silk, woollen, or other fabrics, they may compete with us in all foreign markets, and undersell us even in our own. Under the system we have adopted, they are as free to do so as are the corn-growers and cattle-breeders of Russia, Holstein, the United States, and other countries, to undersell our farmers in Smithfield and Mark-lane. Free trade has thrown our markets open to the world. Foreigners have seen with envy, and very properly do their best to rival, the manufacturing prosperity of England.

All the States I have mentioned have founded what are called trade schools, in which the principles of mechanics, chemistry, and physics—the nature and qualities of raw materials, and the *rationale* of the processes by which they are converted into manufactured articles—are carefully taught by thoroughly qualified teachers. Such schools also exist in Switzerland, Austria, and the states of South Germany. Fifteen years ago, as I find from a report on the subject published by our own Government, the trade schools of the comparatively small kingdom of Bavaria were 26 in number, with 221 teachers and 11,579 pupils. I hold in my hand prospectuses of the technical schools of Mulheim, Crefeld, and Elberfeld, on the Rhine, three towns very similar in character to Huddersfield, from which it would appear that the instruction given in them is of the most complete character. I will leave the prospectuses with your secretary, and I shall be glad if some member of the German class, if you have one, will translate them for the benefit of the members. The French have also, of late years, paid great attention to the industrial education of their artisans. They have established technical schools of all kinds with that object. At Paris, there is the school of the Conservatoire des Arts et Metiers for the free education of skilled artisans, and the Central School of Arts and Manufactures for higher class pupils. I find it stated in a letter of Dr. Lyon Playfair to the chairman of the Schools Enquiry Commission, of which Mr. Baines is a member, that when M. Dumas, the French Senator and *savant*, in going through the Paris Exhibition, came to anything excellent in French manufacture, his invariable question was—"Was the manager of this establishment a pupil of the School of Arts and Manufactures?" and in the great majority of cases he received a reply in the affirmative. At Lyons, the School of St. Pierre gives first-class instruction, gratuitously, to about 200 students. One of the branches taught is the application of art to the silk manufacture, and the instruction of the students in the method of transferring the productions of the artist to the loom of the weaver. This school is constantly sending forth a number of young men highly educated in all the arts applicable to the silk manufacture, as regards the preparation of the raw material, dyeing, and designing of patterns. And by this means Lyons is enabled to keep the lead of the world in this branch of production, the only town running it close being Crefeld, where there is a similar school. The municipality of Lyons gives 20,000 and the Government of France 20,000 francs annually for the maintenance of this institution. Roubaix, in the North of France, which comes closely into competition with Bradford, besides educating the whole children of the commune gratuitously in common day schools, has efficient technical schools for the advanced instruction of the workmen. I saw, the other day, a great pile of goods from Roubaix, in the warehouse of a gentleman in the City of London, who had, until recently, a factory for the making such goods at Glasgow, which he has now

closed. At the Chalons-sur-Marne Public School of Art and trades, 450 pupils are maintained at the expense of the Government, besides those who pay for their instruction. Let me tell you that the masters there, the employers of labour, are as anxious for instruction as the working men themselves. While the working class organizations of this country are enacting regulations far the limitation of skill—so that the standard of work shall be not that of the best, but of the most ordinary workman—the foreigners are stimulating the skill of their workmen, rewarding those who excel in it, and in all ways actively promoting the industrial education of their people. Now these are serious facts, and it is right that we should look them fairly in the face. Is it not full time that we took a lesson from them? for if we are to maintain our position, we, too, must educate our working men, who for energy, industry, and natural capability are unequalled in the world.

So long ago as the year 1851, Mr. Moseley, one of our Government Education Inspectors, made this remark in his report:—"There is good reason to believe that unless measures be taken for the better instruction of the workmen in England, our neighbours will gain that advantage over us in the scientific character of their machines, which they have confessedly done, by means of their drawing schools, in the arts of design." Fifteen years ago, principally through the instrumentality of Prince Albert, schools of design were established, and have worked most satisfactorily in all the large towns. The results have been admirable, yet we are not supposed to be an artistic people. The French even say that our English ladies do not know how to put on a shawl. Yet these schools have shown, and our works of art show, that we have in us the germs of art; and that art as applied to manufactures, has rapidly improved in England of late years, was distinctly admitted by M. Chevalier, in his report on the English Exhibition of 1862. Dr. Lyon Playfair, shortly after the Exhibition of 1851, expressed the same alarm as Mr. Moseley did, lest England should be falling behind in consequence of the want of efficient instruction of our workmen. He pointed out that the special advantages which England possesses as a manufacturing nation have, in a great measure, ceased; that the facilities which now exist in the means of communication between countries have placed most European nations nearly on a level as regards the supply of the raw materials of manufacture; that competition in industry is year by year becoming more and more a competition of intellect; and that the nation which most quickly promotes the intellectual development of its artisans must, by an inevitable law of nature, advance, while the country which neglects its industrial education must, by the same law, inevitably recede.

Since the opening of the present Paris Exhibition, Dr. Playfair, who was one of the jurors, has reiterated his opinion in a letter to Lord Taunton, chairman of the Schools Enquiry Commission, until recently sitting in London; and he alleged that from all that he saw and heard at Paris, he was convinced that the foreign manufacturers were making much more rapid progress than we were, and that the chief cause lay in our neglect of industrial education, to which the foreigners were paying such constant and sedulous attention. A copy of Dr. Playfair's letter was sent by the Commission to a number of the more eminent English jurors, for their opinion upon it, and their replies have been published. Those opinions are of a very startling character, and calculated, if anything can do so, to rouse us from the state of placid content into which we have fallen as to our unapproachable superiority as a manufacturing nation. I will quote a very few of them. Professor Tyndall acknowledges that "the facilities for scientific education are far greater on the Continent than in England, and where such differences exist, England is sure to fall behind as regards those industries into which the scientific element enters. In fact," says he, "I have long entertained the opinion that in virtue of the better education provided by continental nations, England must one day—and that no distant one—find herself outstripped by those nations, both in the arts of peace and war. As sure as knowledge is power, this must be the result." Then, the late excellent president of your institution, Mr. Huth, speaking on a subject with which no one can be more practically conversant, expresses his "fear that the enormous strides that have of late years been made by our continental rivals in France, Belgium, Prussia, and Austria, will daily make it more difficult for our woollen manufacturers to hold, not only their former prominent position, but even in many cases to maintain their present one;" and he adds—"From all I could see and learn, I found both masters and foremen of other countries much more scientifically educated than our own. This, however, is not all. The workmen themselves of other countries have a far superior education to ours, many of whom have none whatever." As regards mechanical engineering, in which England has heretofore reigned supreme, Mr. Fowler, the president of the Institute of Civil Engineers, concurs with Dr. Playfair in the opinion that "foreign nations have made greater manufacturing progress than England since the Exhibition of 1851;" but Mr. MacConnell, the eminent locomotive engineer, goes much further. Speaking of the foreign locomotives which he saw at the Paris Exhibition, he says:—"I am firmly convinced that our former superiority, either in material or workmanship, no longer exists; in fact, there are engines shown there, made in France and Germany, equal to those of the best English makers;" and he adds, "it requires no skill to predict that, unless we adopt a system of technical education for our workmen in this country, we shall soon not even hold our own in cheapness of cost as well as in excellence of quality of our mechanical productions." That Mr. MacConnell was fully justified in making this statement, is proved by the fact that since his letter was sent in, the Schneider firm at Creuzot, in France, have obtained a contract from Russia for 80 locomotives, which before would most probably have come to England.

A few words about this great Creuzot manufactory. It employs no less than 9,950 workpeople. The blast furnaces produce 130,000 tons of pig iron yearly, and the forges produce 110,000 tons of wrought iron, which is worked up into engines—locomotive, marine, and fixed—as well as machines of various kinds. The workshops of construction alone turn out engines and machinery of the annual value of about £560,000. Indeed, Creuzot is one of the largest manufactories in France. I do not know whether that of Krupp, at Essen, be larger: that, also, is a gigantic manufactory, employing many thousand workpeople. But another important feature of Creuzot, is the complete system of instruction provided for the workpeople in the technical schools of the place. At the Paris Exhibition there was an entire building occupied by the engines and machines of the establishment, together with models and drawings showing the arrangements of the schools as well as the proficiency and progress of the pupils. And it is clearly shown that those pupils who most successfully availed themseles of the instruction provided for them, are those who take the highest moral and social position, and rise to the highest ranks as workmen, foremen, clerks, superintendents, and engineers. But this, of course, was only what was to have been expected.

Another circumstance is worthy of being mentioned in passing. The foreign workpeople seem to get more good out of their wages than ours do. Being well educated, they are able to live more comfortably and more intelligently than if they had received a narrow education. The effect of improved culture is not only to render artizans more skilled as workmen, but to raise them in the social scale and to elevate them in the dignity of thinking beings. That the workmen of Creuzot are well conditioned and provident, is proved by the circumstance that of the persons employed there, 540 had

£97,469 deposited in the works' bank in 1866, while 1,230 possessed fixed property in dwellings and land worth the annual value of about £28,000, besides their wages. There is a passage I would like to read to you from the letter addressed by Mr. Mundella, of Nottingham, to Lord Taunton, which is very instructive on this point. He is a very large hosiery manufacturer, employing about 5,000 workpeople, with establishments at Nottingham, Derby, and Loughborough, as well as Chemnitz and Pausen, in Saxony. He says—"The contrast betwixt the workpeople of England and Saxony, engaged in the same industry, is most humiliating. I have had statistics taken of various workshops and rooms in factories in this district (Nottingham), and the frightful ignorance they reveal is disheartening and appalling. I was born and educated amongst the working classes, and all my life have been in close association with them, but I have never realised the condition of the lower masses of our workpeople till I took the pains to examine them personally in the manner I have indicated. In Saxony, our manager, an Englishman of superior intelligence, and greatly interested in education, during a residence of seven years, has never yet met with a workman who cannot read and write. And this not in the limited and imperfect manner in which the majority of English artisans are said to read and write, but with a freedom and familiarity that enable them to enjoy reading, and to conduct their correspondence in a creditable and often superior style. Some of the sons of our poorest workmen in Saxony are receiving a technical education at the Polytechnic schools such as the sons of our manufacturers cannot hope to obtain." Permit me also to quote one more passage from the letter of Mr. Huth to Lord Taunton, where I think he hits the nail on the very head. He says—"Of what use is an industrial scientific education to our working population if they have not had a good elementary education to begin with? . . . . . Let this national elementary education once be established throughout the country and you have a fine nucleus for scientific industrial schools, in nearly all our manufacturing towns at least, in our Mechanics' Institutions, wherever such Institutions are properly conducted." If you will allow me to make an observation on your Institution—which is one of the best and most efficient of its kind—not with a view to disparage your labour, but with the object, if possible, of elevating you into a higher path of work, it would be this—you are at present occupied for the most part in imparting the elementary education which ought to have been given at school. The true work of Mechanics' Institutes is something higher than teaching reading, writing, and arithmetic. I hope the day will come when they will not be merely elementary schools to teach grown-up persons what they ought to have been taught in youth, but scientific institutions giving scientific instruction to the higher class of workmen throughout the country. There is, perhaps, no nation in the world that can show so many brilliant instances as ours does of men sprung from the ranks of the working class, who, in the face of difficulties apparently insurmountable, have raised themselves to the highest positions as inventors, discoverers, and leaders of industry. But it must be acknowledged that these are exceptional cases. Such men as Arkwright, Brindley, and Stephenson, did not possess such advantages as every member of this Institution possesses in your excellent classes and library. They went groping after knowledge, as it were, in the dark, often stumbling, but rising again, and conquered success only by dint of valorous self-help, unfaltering industry, and indomitable pluck. But with the great mass of the people, who stand outside the domain of knowledge, the case is very different indeed. They must be helped to help themselves; and this can only effectually be done after a well-devised plan and system, which it is the business of society, acting through its organised instrument—the Government—to arrange and settle. And I cannot but regard it as a bounden duty on the part of society that it should actively endeavour to remove, so far as it can, the obstacles which stand in the way of social elevation, and in fact the civilisation, of the poorer classes of society—of which one of the greatest unquestionably is their want of efficient culture in youth. That the poor boy should be started on the road of life with his poverty is burden and calamity enough, but that he should be started also with ignorance, is a still heavier burden and a still greater calamity. As regards natural capability, no nation in the world can surpass our own. For industry and energy there is perhaps no people to equal the English. But they must be trained and disciplined to work intelligently, or their natural advantages will prove of comparatively little avail. What Opie, the painter, once said to a youth who asked him how he mixed his colours, applies to all skilled industry:—"I mix them with my brains, sir," was the reply. And unless the English artisans, like the foreigners, are taught to mix their brains with their work, it is inevitable that they must fall behind in the race of competition with the world.

PARIS ASSOCIATION FOR THE SECONDARY EDUCATION OF GIRLS.

It has for some time been a source of complaint that no opportunities of secondary education are offered to the female children of Paris. M. Duruy, the minister of public instruction, has now taken the matter in hand, and addressed a circular to the rectors of universities, inviting them to encourage the establishment of female classes with the aid of the professors of the Lycées. In cases in which the local authorities provide rooms for such classes, the minister of public instruction will supply the necessary materials of education.

In consequence of these circulars, the association in question has been formed, the members being professors of the universities or of public or private schools, including M. Milne Edwards, and other members of the Institute, to whom are added M. Viollet le Duc, the architect and inspector-general of historic monuments, and one lady, Madame Pape-Charpentier, directress of the normal classes of the Salles d'Asile.

The courses of study to be established by the association are to be held at the Sorbonne, and were to commence on the 1st of December. The courses, which occupy three years, will include literature, history, geography, domestic economy, the elements of jurisprudence, natural sciences, physics, and some branches of mathematics. There are to be two terms per annum between the 1st of December and the end of May; the lessons to take place three times a week, one on literature and one on science, each restricted to one hour in length, to follow immediately after each other. The pupils are to write exercises either upon the subject of the lesson, or other subjects given by the professor; these exercises are to be corrected and annotated, and finally there will be exercises, compositions, and examinations at the end of each academical year. These are not compulsory except for those pupils who compete for the medals or other awards to be given by the association. In the three years the pupils will have gone through nearly the whole course of instruction given at the Lycées, and may obtain on examination the same diploma as is given to the young men who have finished their education at a lycée in a satisfactory manner. The professors appointed for the first year are Madame Pape-Charpentier, for domestic economy; M. Philippon, secretary of the faculty of sciences, and M. Salicis, of the Ecole Polytechnique, mathematics; M. Albert, of the Lycée Charlemagne, literature; M. Hébert, of the faculty of sciences, and M. Duchartre, of the Institute, natural history; M. Gérardin of the Lycée Saint Louis, history of France; M. Cahors, of the Ecole Centrale, chemistry; M. Levasseur, of the Lycée Napoleon, geography; and M. Jamin, of the Ecole Polytechnique, physics. It will

be seen by the above list that the association starts with a strong corps of professors.

The fee is fixed at 75 francs (£3) for each pupil per term, and each may be accompanied by her mother, governess, or schoolmistress.

Fine Arts.

EXHIBITION OF FINE ARTS, MADRID.—Heretofore, the Madrid exhibitions have been confined exclusively to native artists, but it is said that the directors of the Academy of the Beaux Arts have come to the determination of admitting in future the works of foreign artists, and that the regulations will shortly be announced.

STATUE TO THE LATE PAINTER INGRES.—A public subscription, amounting to four hundred pounds, has been made towards the erection of a statue of the late painter, Ingres, in his native town, Montauban; the council of the department, Tarn and Garonne, has voted a sum equal to £320; and the municipal council of Montauban will defray the rest of the expense. The statue is to be in bronze, the work to be thrown open to competition, and the Academy of the Beaux Arts of Paris to be invited to adjudicate.

DISCOVERY OF A SAXON RING.—The *Leeds Mercury* gives an account of a fine specimen of one of these rings, which has been discovered in a field near Driffield, in a singular manner. A man was ploughing, when he felt a slight obstruction to the plough. On searching for the cause, he found that the point of the plough-share had entered the opening of a large and valuable finger-ring. On examination it appeared to be of massive and pure gold, and of elegant manufacture. It weighs an ounce and a quarter, and contains gold equal to five sovereigns. The face is oval, and surrounded by a band, composed of small globules. Within this band the space is divided into four geometrical parts. The four upper divisions contain each an initial letter, and the cavities are filled with black enamel. The under curves contain each an ornament resembling a figure of 8, or a semi-true-lover's knot. The signet or design, which appears to have occupied the centre, is unfortunately lost, and nothing remains but the plain circular plate to which it has been pinned; a portion of the pin and the cavity in which it is inserted still remain, showing how it has been attached. The hoop or connecting band of the ring is formed of a grotesque nondescript animal's head, similar to the gargolls or heads we frequently see on Saxon and Norman churches. The remainder of the band consists of lozenge-shaped ornaments and a centre-piece, on each of which is an initial letter, and the interstices are filled with black enamel. This ring is probably purely Saxon, and, from its size and the rich character of the workmanship, must have, in its time, adorned the finger of some distinguished individual, and it is at least twelve hundred years old. Driffield is reported to have been the royal residence, and the church at Little Driffield contains the body of one of the Saxon kings.

Manufactures.

MANUFACTURE OF LEATHER IN ITALY.—The manufacture of leather is one of the most important among the national industries of Italy. The number of leather manufactories in this kingdom amounts to 1,175, employing about 12,500 workmen, and producing about 282,346 cwt. per annum, to the value of two millions and a half sterling. In this manufacture Piedmont and Liguria occupy the first place, afterwards the Neapolitan provinces, then the Venetian provinces for £360,000, then Lombardy for £340,000, and finally Tuscany, which produces leather to the value of £240,000 per annum. The island of Sardinia does not produce leather, but exports to the main land hides to the amount of £44,800. Upwards of 190,000 cwt., estimated at about £920,000, are annually imported from America, England, France, and Austria. The exportation of leather from Italy is very small indeed, whilst, on the other hand, the importation from France amounts to £160,000. The tanneries in Italy are abundantly supplied with water and materials used for tanning, which, if properly developed, might produce sufficient to prevent any importation from abroad being necessary. The art of making parchment is carried on to a large extent at Arpino and Sulmona, from whence are exported annually about 6,600lbs. The manufacture of glue is extensively carried on at Chieti. In Piedmont a glue called French glue is made, treating the bones with muriatic acid. Of this 88,000 lbs. are exported annually. Naples, Genoa, Turin, and Venice are famous for their manufactories of gloves. Those of Naples are preferred for their good quality and cheapness, and are even exported to America. Some are so fine as only to weigh little more than an ounce per pair, and three pairs may be put into a walnut-shell. Naples exports yearly 32,644 dozen pairs of gloves, of the value of £6,000, whilst 15,000 dozen pairs are exported from Genoa, and about the same amount from Turin. At Venice about a thousand persons are employed in this manufacture. Allied to the manufacture of leather is that of bootmaking, which, after supplying the wants of the country, produces a considerable quantity for exportation. At Genoa there is an establishment for bootmaking by machinery, with branches at Naples and Florence, at reasonable prices. The total exportation of boots may be estimated at 121,000 pairs, of which 56,000 are sent to England, 45,000 to South America, 12,000 to Turkey, and 8,000 to France. In Italy there are 1,500 manufactories of hats, of which the principal are at Turin, Milan, Florence, and Naples, but the best hats are imported from France, and this industry is capable of great improvement to be able to prevent this importation.

Commerce.

IMPORTATION OF CATTLE TO MARSEILLES.—There has been a considerable increase in the importation of cattle to the port of Marseilles in the first nine months of the present year, as compared with a similar period of last year. The number of bullocks imported from Sardinia was 23,796, and 25,887 from Algeria, altogether 49,683, against 24,685 imported during first nine months of 1866. The importation of sheep has nearly doubled. During the first nine months last year it amounted to 130,794 head; this year, for the same period, 259,194 head were imported. The number of sheep imported from Italy has not increased, but the quantity obtained from Algeria has been nearly doubled. As to bullocks, the importation from Sardinia is doubled; and besides, 2,564 cows have been imported from that country.

FRENCH CUSTOMS' RETURNS.—The official returns for the first nine months of the year have recently appeared. The imports of alimentary substances exceed those of last year by nearly six millions sterling, five-sixths of which consist of grain and dry vegetable substances. Under the head of principal natural products and materials of industry, the imports were $1,542\frac{3}{4}$ millions of francs, against $1,484\frac{1}{2}$ millions in 1866, or an excess of $2\frac{1}{3}$ millions sterling; the principal augmentation being in horses, skins, and furs, wool, silk, flax, guano, forage, oleaginous and other seeds, and spice; while there was a notable diminution, on the contrary, in cotton, silk-worms' eggs, leaf tobacco, and petroleum. The imports of manufactured articles amounted to $174\frac{3}{4}$ millions, against 178 millions of francs, or an increase of £270,000; the chief objects of increase being linen yarns, hemp and jute, linens and silks, prepared skins, and watch and clockwork; while there was a decrease in the case of woollen yarns, straw and bark mats, machinery and

iron ships; the imports of miscellaneous articles were 90½ millions, against 88 millions of francs, showing an increase of £100,000. The total of the imports of 1867 therefore shows an increase, as compared with the nine months of 1866, equal to £11,040,000. The exports exhibit a contrary aspect, those of the present year amounting to 2,197 millions, against 2,375⅓ millions of francs in 1866, giving a difference equal to £7,120,000. The list is completed by the return of the movements of precious metals, of which the excess of entries over exports was 404⅕ millions in 1867, against 467¾ millions in 1866, or a diminution of £2,560,000.

Colonies.

Exports to, and Imports from, the Colonies.—The value of the exports of British produce and manufactures to the Australian colonies during the eight months ended August, 1867, are stated to be £5,850,875, which amount shows a decrease of over three millions on those of last year for the same period, distributed as follows:—

	1866.	1867.
Victoria	£4,017,995	£2,732,090
New South Wales	1,963,318	1,204,696
New Zealand	1,296,874	979,154
South Australia	1,024,564	526,590
Queensland	349,109	192,302
Tasmania	150,364	153,172
West Australia	81,614	62,871
	£8,883,838	£5,850,875

The total value of the gold bullion and specie imported from Australia and New Zealand during the past nine months of the present year, was £3,863,970, against £4,639,371 in the same period of 1866. The following is a list of the principal articles of Australian produce imported into the United Kingdom during the nine months ending 30th September, as compared with the corresponding period of last year:—

	1866.	1867.
Wool	102,047,664 lbs.	118,672,805 lbs.
Copper ore	12,671 tons	10,839 tns.
Copper, wrought	56,060 cwt.	57,320 cwt.
Tallow	17,155 „	17,574 „
Hides, wet	71,387 „	53,944 „

194 vessels, with a tonnage of 176,300 tons, cleared out from the United Kingdom, against 280 vessels, with a tonnage of 260,189 tons, in the first nine months of last year; 160 vessels, with a tonnage of 139,178 tons, were entered inwards during the first nine months of the year, against 144 vessels, with a tonnage of 131,408 tons, in the corresponding period of last year.

Notes.

The Half-Time School System.—The half-time school system now in course of extension in the manufacturing districts in England, is beginning to attract attention in France. An association has been formed recently there under the presidency of M. Dumas, of the Institute, for the amelioration of the condition of apprentices and young children engaged in manufactures. Upwards of two thousand persons have already joined the association as subscribing members. At the recent formal seance, presided over by the Empress at the Palais d'Industrie, a report was read from the officers of the association, which her Majesty has taken under her special patronage, urging the adoption of the principle of compulsory attendance of children at school three hours a-day, or the half-school time, as a security against bodily overwork, as well as against exclusion from education, and proclaiming the award of a medal to Mr. Edwin Chadwick as the originator and promoter of the system in England. In Canada and in Massachussetts, and in several of the United States, lectures have been delivered, chiefly from his papers, and the principle is in the course of adoption, chiefly in connection with a system of military drill and gymnastic training during the hours taken from the usual school time. Earl Russell, in his recent speech on a national system of education, referred to an address given at Paris by Mr. Chadwick to the Academy of Moral and Political Science of the Institute, as containing facts and reasonings which had convinced his Lordship that the half-school time system was an improvement in the method of instruction, which ought to be generally adopted in a national elementary system of education. In answer, the Duke of Marlborough, as Lord President of the Privy Council, stated, that the Acts for the regulation of factories recently passed, provided for its wide extension in the manufacturing districts, and that it had been referred to a commission to consider of its application to the elementary schools for children engaged in agriculture. It is estimated that under the recent Acts the half-time system will be eventually extended to about one million of children in the manufacturing districts. The last number of the *North British Review* contains an article on the military organisation of the country, urging the transference of as much as possible of military exercises from the productive or adult stages of life to the non-productive, or the school stages on the half-school time principle, as a means of spreading a predisposition to a better order of recruiting, and lessening the expense of military training.

National Debt of Austria.—The official gazette of Vienna publishes the total amount of the national debt of Austria up to the 30th June of the present year, at 2,988,466,695 florins, (£298,846,669 10s.) The amount up to the 31st December 1866, being 2,919,717,680 florins, shows an increase in the debt for the first six months of the present year of 68,769,665 florins, (£6,876,966 10s.

Turkish Railways.—An important network of railway has just been conceded by the Turkish Government to a French and Belgian Company. This line will put Vienna and Constantinople in direct communication with each other. The total length of the main and branch lines will be about 1,200 English miles. From Constantinople the line will pass through Adrianople, Sophia, Nissa, Belgrade, and will be united with the network of European railways at Basiasch. Branch lines will be constructed from Constantinople to Enos, and Nissa to Salonica. The works between Belgrade and Nissa will be commenced during the present winter.

Correspondence.

The Recent Monetary Conferences.—Sir,—The reading and discussion of my paper on Wednesday, the 27th ult., were protracted till too late in the evening to allow me to answer the observations made upon it. Will you allow me to do so as briefly as possible? I may no more than Mr. Hendriks attach much weight to the report of the Royal Commissioners of 1855, seeing that they were so few in number, and the task virtually fell upon one only, who entered into the inquiry with dispositions not very favourable to decimalisation; but no one can read the three folio volumes they have issued without being convinced that the question was at least well sifted. To my mind their verdict upon the pound and mil scheme is final. Only incidentally, the Commissioners for the restoration of the standards of weight and measure of 1841 suggested the great advantage that would result from decimalising the pound by dividing it into 1,000 mils. But they did not enter into the subject. The Committee of the House of Commons of 1853, presided over by a decided friend of that scheme, having examined scarcely any other witnesses than promoters of the same, concluded, upon imperfect information, that

this was the only way to a decimal system. But when Lord Overstone's Commission summoned the opponents as well as the friends of that scheme, and the views of both were duly balanced, it was found that the advantages of taking the pound as a basis of decimalisation were greatly exceeded and counterbalanced by its defects and inconvenience. Many, no doubt, think that if we maintain the pound in its integrity the greatest difficulty of a change is overcome; but in this, as in many other things, the shortest is not always the most direct way. Why is it that more than twenty-five years have elapsed since the scheme has been advocated, and yet we are not farther advanced at this moment than ever we were? Simply because insuperable obstacles rendered it unpopular and impracticable. It is a grave fault of the scheme, that it touches the penny, which regulates so many transactions, and is perhaps the most familiar coin in the realm. Say what you will, it would be a burden to bring into all calculations the 1,000th part of the unit. With three decimals to carry in every summation, the labour and time required in calculation would not be less than with the present system. The cent is too large for a copper coin, too small for a silver one, and it is no light defect that very few of the existing coins would find their exact equivalents in the new system. Would it not be better that the friends of decimalisation should endeavour to find some other method for attaining the great desideratum? It is to be regretted that many, whose name and influence would be of immense advantage to the solution of the problem in some more practical way, still cling to a scheme which may be called defunct, and that overlooking all that has been said against it, when discussed for national purposes, now bring it forward afresh in an international aspect. The conferences recommended the gold five-franc piece as a basis for international coinage, on the supposition that England might easily reduce the pound to the value of twenty-five francs, and America make her dollar equivalent to five francs. It is vain, however, to imagine that this method would give to the world a sound international system of coinage, and to England a perfect decimal numeration in currency and accountancy. Suppose Austria to coin a ten-florin piece, France a twenty-five-franc piece, and America a five-dollar piece, that would not produce uniformity of accountancy unless these nations agreed to make the twenty-five-franc piece the unit, divided into one thousand parts. But will Austria, France, and America abandon respectively their florin, franc, and dollar? No. And if not, then the only point of contact being in the highest coin, very little advantage indeed would result from it either to travellers or merchants in their international intercourse. We shall have still to reduce the dollar, florin, and franc into sovereigns; and with these, and many more units, I doubt whether we shall advance much towards a common system. It appears, moreover, that Austria never means to go farther than issuing the gold piece of ten florins, the Coinage Commissioners having reasonably objected to coin a piece of half that amount—viz., five florins, or twelve and a-half francs, and preferred to coin a four-florin piece, or ten francs. And as to France, she does not want a twenty-five-franc piece with the twenty-franc pieces in general use. If she issues it as a compliment to this country, she will soon find the demand for such a coin so small that it will not be worth while maintaining it even in internal circulation. Nor is it so easy for the country to reduce the pound to the exact equivalent of twenty-five francs, as might at first sight appear. The pound being now worth 25·20 francs, could not be declared by law to be 25 francs; and I have great doubt that the Government will be prepared to reduce the standard of the pound to meet this agreement. If the plan were otherwise acceptable, the only way would be to issue a new sovereign of that value. But what shall we do with the hundred millions of sovereigns in circulation? They must all be withdrawn, since it would never do to have two sovereigns, differing so little, in circulation at the same time. When I went to Paris to assist at these conferences, all these difficulties pressed upon my mind, and feeling that it was absolutely necessary to propound a plan which might be adapted to the five-franc piece, as suggested by the Conference, I came to the decided conviction, after the closest investigation, that the very best we can do is to take the ten-franc piece as the future unit for British coinage, in the shape of a coin representing one hundred pence, divided into ten new silver tenpence pieces. This plan would have all the advantages of the tenpenny scheme, so warmly and so ably advocated years ago by Mr. Rathbone, Dr. Gray, Mr. Slater, Mr. Yates, Mr. Minasi, and many others, and would have the additional element of internationality, which we are now seeking. The supposed difficulty of converting the present coinage into the new system, and *vice versa*, is, I apprehend, greatly exaggerated. Mr. Fellows and other friends justly say, how do you dispose of the difference between the British and French standards? I know full well that we cannot get over this, whichever plan we take; but there is this difference in favour of my plan, that whilst by reducing the sovereign to the value of twenty-five francs, you operate directly on the pound, and create a necessary confusion between the new and the old pound, by introducing an intermediate coin, as a token only, in the first instance, you familiarise the people with the new system, and facilitate the preparation for the coming change. It is understood, of course, that when the one hundred pence, or ducat, is declared to be the unit, holders of sovereigns will be entitled, in changing them for the new coins, to be allowed the difference in the respective values, a proper table being issued by authority specifying the exact equivalents. Let me just add, that, with the ten francs scheme we can easily obtain a much higher unit than the pound for large transactions. Whether we should coin or not a ten-ducats piece, to be called a Victoria, by merely removing the decimal point to a higher figure, we have at once a unit equivalent to nearly four pounds sterling. A gold coin of eight shillings and fourpence is not quite new. The gold noble, current under the reign of Henry IV., was worth eight shillings and fourpence. Silver coins of tenpence and fivepence were issued in Ireland long ago. As to Mr. Muspratt's suggestion of combining the two modes—that is, to have the pound reduced to twenty-five francs, and a coin representing one hundred pence—the difficulty would be, that though we might have a coin representing twenty-five francs, or nearly equal to the sovereign, its divisions would not agree with those of the ducat—the tenth, hundredth, and thousandth part of the one having nothing in common with the tenth and hundredth part of the other. In the introduction of a new system of coinage, the great difficulty to be met with is to induce the masses to depart from standards with which they are familiar. Do not, then, touch the penny, which is the standard best known to millions of our working classes. As for the difficulty of re-arranging the terms of all pecuniary obligations, that is easily overcome, since it affects especially the middle and higher classes of society, who can readily make the necessary calculations, assisted as they will be by an abundance of ready-reckoners and tables of equivalents, and conversion.—I am, &c., Leone Levi.

10, Farrar's-buildings, Temple, 10th December, 1867.

MEETINGS FOR THE ENSUING WEEK.

Mon......British Architects, 8.
Medical, 8.
Asiatic, 3.
Society of Engineers, 7½. Mr. James Gresham, "On the most recent Improvements in the Injector."

Tues ...Civil Engineers, 8. Annual General Meeting.
Statistical, 8. Mr. Jas. Heywood, "On the Form of Government and Educational System of the University of Cambridge."
Pathological, 8.
Anthropological, 8.

Wed ...Society of Arts, 8. Mr. N. P. Burgh, "On the Principles that Govern the Future Development of the Marine Boiler, Engine, and Screw Propeller."
Geological, 8. 1. Sir J. Lubbock, "On the Parallel Roads of Glen Roy." 2. Dr. C. Collingwood, "On the Geological Features of the northern part of Formosa." 3. Dr. C. Collingwood, "On some Sources of Coal in the Eastern Hemisphere."
R. Society of Literature, 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Chemical, 8. Mr. Alfred Tribe, "On the Freezing of Bismuth and Water."
Linnæan, 8. 1. Dr. Hooker, "*Fuchsia coccinea.*" 2. Mr. Jackson, "Japanese Pines." 3. Mr. Bentham, "*Myrtaceæ.*"
Zoological, 4.
Numismatic, 7.
Philosophical Club, 6.

Fri........Society of Arts, 8. (Cantor Lectures.) Professor Richard Westmacott, "On Art; especially including the History and Theory of Sculpture."
Philological, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 2nd December, 1867.*

15. Bill—Bank Holidays.
17. ,, Local Officers Superannuation (Ireland).
18. ,, Religious, &c., Buildings (Sites).

Delivered on 3rd December, 1867.

5. Bill—Burials (Ireland).
14. Public Income and Expenditure—Account.

Patents.

From Commissioners of Patents' Journal, December 6.

Grants of Provisional Protection.

Boilers—3343—J. A. Hopkinson and J. Hopkinson, jun.
Boilers, supplying water to—3350—A. V. Newton.
Boots and shoes—3281—C. Mole.
Butter baskets—3269—J. Colebrook.
Chimneys, &c., cowls or guards for—3300—W. Blundell.
Coffins—3283—S. Coulson.
Cotton, &c., opening and cleaning—3263—E. Lord.
Cribbage boards—3326—T. Barton.
Engines, marine steam—3320—W. Macnab.
Engines, rotary—3334—A. V. Newton.
Engines, steam, &c.—3299—W. R. Green and J. G. Freeman.
Engines, &c.—3309—J. G. Tongue.
Envelopes—3342—C. E. Penny.
Evaporators—3277—W. Anderson.
Exhibitions, producing illusory—3297—S. and B. Barczinsky.
Fabrics, ornamenting—3357—A. M. Clark.
Fabrics, woven—3273—R. Ward and T. Travis.
Fabrics, &c., dyeing textile—3267—W. J. Hanson and J. C. Ellison.
Fire-arms—3308—J. Wormald and W. B. Dalton.
Fluids in process of decantation, changing the condition of—3315—W. Needham and J. Kite.
Food—3275—W. J. and A. Coleman.
Furnaces—3348—C. T. Higginbotham.
Furniture—3182—G. Ellis and M. Jacobson.
Girders, &c., piles for wrought-iron—3355—J. H. Johnson.
Goods, dyeing—3329—T. L. Greenwood.
Hinges, spring—3364—W. R. Lake.
Iron into blooms, converting—3352—E. H. Bentall.
Kitchen ranges—3327—F. Brown.
Knitting machines—3265—E. T. Hughes.
Lamp burners—3353—M. A. Hamilton.
Lamps—3110—H. Allman and F. N. Gisborne.
Lamps—3287—H. Greene.
Lamps—3303—E. Thorold.
Metals, coating and uniting—3340—J. P. Smith.
Metals, &c., coating—3288—C. de Lavenant.
Metals, &c., treating—3360—H. F. Gardner.
Motive power—3279—A. Barclay.
Motive-power—3319—W. Boulton.
Motive-power—3316—G. H. and E. Bolton, W. Whitthread, and T. Robinson.
Oils and spirits, treating—3191—F. L. de Gerbeth.
Packing cases—3328—G. Turner.
Paper, manufacturing—3347—J. Hudson, jun.
Paper pulp, preparing—3351—A. V. Newton.
Patterns, ruling ornamental—3322—S. Amphlet and J. B. Fenby.
Petroleum, &c., vessels for storing, &c.—3344—J. and J. Hinks.
Piston heads, packing for—3293—W. R. Lake.
Rabbits, &c., treating skins of—3349—J. H. Johnson.
Railway carriages, &c.—3261—L. and W. Brierley and J. Bonnell.
Railway rails—3325—M. A. Hamilton.
Railways—3362—J. McFarlane and G. Barker.
Roads, &c., watering and cleansing—3337—W. Sim.
Smoke, consuming—3289—J. Staincliffe.
Smoke, consuming—3314—G. D. Hughes.
Soda and potash—3295—J. Townsend.
Soda water, &c.—3307—V. Burchell.
Solid substances, apparatus for stirring, &c.—3124—A. McDougall.
Spinning, &c., frames—3242—R. C. Addy.
Steam generators—3321—C. E. Brooman.
Tobacco pouches—3341—E. Townshend.
Tobacco, twisting—3332—R. Ward.
Tools, couplings for boring—3285—T. H. Tilley.
Tools, cutting, &c.—3339—J. P. Smith.
Tyres—3356—W. Fowler and J. Griffiths.
Watches, &c.—3298—J. F. Watson.
Water-closets—3305—H. James and E. Drewett.
Whales, killing—3312—G. Welch.
Windows, &c.—3206—J. Carter and T. Chalmers.

Inventions with Complete Specifications Filed.

Car and carriage trucks—3363—S. A. Chase.
Lubricating apparatus—3403—W. R. Lake.
Spindles—3432—J. Collingham and T. E. Smith.

Patents Sealed.

1213. A. Clark.
1324. A. Clark.
1584. R. Pollit.
1669. C. E. Giajola, J. H. Gray, and P. Martinengo.
1692. J. Turner & R. B. Dunnett.
1695. A. Parkes.
1696. R. E. Pepys and J. Warburton.
1699. W. French.
1704. F. B. Dœring.
1709. R. Hornsby, J. Bonnall, and H. Shield.
1719. W. Rowan.
1756. W. R. Lake.
1762. C. D. Abel.
1798. A. M. Clark.
1810. H. Oram.
1815. A. M. Clark.
1825. R. W. Morrell.
1948. J. McAdams.
2052. A. M. Clark.
2209. B. Dobson and W. Slater.
2568. C. Mather.
2792. H. Pinkus.

From Commissioners of Patents' Journal, December 10.

Patents Sealed.

1393. A. Clark.
1713. H. Fletcher.
1716. J. Thom.
1723. J. Cochrane.
1725. D. Crichton, W. Donbavand, and D. Crighton.
1729. T. S. Prideaux.
1730. E. T. Hughes.
1732. J. Holmes.
1733. F. B. Baker and L. Lindley.
1735. J. Glover.
1739. S. Tuddenham.
1742. S. E. Crow.
1758. L. J. Crossley and J. Sunderland.
1763. J. H. Johnson.
1767. F. B. Miller.
1768. I. G. Lloyd.
1827. S. Holman.
1939. T. Borlase.
1940. W. S. Scott and W. H. Steel.
1963. A. V. Newton.
2011. W. E. Newton.
2028. G. R. B. Amott.
2103. W. R. Lake.
2115. J. W. Butler & E. Edwards.
2228. W. Tranter.
2417. H. A. Bonneville.
2519. J. B. Handyside.
2707. J. Oxley.
2906. J. Oxley and G. Wilson.
3041. W. R. Lake.

Patents on which the Stamp Duty of £50 has been Paid.

2993. J. Soper.
3007. G. Wailes and B. Cooper.
3027. J. Yearsley & E. Timbrell.
3036. G. Dixon.
3046. R. Richardson.
3069. A. J. Sedley.
3078. R. Mathers.
3123. W. Cotton.
3059. E. Myers.
3065. W. Tongue.
3055. J. Livesey and J. Edwards.
3056. H. Wilson.
3066. T. H. Roberts.
3116. J. Ellis.

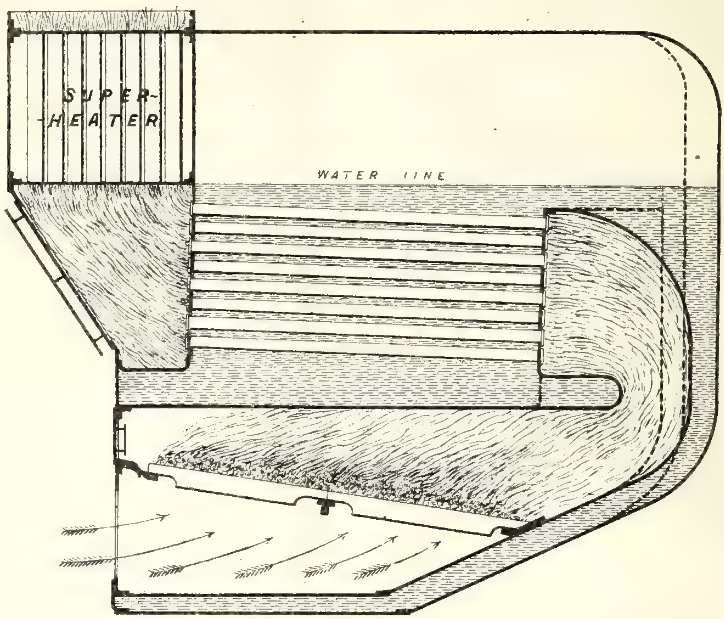
Patents on which the Stamp Duty of £100 has been Paid.

2957. W. P. Piggott.
2985. E. Morewood.
2989. H. Jordan.
3017. D. Annan.

Registered Designs.

4903—Nov. 13—Improved combined chair and steps—A. E. Pierce, 109, Hatton-garden.
4904—Nov. 15—Snake puzzle—J. Jaques, 102, Hatton-garden.
4905—Nov. 21—The nonpareil pouch—C. H. Bartlett, 1, Noble-street, City, E.C.
4906—Nov. 21—An envelope—J. Smith and Co., 42, Rathbone-place, Oxford-street, W.
4907—Nov. 26—Tube respirator—W. E. Lowe, 8, Stafford-street, Old Bond-street, W.
4908—Nov. 26—The gas-light carbon burner—R. Pilkington, West Ham, Essex.
4909—Dec. 4—An improved water or gas cock—D. Clark, Canada Works, Birmingham.
4910—Dec. 6—Fastening for the doors or the internal partitions of portmanteaus, bags, trunks, cases, or boxes—W. Middlemore, Birmingham.
4911—Dec. 7—A match-box—Bell and Black, Bow-lane, Cheapside, E.C.

SECTION A. Nº 1.



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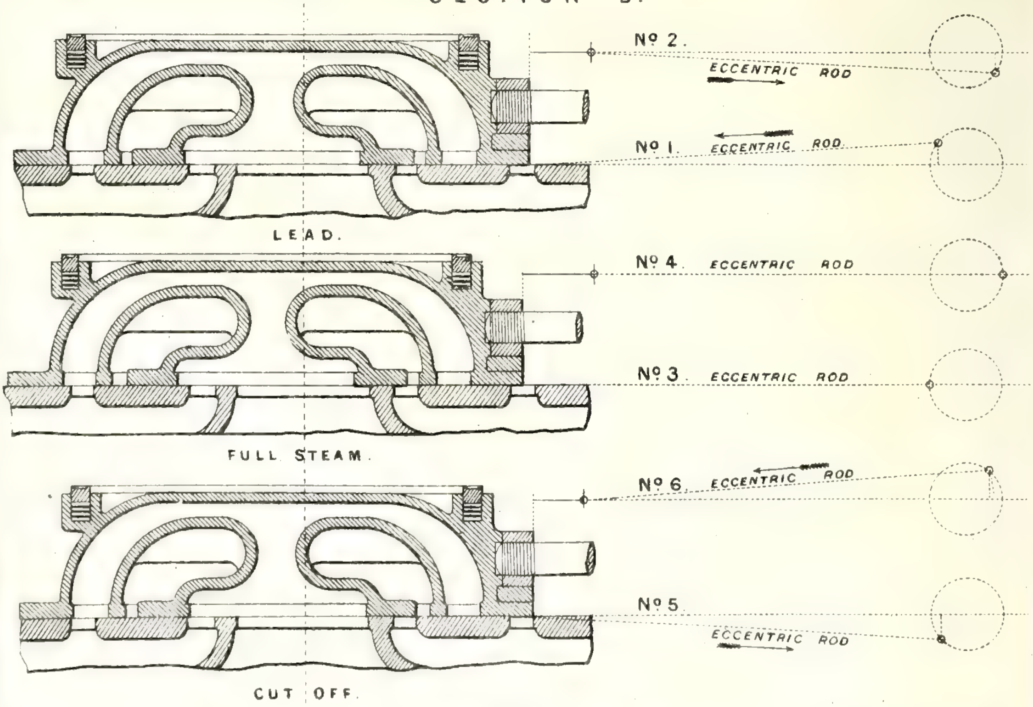
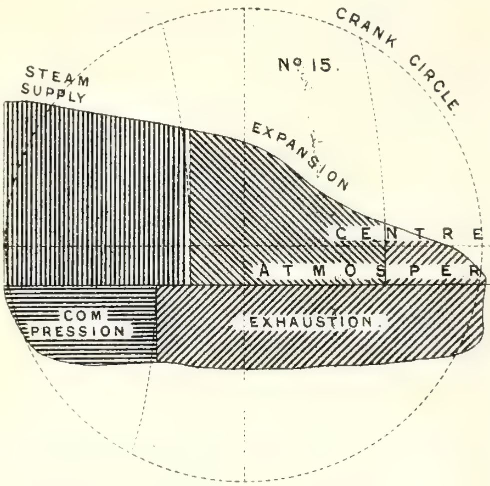
SECTION B.

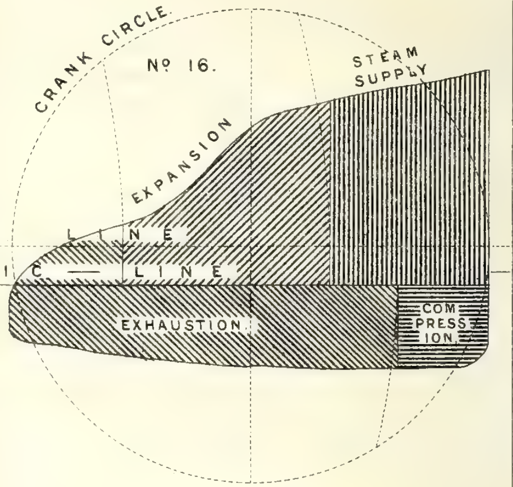


Scale 1¼ in = one Foot.

Newbon & Alexander, lith 43, Castle Sᵗ Holborn

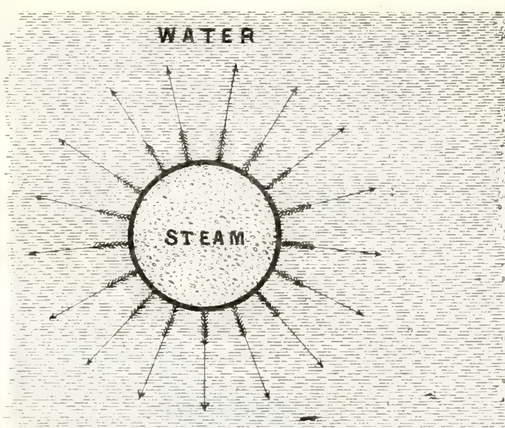
SECTION B.





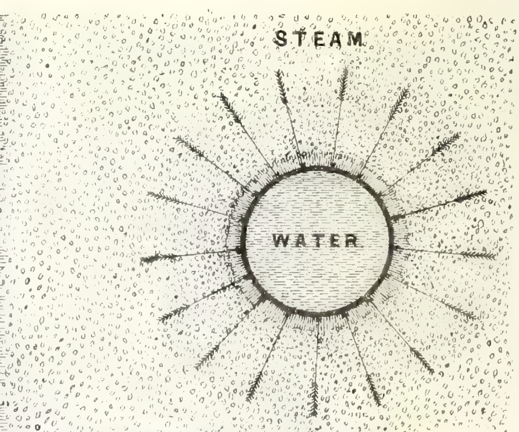
INSIDE CONDENSATION.

Nº 17.

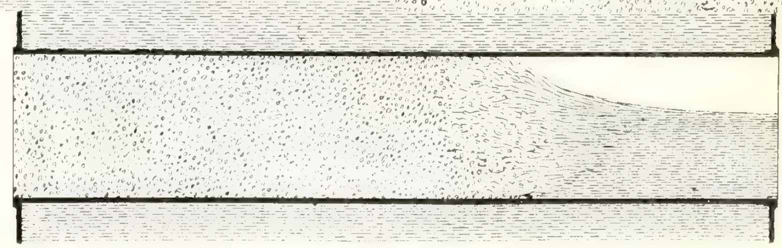


OUTSIDE CONDENSATION.

Nº 18.



Nº 19.

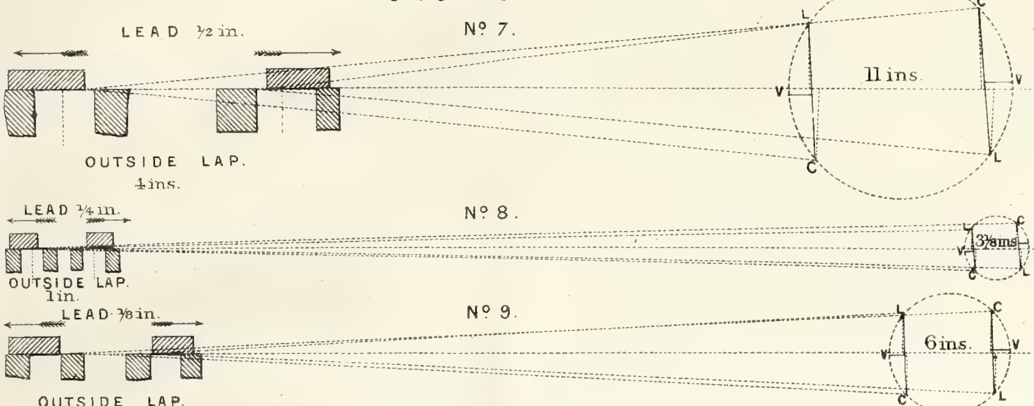


Full size diam.r

HORIZONTAL ACTION OF CONDENSATION.

Newbery & Alexander, lith. 43, Castle St. Holborn

SECTION B.



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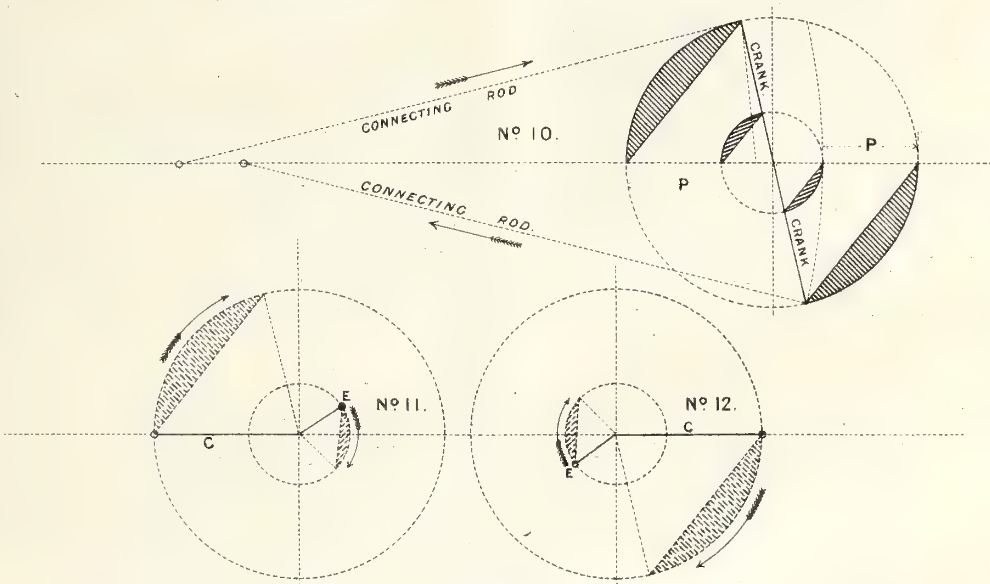

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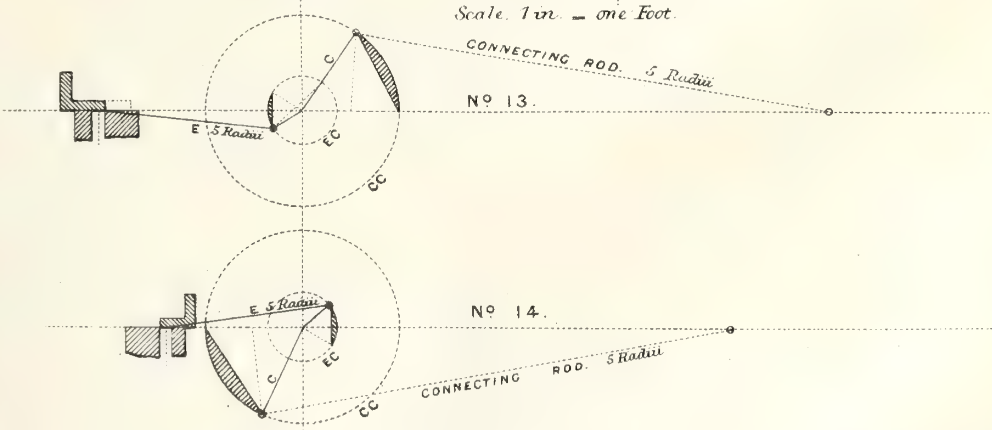
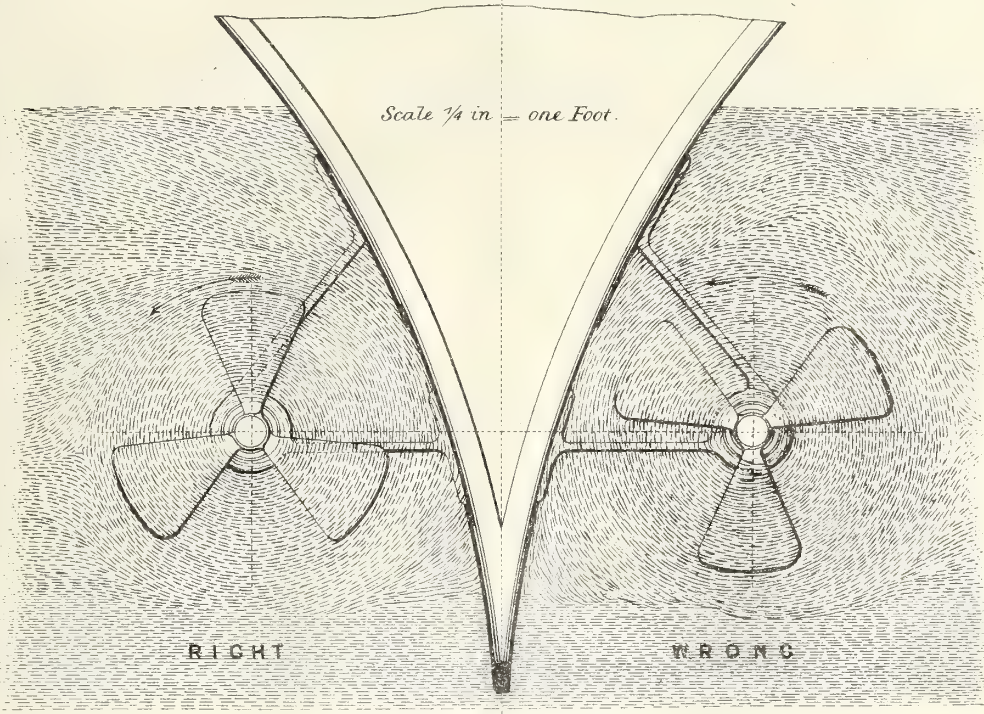


Scale 1 in. = one Foot.

Newbery & Alexander, lith 43 Castle St. Holborn.

SECTION C.

No. 1.



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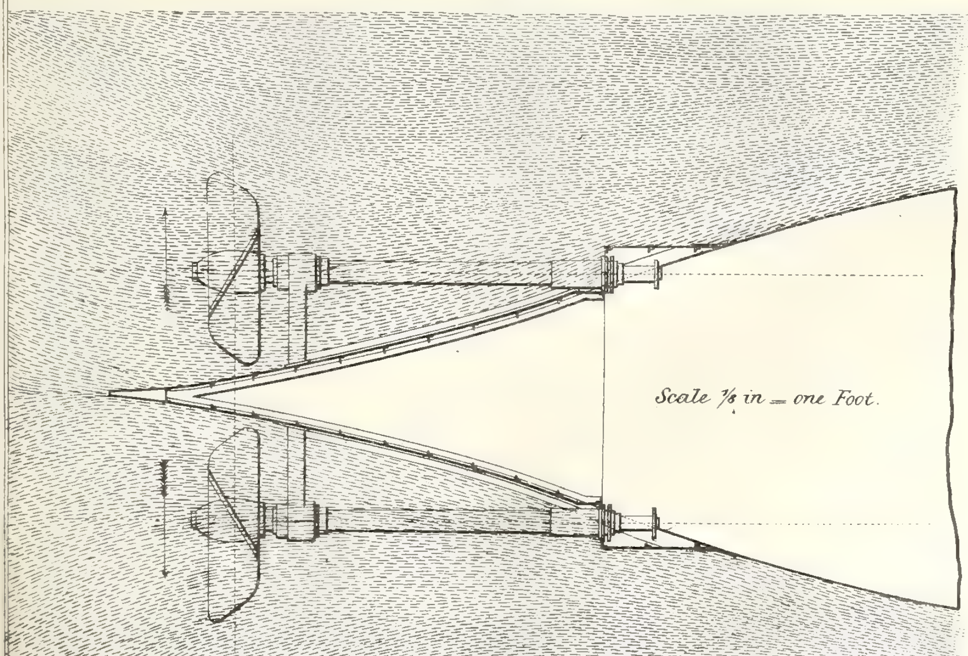


Journal of the Society of Arts.

FRIDAY, DECEMBER 20, 1867.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now in the press, and will be published in a few days, by the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., price 2s. 6d.

Cantor Lectures.

The first course for the present session is "On Art, especially including the History and Theory of Sculpture," and is being delivered by Richard Westmacott, Esq., R.A., F.R.S., Professor of Sculpture in the Royal Academy, as follows:—

December 20th.—Lecture III.—The subject continued, including a review of the mediæval and more modern schools, to the close of the eighteenth century.

The lectures commence each evening at eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Technical Education.

The Council feeling the great importance of this subject, have resolved to hold a Conference at the Society's house, on the 23rd and 24th January next, the particulars of which are explained in the following circular:—

Society for the Encouragement of Arts, Manufactures and Commerce, Adelphi, London, W.C., 9th December, 1867.

Technical Education.

Sir,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to invite your (Chamber of Commerce or other body) to appoint its President or other representative, to attend a Conference which is to be held here, on Thursday and Friday, the 23rd and 24th of January next, to consider and suggest what measures may be taken to promote the industrial and scientific education of the various classes of the community.

The Conference will commence its sittings on Thursday, the 23rd of January, 1868. The Chairman of Council will take the chair at 12 o'clock precisely.

At as early a period as possible, the Council will issue to each gentleman who accepts their invitation to the Conference a programme of the probable course of its proceedings; and, to enable the Council to do this in a satisfactory manner, I am to request you to inform me, with the least possible delay, whether a representative from your [ ] will be able to attend the Conference; whether your [ ] has any special resolutions to suggest, or any particular points to which it desires to direct attention; what general measures for the promotion of education it may conceive to be requisite; and what institutions of a specific character are needed in your own neighbourhood to give the greatest practicable facilities for the acquisition of knowledge applicable to your local industries.

The object of the Conference is to ascertain, not merely what the Society of Arts, Manufactures, and Commerce, but what the nation at large can do to promote technical education among the workmen, the foremen, the overlookers, and the employers in Arts, Manufactures, and Commerce; and it is hoped that an expression of opinion by this Conference may tend in some degree to diminish the difficulties with which the solution of this vital question of national education is at present confessedly surrounded.

I am, your obedient servant,
P. Le Neve Foster, Secretary.

The foregoing circular has been forwarded to:—

- The Mayors of the Towns which are the principal seats of manufacture in the United Kingdom.
- The Presidents of the Chambers of Commerce and Agriculture.
- The Presidents of all Societies and City Companies which have co-operated with the Society in respect of Education or Art-workmanship.
- The Presidents of Institutions in Union with the Society of Arts.
- Her Majesty's Inspectors of Schools, Factories, Mines, and Collieries.
- Professors at University, King's and other Colleges.
- The Examiners of the London University.
- The English Jurors at the Paris Exhibition of 1867.
- The Society's Judges in Art-Workmanship.
- The Society's Examiners in Education.
- The Society's Visiting Officers.
- The writers of letters to the Schools' Inquiry Commission.

And many other gentlemen connected with education.

Members of the Society taking a special interest in this subject are invited to attend.

Examinations, 1868.

In addition to the prizes announced in the Programme of Examinations, the following are offered:—

The Worshipful Company of Coach and Coach Harness Makers offer as prizes—

1. A Silver Medal in Freehand Drawing; and
2. A Bronze Medal in Practical Mechanics;

To any candidate, being a workman or apprentice employed in the coach-making trade, who obtains the highest number of marks, with a certificate, in these subjects respectively.

The medals will be presented by the Master of the Company in open court.

Proceedings of the Society.

Food Committee.

The Committee met on Saturday, the 23rd of November. Present—Mr. Harry Chester (in the chair), Mr. J. T. Ware, Mr. M'Lagan, M.P., Mr. W. H. Michael, Mr. E. W. Hollond, Capt. Grant, and Rev. E. D. Tinling.

Mr. Merriam attended before the Committee to

give information respecting the manufacture and sale of preserved milk, as prepared by the Anglo-Swiss Condensed Milk Company.

Mr. Merriam, in reply to the interrogatories of the Committee, stated that he is a director of the above company, and agent in England for the sale of the article manufactured by them. Mr. Merriam explained that the article consisted of milk, from which a considerable portion of the water had been evaporated to the consistency of honey, with the addition of pure sugar; no other foreign substance whatever was introduced. Milk was so very cheap in Switzerland that there could be no advantage in adulterating it. The process was simply abstracting the watery particles from the milk, and the addition of the sugar. Upon the recommendation of Dr. Liebig beetroot sugar was used, on the ground that its preservative qualities were as good, and the price cheaper than cane sugar; in saccharine properties it was stated to be equal to the other sugar. It was also more bulky, though a pound of beet sugar contained as much saccharine matter as the same amount of cane sugar. The milk thus prepared he had seen after it had been open six months. It was in no way spoilt, though dried to a great extent. It was neither sour, rancid, nor mouldy. He had also seen a can opened about a year after it had been made, and it was in good condition and sound. It would bear the ordinary changes of temperature without injury. It was sold in canisters, which contained the equivalent of rather more than half-a-gallon of good milk, of about the quality of the best country milk. Dr. Liebig estimated that the addition of five parts of water would produce a quality equal to the original Swiss milk, and the richness was reduced according to the quantity of water added; whilst a smaller quantity of water made it of the consistency of cream, and, indeed, the cream would rise to the top. He had no concern with the retail price at which the article was sold; but the price of the canister on the table was 1s.3d., which was equal to half-a-gallon of a very rich quality of milk. The canister would probably cost a penny, and the duty was a penny per canister, which made the price of the milk, as diluted for use, sixpence per quart. For each canister the quantity of sugar was about one-third of a pound, so that less sugar was required when it was used for domestic purposes. The quantity of sugar used in the preparation might be considered by some people objectionable, but when given to young children was beneficial. No doubt a smaller quantity of sugar would be sufficient to preserve the milk for a moderate time in a climate like that of England, but up to this time no difference in that respect had been made in the preparation, and a large quantity of the article was sent to warm climates. He estimated that the sugar cost as much as the milk. The reduction of the quantity below what was now employed might endanger the preservation of the article. Milk was sold in Switzerland by the maas, and 2½ maas were equal to our gallon. It was claimed for this milk that it was more wholesome as food for very young children than ordinary milk, on account of its invariably uniform quality; and this was not the case with dairy milk in the country, because the milk of two cows was not of the same quality, and it varied at times in the same cow. One great recommendation of the article was the uniform quality of the milk, which, from the large bulk made at the same time, was secured in the highest possible degree. In the manufacture of this article the milk was brought on men's shoulders and emptied into a large reservoir, and within one hour after the whole quantity was put under the process of condensation. The preparation of the milk took place so quickly after its delivery at the works that no change could take place. He had not heard of any butter being made from this condensed milk, but the cream would rise on it when diluted for use. He considered this form of milk advantageous for family use in all cases where a supply of pure and good milk could not be guaranteed. The article was not protected by any patent. The manufactory was situated on the Lake of Zug, a very short distance from Zurich. The government authorities there were very rigid in their measures with regard to adulteration of food, especially of milk. There had been several instances in which the milk sent by the farmers had been rejected by the managers of the works. Each farmer's milk was tested. A sample was set aside to see if the cream rose, in order that they might know he was not cheating them. That was done every day, and then if there was anything unusual in the milk it was detected. If the milk was poor and thin it was rejected. That was all the company did; but the public authorities had in several instances taken up cases of adulteration of milk, and punished the offenders for selling bad milk; but in this country we were exposed to adulteration without any legal redress. Such was the system generally throughout Switzerland. The test of the milk was not so much by the lactometer as by the rising of the cream. There were shallow pans in which the milk was set. The specific gravity was not always a test to be relied on, inasmuch as other matters were put into milk to replace those which had been taken from it. Adulteration of that kind might be practised if they depended upon the test of the lactometer. Each dealer's milk was tested, and if the ordinary quantity of cream did not rise it was rejected. The sale of the condensed milk was increasing in England. Last month there were sold for home use and shipping as many as 1,250 doz. The Director-General of the Medical Department of the Navy had expressed his approval of it for use in the navy, but would not adopt it till it had been more tried in hot climates. At present desiccated milk was used in the ships, but the milk was not so good as this, because the desiccating process broke up the globules of the milk.

The Chairman suggested that experiments should be tried with regard to the smallest possible quantity of sugar which would be sufficient to preserve the milk in a climate like that of England for a short time, so as to make it available for family purposes. He considered the extreme sweetness of this preparation was the great objection to it.

Mr. Merriam thought it probable that half the present amount of sugar would suffice for the use of the milk in this country. That would have reference to the regular milk business. They could hardly expect the milk dealers to take it up; nor did he think it was desirable. If the company used the article in that way they would be placing themselves on a par with other dealers, and it was difficult to make people believe that they were honest with the milk they supplied in the ordinary form in which it was used for family purposes, and, the article once out of the hands of the company; they had no control over it. In its present form the milk would keep good for years; if it was not properly prepared it would not keep good. The Peninsular and Oriental Company, the Royal Mail, and the Pacific Mail Companies used this milk on board their vessels. With regard to the desiccated milk, the globules were broken up, and it was no longer milk. All that was done with this milk by the Swiss Company's process was to deprive it of the water. Microscopic observation showed that the substance of the milk, after condensation, was unchanged, and analysis of the water abstracted from the milk showed that the original properties of the milk were all retained. The process of manufacture was fairly given in the report of Dr. Liebig, a copy of which he furnished to the Committee. That report, however, did not go into the details of the extreme cleanliness which was obliged to be observed in the manipulation of the milk. On that account a spot was selected for the manufacture where there was an abundance of fresh water. The tanks and tins were cleaned with steam and hot and cold water, and steam was passed through them after the milk had been evaporated. The object of that was to render every

part of the apparatus perfectly sweet, and free from any taint from the milk previously operated upon; because, if anything was left behind which was liable to turn sour, not only would the company injure its reputation, but would suffer in pocket, inasmuch as the quantity of milk heated in one operation was generally as much as from 750 to 1,000 gallons. After the milk had been placed in the vessel it was heated by steam, and the milk was evaporated *in vacuo* at a low temperature. The whole process was completed in about two hours. As soon as the gauge indicated that the evaporation was completed, the steam was turned off, and the mass of milk so heated was put into tins, and closed up ready for use. He was not able to give all the details of the process, as the practical operator could do; but he would endeavour to lay some further particulars before the Committee on a future occasion.

The CHAIRMAN inquired with regard to the price of this article, comparing this with other forms of preserved milk, or butter, or cheese. Would it not be possible to sell this milk at a lower price than was now charged for it? It appeared to be about a penny per quart more than the price of the best London milk, which was liable to spoil soon.

Mr. MERRIAM remarked that as a set-off to that there was the sugar. It would amount to about sixpence per quart on the average. A canister of this milk, diluted to the consistency of ordinary London milk, would make about three quarts, and that would bring the price down to that of ordinary milk.

The Committee, having thanked Mr. Merriam for the valuable information he had given, then adjourned.

On Friday, the 13th December, the members of the Society and their friends attended at the Society's House to witness a practical demonstration of Captain Warren's apparatus for cooking for the army and other large bodies of people, and M. Sorensen's Norwegian cooking-boxes.* Messrs. Allen and Hanbury, Plough-court, Lombard-street, showed various soups made with the Liebig's *Extractum carnis*. Bread from the patent entire wheat-flour, from the St. James's-mills, Hatcham, was shown by Mr. Bonthron, of Regent-street, and the patent condensed milk by Mr. Merriam, of 95, Leadenhall-street. A description of Captain Warren's cooking apparatus appeared in last week's *Journal*. The apparatus shown was of a size suitable for cooking for 130 men, and the following is a statement of what took place:—

Weight of wood used	1 lb.
„ coals „	19 lbs.
Fire lighted	10.50 a.m.
Steam up	11.15 „

	Weight before cooking.		When put in.	When taken out.	Weight after cooking.†
	lb. oz.				lb. oz
Leg of mutton	8 14	"Warrenized"	11.15	1.45	7 12
Ditto	8 10½	Ditto and browned	11.15	12.45 [And put in oven and dished up 1·40.]	6 6
Ditto	8 4	Boiled	11.20	1.40	6 11
Chicken	2 10½	Roast	12.35	„	...
Ditto	2 6	"Warrenized"	12.35	„	...
Ditto	2 4½	"Warrenized" and browned	12.35	„	...
Ditto	2 7	Boiled	12.35	„	...
Potatoes	10 0	...	12.40	„	...

Attention was particularly called to the meat, which is termed "Warrenised" in the foregoing statement. It is cooked, as described in last week's *Journal*, in a dry heat, no water or steam being allowed to come in contact with the meat, which is placed in a tin vessel with a double skin, by means of which the steam circulates round the interior, keeping it hot, whilst no steam can get at the provisions. The advantage of this mode of cooking appears to be that the meat is more juicy, and that there is less loss in cooking. It will be observed, that while the legs of mutton cooked in the ordinary way by boiling lost 1 lb. 9 ozs. in 8 lbs. 4 ozs., or about one-fifth, the "Warrenised" leg lost only 1 lb. 2 ozs. in 8 lbs. 14 ozs., or about one-eighth. The meat which was browned in the oven showed a still greater loss, but it must be remembered that this joint was kept in the oven a very much longer time than was necessary, being there 55 minutes, instead of 15, the usual time allowed. A joint roasted in the ordinary way loses about one-third in weight.

The principle on which the Norwegian cooking apparatus acts was fully described in the Society's *Journal*, vol. xv. p. 664. It simply consists of a wooden box, lined with thick felt, with a close-fitting lid, also thickly lined with felt, by means of which the heat of any article enclosed in it is retained for a long time. The joint to be cooked is placed in a tin vessel, with water, and brought to the boil, and after so boiling for five minutes the vessel is placed in the box and the lid closed down; the heat being thus retained the cooking continues, and at the end of a given period the meat is found thoroughly cooked. On this occasion the dishes cooked were a leg of mutton, potatoes, greens, pea soup, Irish stew, boiled fowl, roast fowl, and beef-steak, the two latter articles being cooked by means of a layer of butter at the bottom of the tin instead of water. The dishes were heated in the Society's house, and the boxes sealed down until they were opened in the presence of the members, when the various dishes were found completely cooked.

Messrs. Bonthron's bread from the entire wheat was tasted by the company. It is a brown bread, and the flour of which the bread is composed contains all the constituents of the grain. The bran, which in ordinary flour is entirely separated from it, is, in this instance, re-ground very fine and again mixed with the flour.

A full description of the condensed milk, shown by the Condensed Milk Company, will be found on the preceding page.

Allen and Hanbury, of Plough-court, Lombard-street, exhibited Liebig's extract of meat, manufactured in Australia by Mr. Robert Tooth. Excellent soups made with the extract were provided for the visitors. They consisted of mullagatawny, julienne, and pea and barley soup; the last-named was made after the recipe that has been in use during half a century at the Spitalfields Soup Kitchen, extract of meat taking the place of fresh meat. The receipts for the three soups exhibited at the Society's House are appended, extracted from a little pamphlet, issued by Messrs. Allen and Hanbury, entitled, "True Extract of Meat, What it is and How to Use it," which contains a history of the manufacture of the extract in Australia, together with a large number of receipts for the guidance of families using it. Extract of meat lozenges were also shown. Each lozenge is stated to contain half its weight of the extract, thus offering a peculiarly advantageous form for taking it.

The receipts for the soups shown are as follows:—

Mullagatawny. (For two quarts.)—Cut into dice 6 onions, 4 ounces of lean ham, and one carrot. Melt 4 ounces of butter in a stewpan holding about 2 quarts; fry the ham, carrot, and onions, stirring them till they become slightly brown; add four ounces of best flour, and continue to stir for 10 minutes; now add three tablespoonfuls of curry powder, 1 apple cut into thin slices, 2 quarts of Stock No. 1,* and five teaspoonfuls of the

* Capt. Warren's apparatus is manufactured by Messrs. Adams and Co., 41, Marshall-street, Golden-square; and M. Sorensen's establishment is at 13, Duke-street, Grosvenor-square.

† There was a pint of the essence of meat in the cooker not accounted for in weighing when dished up.

extract of meat ($1\frac{2}{3}$ ounce); boil for one hour gently by the side of the fire; skim, and while boiling add a bunch of herbs, consisting of four sprigs of parsley, 1 of thyme, and 1 bay leaf; when done, rub through a tammy or hair sieve, heat till boiling, season according to taste, add the squeeze of a lemon, have ready some nicely boiled rice, and if convenient, serve with one piece of chicken to each person.

Potage Julienne. (For two quarts).—Cut into fine shreds 1 inch in length, 1 carrot, 2 turnips, 1 head of celery, 4 leaves of lettuce, and half an onion, and boil them in water for five minutes; strain and put them into a stewpan with a pinch of pounded sugar and a piece of butter the size of a walnut; cover them down closely till they begin to brown; add two quarts of Soup No. 8;† boil till the vegetables are done, and serve.

Pea and Barley Soup.—Extract of meat one ounce, pearl barley $\frac{1}{2}$ lb., split peas $\frac{1}{2}$ lb., onions 1 oz., salt (according to taste) say $1\frac{1}{4}$ oz., pepper (according to taste) say 30 grains, water sufficient to make up to 1 gallon; soak the pearl barley and peas in water for 24 hours; then boil for 4 hours with the onions (chopped fine), salt and pepper, and lastly dissolve the extract of meat in the boiling liquid.

This is adapted as a cheap soup for distribution to the poor, and is stated to be nutritious and agreeable; it may be made richer and better adapted for family use by increasing the quantity of the extract of meat.

The following table for making this soup in various quantities may prove useful:—

To make	1 Gallon.	4 Gallons.	12 Gallons.	20 Gallons.	40 Gallons.
Take of					
Extract of Meat	1 oz.	4 ozs.	12 ozs.	$1\frac{1}{4}$ lb.	$2\frac{1}{2}$ lbs.
Pearl Barley	$\frac{1}{2}$ lb.	2 lbs.	6 lbs.	10 lbs.	20 lbs.
Split Peas	$\frac{1}{2}$ lb.	2 lbs.	6 lbs.	10 lbs.	20 lbs.
Onions	1 oz.	4 ozs.	12 ozs.	$1\frac{1}{4}$ lbs.	$2\frac{1}{2}$ lbs.
Salt (according to taste) say	$1\frac{1}{4}$ oz.	5 ozs.	15 ozs.	$1\frac{1}{2}$ lbs.	3 lbs.
Pepper (according to taste) say	30 grs.	$\frac{1}{4}$ oz.	$\frac{3}{4}$ oz.	$1\frac{1}{4}$ oz.	$2\frac{1}{2}$ ozs.
Water, sufficient to make up to	1 gall.	4 galls.	12 galls.	20 galls.	40 galls.

Cantor Lectures.

"On Art; especially including the History and Theory of Sculpture." By Richard Westmacott, Esq., R.A., F.R.S.

Lecture 2.—Friday, December 13.

In urging upon those who really take an interest in art, the value and importance of education in its principles and position, the lecturer said he had, on the last occasion, referred to it as a means of increasing their enjoyment in looking at works of art, and of giving them self-reliance in forming a judgment on the merits of a picture or a piece of sculpture. He should, this evening, endeavour to place before them the various recommendations that a study of art possesses beyond its charm as an exponent of sentiment or of beauty, whether in form or colour. The public was not only generally uneducated in practical art, but it was equally uninformed in its history, and the important functions it fulfilled, as a contemporary record of the state of nations and of their civilisation, when the more ancient works were produced. As illustrations of the condition and habits of the people amongst whom it was, in its first ages, practised, the remains of old time had an interest far beyond what any modern art could offer. Monuments of sculpture, especially, were, at one time, the only records of memorable events. They pourtrayed the great acts of kings, heroes, and conquerors. They marked important historical incidents; and from them we had acquired an insight into the mythology and the poetry of the ancients. In these representations we had most curious and reliable authority for the costume and habits of remote nations of whom there was no written or other recorded account. Here, then, they stood out with an interest entirely their own, and independent of any recommendation, as regarded art excellence. There could be few present who had not seen the sculptures from Egypt, Spain, Hindustan, and from early Greece and Asia Minor, now collected in our British Museum. Some of these were of extraordinary antiquity, and we felt grateful for their preservation, while we stood, with a feeling akin to veneration, before works executed long prior to any written history. The monuments of Egypt probably mounted up to not less than 2,000 years before the Christian era. The sculptures brought from Nineveh and its neighbourhood, exhibited a comparative perfection of workmanship that showed long practice; yet we knew that the wonderful city from whose ruins they were exhumed, was utterly destroyed above 600 years before Christ. This comprehended a period of nearly 2,500 years, and many of the sculptures must have been executed long before this event. Incidentally the peculiar symbolic treatment of these monuments was explained, in the union of intelligence, force, and motion or activity, in the colossal and other figures where the human head appeared joined to the powerful muscular body and legs of the lion or bull, while enormous wings expressed the capability of rapid motion. The sculptures of the Parthenon from Athens, though not amongst the earliest works of Greece that might be referred to, had also that extra interest which was afforded by the certainty that from the age of Pericles all the greatest men of ancient classical times—generals, poets, historians, philosophers—had contemplated and doubtless admired those very productions. In the larger number of the older works of Assyria and Egypt, there were the most minute representations, both in painting and sculpture, of the everyday habits of the different nations; their wars and conquests, their amusements, their occupations in handicraft, their building, boating, in short, all the various business of life. Here, surely, was sufficient to give an absorbing interest to representative art, simply in its function of illustrating human life and progress.

The lecturer then proceeded to give a rapid review of the different schools of sculpture from the most ancient period. At about 450 years before Christ, sculpture, hitherto treated without reference to any art-excellence, began to be practised on a new basis. It was then not only used to illustrate the religious myths and heroic deeds of the Greeks, in the rude style of the earlier time, but the principle was introduced that these noble subjects should have their expression in the most perfect forms. Then began an entirely new phase of art, most important in its history, which made Beauty a condition of its practice. The school which ranked highest in this noble achievement was that under Phidias and his contemporaries, when the most sublime subjects were represented under the most majestic and dignified forms. To this succeeded the school of Praxiteles, who, departing from the more severe and pure treatment of the previous artists, made beauty itself the object and end of art. This, though the subjects were still religious, introduced a sensuous style, in works of exquisite and attractive execution. It was a downward step in art, because it made its appeal to the eye and sense alone, and not to the purer and more noble sentiments. After this came the school of Lysippus, which still further deteriorated from the high standard of the greatest masters. He was the favourite sculptor of Alexander the Great, and it was under that ambitious, self-glorifying monarch that portrait-sculpture was first introduced. Here individual character and details were studied, instead of the larger,

* Stock No. 1 is simply the liquor from boiled meat or bones, seasoned.

† This soup is "clear gravy soup."

general type of form seen in the most perfect works of nature; and, although productions of great merit were supplied by the sculptors of the period, and for some short time after the death of Alexander, the most perfect style of art ceased to be the object of study. The time during which sculpture, in its finest form, flourished, was comprehended in the comparatively short period of 200 or 250 years. The lecturer then traced what he called its downward course to later times—to its existence among the Romans, where, owing to the peculiar character of the nation, what was termed fine art, as it had been practised in Greece, excited little or no sympathy. The lecturer took occasion, after still further extending his survey, to return to the proposition with which he set out—namely, that there were many grounds of interest to recommend art to the attention of thoughtful and cultivated persons beyond its attractions as a means of mere representation or imitation, and as the outward expression of sentiment and beauty. He concluded by hoping he had succeeded in impressing this fact upon many present who, probably considering painting and sculpture only in an objective point of view, had not carried their interest in it beyond the pleasure it was capable of affording them as material art. This, of course, in these days was a great purpose of painting and sculpture; but the earlier function it fulfilled gave a dignity and character to its history which deserved the recognition of all persons of reflection and education. The higher the estimation in which any object was held the greater its interest and the reason of its attractiveness to all persons of sensibility and of cultivated minds. The lecturer said his purpose in dwelling on the uses and application of art in the earlier ages, its history and progress, independently of its material charm, was to incite this extra interest. He should be very glad if anything he had said or might say on this subject should be the cause of inducing those who attended his discourses to feel the importance of education in the history and principles of art; and to acquire themselves, and, if they had the opportunity, to extend to others, the knowledge which would so surely open to them a wide field of intellectual enjoyment and delight.

FIFTH ORDINARY MEETING.

Wednesday, December 18th, 1867; THOMAS WEBSTER, Esq., Q.C., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Caley, J. W., Norwich.
Duckett, Sir George F., Bart., Fangfoss-hall, Pocklington, Yorkshire.
Parker, John, 11, Goldsmith-street, E.C.
Ridgway, Matthew, Dewsbury, Yorkshire.
Smith, Griffiths, 2, The Grove, Highgate, N.
Webber, Thomas, 82, Lombard-street, E.C.
West, W. Cornwallis, Hedgebury-park, Cranbrook.

The following candidates were balloted for, and duly elected members of the Society:—

Atkins, Samuel Elliott (Deputy), Cowper's court, Cornhill, E.C.
Bath, Charles, Pfynone, Swansea.
Crowther, George Henry, Bond-terrace, Wakefield.
Davis, Lewis, 7, Bute-crescent, Cardiff.
De Jersey, Henry (Deputy), 13A, Gresham-st. west, E.C.
Dimsdale, Robert, M.P., 11, George-st., Hanover-sq. W.
Dodd, G. Ashley, 40, St. James's-street, S.W.
Fellows, Frank, Hampstead, N.W.
Haywood, W., Guildhall, E.C.
Jenkinson, William, 44, London-wall, E.C.
Legg, Cyrus, 192, Bermondsey-street, S.E.
Levick, John Musgrave, 27, Great Winchester-st., E.C.
Lindroth, Gustaf W., Drottinggatan, Stockholm, Sweden.
Miller, W. M., Tonic Sol-fa Choral Society, Glasgow.
Montgomery, Sir Robert, K.C.B., 7, Cornwall-gdns, W.
Page, Charles H., Dulwich-house, near Cardiff.
Phillips, J. S., 54, Euston-square, N.W.
Sims, Davis, 3, Bartholomew-lane, E.C.
Warne, Frederick, 15, Bedford-st., Covent-garden, W.C.
Woodley, Thomas, 74, Aldgate High-street, E.C.

The Paper read was—

ON THE PRINCIPLES THAT GOVERN THE FUTURE DEVELOPMENT OF THE MARINE BOILER, ENGINE, AND SCREW PROPELLER.

BY N. P. BURGH, ESQ., C.E.

I have separated the subjects I have this evening brought before your notice into three sections—Section A, the marine boiler; Section B, the engine; and Section C, the propeller.

SECTION A.

The principles on which the marine boiler is founded are the action of combustion, which produces heat; the conduction or passage of the heat through the plates and tubes; and the action of the heat and water combining, thus forming steam. There are obviously, therefore, three separate functions to be noticed, and if either is neglected, a proportionate amount of power is lost or is not developed; therefore, in dealing with this subject the properties of each portion must be duly considered. To begin, then, I must allude to the quantity of heat in the fuel and the correct mode of extracting it. The chemical properties of coal are, free carbon, hydrocarbons, water or oxygen, and hydrogen, and solid matter termed ash; the proportions of these vary considerably; in some instances, the solid matter is 25 per cent., while with superior coal only 6 or 10 per cent. The products of combustion, according to Professor Rankine, are carbonic acid gas, nitrogen, air, ashes, and steam in the following proportions:—

	Value.
Carbonic acid gas	·217
Nitrogen........................	·245
Air	·238
Ashes	·200
Steam	·475

The mean value of these products is ·275, but the Professor prefers the lower value, ·237, as the mean specific heat. The total amount of heat that is in one pound of ordinary coal is 14,500 units; but for marine purposes 14,000 will be a nearer equivalent. Then, as there can be no combustion without the admission of air into the fire-box, I must next notice the amount of air requisite per pound of fuel consumed, which is, on the average, about ten pounds of air per pound of coal. Some authorities estimate it as twelve pounds, but I think the former amount the more practically used. It must not be forgotten also that, exclusive of the oxygen requisite for combustion, air is required in the form of draught, so that totally twenty pounds of air per pound of coal consumed is admitted into the furnace.

If it is required to know the maximum amount of heat in a furnace, the following formula is used:—Divide the total heat in 1lb. of coal by the least amount of air in lbs., plus 1 lb. of fuel multiplied by the mean specific heat, and the quotient equals the number of degrees Fahr. Suppose, for example, the following figures:—

Total heat = ...	14,000..h
Amount of air requisite for combustion..	19 lbs...a
Coal in lbs.	1 lbs...c
Specific heat in the coal	·237..s
Temperature of furnace	x

Then $x = h \div [a + c \times s]$ or equal to 3,059 deg. Fahr. You have therefore the fact before you that there is a known amount of heat in a certain quantity of fuel, and the fault is ours, not that of the coals, if we do not extract that heat, and absorb it by the water surrounding the heating surfaces.

What indeed is most productive of economy in fuel is time for combustion; and with marine boilers, the time transforms itself into cubical space for the heat to be generated, and into heating-surface for the water to absorb it.

The diagram No. 1 is a section of a marine boiler of the latest arrangement, excepting the combustion-chamber, which in its usual form is shown by dotted lines, and the altered form in full lines. It will be seen that the action of the flame is attended to by curving the back and top of the combustion-chamber, for there is full evidence in most boilers that the flat or square top chamber does not receive the impact of the flame. Thus it is the contact of the flame with the surface that will produce evaporation, and if in any arrangement the action or traverse of the flame is not noticed, a waste of effect must result. It is evident that the flame inclines towards the tube-openings, and that the form of the flame's natural circuit is a curve from the fire-box into the combustion-chamber. It is obvious, therefore, that if the fire-box is prolonged, and the combustion-chamber enlarged, with its back-end curved, a better result will be obtained.

This management was advocated in a most extreme manner by Mr. C. Wye Williams, about ten years ago, in his prize essay on "Smoke Consumption," for which the Society of Arts awarded the Gold Medal.

In considering the action of the flame on the tube plate, we must remember, that surface is perforated, and thus a certain amount of free passage is permitted. Now, the crown of the furnace, also the back and sides of the combustion-chambers, are solid surfaces; but not so the tube-plate—it is an amalgamation of hollows and solids, and, although the flame may be driving directly against it, the hollows take off the effect from the solids, because the flame flows into the openings, and the intervening surfaces receive nearly a gliding action in effect. I may here add, I stated some years ago that the flame's action on the tube-plate must be thus—"The flame conforms to the required shape before it can enter the tubes, and therefore a total disturbance beyond or in front of the plate ensued; but that the greater the draught, the more would the tendency to an impact on the plate occur; and also that in some cases minute hollows were formed and destroyed in succession with such rapidity, to ensure nearly the actual contact of the flame and the surface between the tubes.

I must now allude to the flame's action within the tubes. In this instance we have a parallelogramic passage for the flame to traverse, and therefore the impact of the flame is sliding, not direct; a loss of effect therefore occurs; so that, if the flame were retarded in its progress, more time would be allowed for absorption. It is for this reason, I believe, taper tubes will be eventually used.

Now about the length of the tubes. Doubtless most here will agree with me that it is due to the want of space that they are as short as they are, and that the longer a tube is the more evaporation must ensue. In locomotive boilers the tubes are about 2in. in diameter, and 10ft. 6in. to 11ft. 6in. long, being an average of 66 diameters for the length; but with marine boilers 7ft. is the maximum length, and the diameter 2½ to 3in., being a proportion of about 35·4 diameters, or, in round numbers, about half of the locomotive practice.

While noticing the conduction of heat, I may as well remark that it is generally acknowledged by various authorities on that subject that the value of the absorbing power of any body is in an inverse ratio to its reflective property, or, in plainer terms, a body that is a good absorbent is a bad reflector, and *vice versa*; but in the present case we do not desire to absorb the heat for a time, and give it out after by radiation, but rather to conduct the heat immediately into the water, amalgamate with it, and produce the vapour known as steam. Now, if we notice the conductive property of metals, we shall have no difficulty in coming at their relation for evaporative purposes, from the following table:—

	Conductive property for transmission of heat.
Copper	1,000
Brass	468
Wrought iron	336
Cast iron	311

Here it is evident that copper is the best agent for the conduction of heat; but we have not only "heat" to consider but also the strength of the material while it is performing the act of conduction, to which matter I will next allude by the following table:—

	Tenacity in lbs. per sq. inch.
Copper (cast)	19,000
Brass ,,	18,000
Gun-metal (cast)	36,000
Iron (wrought)	51,000
Iron cast	20,000

Now, as the tenacity of gun-metal exceeds that of copper, the former is mostly used for tubes, being next in strength to wrought iron. I may here allude to the fact that large wrought-iron tubes have been used with much success.

In my own practice, for general purposes, I consider the following proportions of the value of heating surfaces:—

Fire box—		
Crown, surface	1·000	value.
Sides above fire-grate	·500	,,
Combustion chamber—		
Crown and part curved back surface	1·000	,,
Tube-plate, effective surface	·875	,,
Back (curved)	·503	,,
Ends	·400	,,
Tubes—		
Total length (if copper)	2·976	,,
,, (if gun-metal)	2·5	,,

Now these values can be increased by allowing more time and draught for combustion, so as to burn the carbon which otherwise accumulates on the surfaces in question, and the carbon being a non-conductor, the value of these surfaces becomes gradually lessened, and the plate burnt.

The preceding calculations refer to coal or solid fuel. Lately, however, liquid fuel has been introduced, in the form of mineral oil, such as petroleum and parafine; these liquid hydro-carbons have given out fair results in some instances, more especially the former. A great deal of information in this matter can be gathered from a paper by Professor Rankine, "On the Economy of Fuel, comprising Mineral Oils," read at the Royal United Service Institution, a little time back. In the discussion it was elicited from Mr. Richardson, C.E., that "liquid hydro-carbon will evaporate 16lbs. to 18lbs. of water per lb. of fuel, and that 200lbs. of the liquid fuel would produce as much as 600lbs. of coal," being in fact a ratio of three to one against the latter fuel. Now the evaporative power of coal is generally about 8lbs. of water to 1lb. of coal in practice, but sometimes as low as 6lbs., so that if Mr. Richardson's figures are founded on practice the liquid fuel has a great advantage over the solid kind.

Having discussed the formation and conduction of heat in the marine boiler, I will next allude to the formation of the steam. To enable you to fully appreciate the value of a certain quantity of heat generated, I will quote from Professor Tyndall's work on "Heat as a Mode of Motion," wherein he states that Mr. Joule found that "the quantity of heat which would raise one pound of water one degree Fahrenheit in temperature is exactly equal to what would be generated if a pound weight, after having fallen through a height of 772 feet, had its moving force destroyed by collision with the earth. Conversely, the amount of heat necessary to raise a

pound of water one degree in temperature, would, if applied mechanically, be competent to raise a pound weight 772 feet high, or it would raise 772 pounds one foot high. The term 'foot-pound' has been introduced to express in a convenient way the lifting of one pound to the height of a foot. Thus, the quantity of heat necessary to raise the temperature of a pound of water one degree Fahrenheit being taken as a standard, 772 foot-pounds constitute what is called the mechanical equivalent of heat," which fact is worthy of more universal attention than at present.

The direct conversion of the water into steam, I believe, is spherodial, *i.e.*, the water is formed into minute oblate spheres filled with the heat, after which into globes, and thus is passed into what is termed saturated steam; but also bear in mind that the more heat put into the water, or the higher the pressure of the steam, the thinner and smaller will the spheres be, and therefore the lesser saturated the steam. This law is the cause for superheating the steam, and putting a safety-valve on the superheating chamber to prevent an explosion from the further generation of steam in the superheater.

Next as to the cause of incrustation and priming. In considering the former, I must first direct your attention to the analysis of the sea-water, consisting of as follows in relative quantities:—

Water	964·745
Chloride of Sodium	27·059
Chloride of potassium	0·766
Chloride of magnesium	3·666
Bromide of magnesium	0·029
Sulphate of magnesia	2·296
Sulphate of lime	1·406
Carbonate of lime	0·033

Generally there are only traces of iodine and ammoniacal salt, and the average specific gravity of the water is about 1·0274 at 60° Fahr. Now it is evident from the above figures that about $\frac{1}{28}$th of the total bulk is soluble matter.

The effect of incrustation on the heating surfaces is, that in proportion to the amount of solid matter accumulated, combined with its non-conductive property, so will the evaporation be retarded, and the relative plate exposed to the action of the flame be burnt, so that two evils are produced actually from one cause. Now there is no difficulty in the present day in preventing incrustation entirely, simply by using surface condensed steam as feed water; but when this is used alone, the boiler suffers from the galvanic action of the mineral property and grease in the water, which the latter has robbed from the surface condensers and cylinder. It will be remembered I have stated that the incrustation formed by the sea-water is almost a non-conductor of heat; it is also a non-conductor of galvanic action to some extent, therefore, by allowing a certain amount of sea-water to mingle with the surface condensed feed-water, the internal surface of the boiler below the water level is coated to a thickness of about one-sixteenth of an inch, and thus the pitting or wearing of the plate is prevented.

The origin of priming can be traced from various sources, such as imperfect distribution or circulation of the water in the boiler, proportionate to the value of the heating surfaces; insufficient steam space; shallowness of the steam space; sudden escape of the steam, or an extra rush of steam into the cylinders; change of feed water; and the opening of the throttle-valve too wide. I have often found the latter cause more certain than any other; and doubtless it is due to the exit of the steam exceeding the formation to some extent, and the water rises after the steam, or follows in its wake; it is for this reason, also, I have known high boilers to prime less than low ones. Another remedy is, to make a chamber inside, at the roof of the boiler, extending around the sides and ends; the steam enters this chamber through perforators or slots; and a plate at an angle beyond them prevents the water from entering also, unless in extreme cases. The advantage of this arrangement is obvious, when it is remembered that the steam is compelled to escape equally from the total area in plan; whereas, with an ordinary steam pipe opening, the rush is always at that locality. A third, and the latest, guard against the evil is a cylindrical vessel in the engine-room, which is close to the throttle-valves, and is so arranged, that, in the event of priming, the water so separated from the steam, and is received into the vessel, instead of going with the steam in the cylinders.

I have thus laid down the principles for further improvement, and my own conclusions are, that as heat is the prime mover, to it we must turn more of our attention, and in the place of 30 lbs. on the square inch, 60 to 80 lbs. for the steam pressure must be adopted for universal practice.

The following table of the proportions of marine boilers by the leading firms of England and Scotland terminates this section:—

Name of firm.	Name of ship.	No. of fire grates.	Length and breadth.	No. of tubes.	Length and external diameter.	Indicated horse power.	Consumption of fuel per hour per indicated horse-power.
Messrs. Penn	H.M.S. *Arethusa*	16	7 ft. by 2 ft. 10 in.	1,216	7 ft. by 3 in.	2,871	From $2\frac{1}{2}$ to 5 lbs.
,, Maudslay	*Roma & Venetia*	30	7 ft. 6 in. by 3 ft.	3,600	6 ft. 6 in. by $2\frac{1}{2}$ in.	...	
,, Rennie	*Charkieh* and *Dakahlieh*	12	6 ft. 6 in. by 3 ft. 6 in.	120	7 ft. by 3 ft 9 in. deep & $2\frac{1}{2}$ in. wide	1,166	
,, Watt	*Medusa & Triton*	10	6 ft. 6 in. by 2 ft. 11 in.	800	5 ft. 8 in. by $2\frac{1}{8}$ in.	1,040	
,, Napier	H.M.S. *Hector*	24	7 ft. 5 in. by 3 ft. 2 in.	3,168	6 ft. 6 in. by $2\frac{1}{2}$ in.	...	
,, J. and W. Dudgeon	*Ruahine*	10	6 ft. 6 in. by 3 ft. $1\frac{3}{4}$ in.	608	560 = $3\frac{7}{8}$ in. and 48 = $2\frac{3}{4}$ in.	1,540	
			Area of fire-grate surface.	Total heating surface.			
,, Humphrys	H.M.S. *Pallas*		420 ft.	11,400 ft.		3,768	
,, Ravenhill	H.M.S. *Lord Clyde*		700 ft.	Tubes, 19,000 ft.		6,065	

Section B.

I have shown you in the preceding section that steam is simply composed of heat and water, and you are also aware that the higher the pressure of steam, the more heat is put into it. Now, any heat wasted, bear in mind, is actually fuel consumed without effect, which is the reason for steam jacketing the cylinders. Were there time and space I would prove to you that the loss of heat by radiation, both with the boiler and engine, is considerable, and that tons of fuel consumed have never performed any duty. To mend this we must work the steam expansively, with high pressures, and simple gear for the cut-off—not to be used as a plaything, but as a requisition of practical value.

The theoretical law governing the rate of expansion is that, inversely as the cubical contents for expansion increases so will the pressure be reduced; which converts the following formula. To the cubical contents

for the supply add the cubical contents for expansion; divide this sum by the cubical contents for supply; the initial pressure of the steam divided by the quotient equals the pressure of steam when expansion terminates.

The valve I believe most practical for sea-going engines is the ordinary equilibrium, double-ported valve, of present universal use by the London engineers; and I think our attention, as engineers, knowing the value of a simple motion at sea, should be turned to perfecting this valve and the link motion, rather than running after foreign ideas composed of complicated arrangement and fancifully-formed valves.

The principles of the motion requisite for the slide-valve I have illustrated by the diagrams appended, which show the slide-valve of the latest proportions and the various lengths of eccentric rods, with the results of the proportions of those lengths, and positions. No. 1 depicts the position of the valve for lead; No. 3 for full steam; and No. 5 for cut-off, being the main positions during the entire motion of the piston. You will observe, I have shown the travel of the slide by the circle in dotted lines, also the length and angle of the eccentric rod in each case, while Nos. 2, 4 and 6, are the angles when the valve has a retrograde motion.

Than I ask your strict attention and remembrance of this fact, that as the position of the piston is affected by the connecting rod, so will the slide-valve be affected by the length of the eccentric rod; both travels are circles, and both rods are radii of larger circles; and put the matter in any form you prefer, these facts are the same. We know that the connecting rod is a radius, whose arc, intersecting with the centre line of motion, will denote a relative position for the piston, and therefore in no case can the angles of the crank be alike, when the positions of the piston are of equal distances from the ends of the stroke.

Now the eccentric's travel and rod are subject to the same cause, therefore the effect must be the same as I have already stated. Turning to the diagrams again for further explanation, No. 7 represents the circle of an eccentric travel, 11 inches in diameter, the lead for the valve being $\frac{1}{2}$ inch, outside lap 4 inches, width of steam supply opening, caused by the valve, $1\frac{1}{2}$ inch, and length of eccentric-rod only 36 inches. Now, notice that the length of the chord cutting the circle nearest the valve, is shorter than the one opposite; hence the versed sines, V V, are, in relation to that circumstance, also due to the radius of the circle being unalterable. The valve having an equal lead when the piston arrived at each end of its stroke, the points L L are due to the length of the eccentric rod, which determines an unequal position for the angle of the eccentric alone, and below the centre line. Here I may mention that the eccentric in practice moves with the crank, and no change of angle can ensue; but it is essential in the present instance to assume the angles changed due to the length of the eccentric-rod, if an even lead is required. The points, C C, are the angles of the eccentrics when the valve is cutting off the steam, and as the arc, L V, above the centre line is unequal to L V below opposite, so will V C above and V C below be unequal.

Compare next the diagram No. 8 with the one I have just explained. Here the eccentric's travel is only $3\frac{1}{8}$ inch—being for the valve shown by Figs. 1, 3, and 5, the lap being 1 inch, lead $\frac{1}{4}$ inch, width of opening 9-16 inch—but the eccentric-rod is in this case $46\frac{1}{2}$ inches long, so that L V and V L are nearly equal, and C V and V C bear a similar comparison with each other, and make no different relation in the versed sines. In No. 7 the lead is $\frac{1}{8}$th of the outside lap, but in No. 8 the lead is half of the lap, while the versed sines, V V, in the latter example, are nearly equal to each other.

No. 9 is another proportion; the outside lap is 2 inches, lead $\frac{1}{8}$th or 1-16th of the lap, width of opening caused by the valve, $\frac{3}{4}$ inch, diameter of eccentric circle, 6 inches, and the length of the eccentric-rod $41\frac{1}{2}$ inches. Here C V and V C are nearly equal; also L V and V L bear the same relation; also the versed sines V V.

I have further demonstrated by the diagram No. 10, that the versed sines of the crank and eccentric are alike in proportion. It is seen the crank has passed through equal arcs, also the eccentric, hence the cords and versed sines are relatively equal, but the grades of expansion, P P, are, of course, unequal. We shall understand this better from the diagrams Nos. 11 and 12. The cranks, C C, are shown in opposite directions, and the angles of the eccentrics, E E, due to the lead required; when the crank in No. 11 is rising, the eccentric is descending, as shown by the arrows, and reverse in No. 12. Another fact is, that this unequal expansion is also due to the connecting and eccentric rods being on the same side of the crank-shaft, so that the arcs of position, for both piston and valve, are in the same direction. This is the fault with all direct-acting engines, and although the fault may be remedied by unequal laps and leads, the principle of the action remains the same, hence this axiom, "that either lead or expansion must be unequa with direct-acting engines."

Now, having shown the bane, I will produce the antidote given by the diagrams Nos. 13 and 14. This is the return-acting type of engine as far as the position of the connecting-rod and slide-valve are affected. The arcs of positions for the piston are equidistant from the limit of the circle, C C; the arcs passed through by the cranks, C C, are, of course, unequal, and those described by the eccentric are the same. When the crank is on the horizontal line, the angle of the eccentric is shown by the dotted line above the horizontal line, and as the crank on rising passes through a certain length of the eccentric circle, the eccentric descends through a similar distance. Now the length of the connecting rod, C R, is five cranks or radii of the crank circle, and due to that length are the arcs of position. I must solicit your earnest attention to the fact that those arcs incline in a certain direction, to which I shall again refer.

The slide-valve is located opposite the connecting-rod, C R, and the length of the eccentric-rod E is five radii of the eccentric circle. The arcs of the valve's positions are thus relative, in a contrary direction to those for the piston. These arcs, therefore, being proportionate, but in opposite directions, a relative action must be certain.

Referring again to the unequal grades of expansion liable with direct-acting engines when the valve and connecting-rod are on the same side of the crank-shaft, I direct your attention to the enlarged diagrams, Nos. 15 and 16. Each were originally taken from opposite ends of the cylinder, and the difference in the positions of the piston at the points of cut-off termination of expansion and exhaustion, also the variation in the commencement of compression are faithfully depicted. You will notice that the length of supply steam is more in No. 15 than in No. 16, so that the points for cut-off must be unequal; also, that although the lengths for expansion are nearly equal, the termination of these points is nearer the end of the stroke in No. 15 than in No. 16. But there is a reverse action with exhaustion, being longer in No. 16 than in No. 15. With compression, No. 16 has also the advantage, being shorter than No. 15.

Having proved that the length of the connecting and eccentric rods, lead, and width of opening caused by the valve, determines the outside lap of the valve for a given grade of expansion or cut-off, I have condensed this matter into the simplest formula possible, in connection with my former statements and diagrams. To find the outside lap of the valve for any grade of expansion—divide the radius of the crank by the versed sine of the crank, multiply the quotient by the versed sine of the eccentric; the product, minus the width of the supply opening caused by the valve, equals the outside lap. The versed sine of the eccentric is the width of steam supply opening caused by the valve, minus the lead as a rule, but in exceptional cases, as shown, half the lead only.

With reference to the link motion, I have not time to enter into that subject, but you will be satisfied, I trust, when I state that it can be arranged and proportioned to suit any requirement, which, in a future paper, I will explain.

I have now finished with the use of the steam as a power, and will presume exhaustion is taking place from the cylinder. This steam, bear in mind, is but heat and water; and if I extract the former, I have only the latter remaining. Now there are, as well known, two processes of doing this: either by water in contact with the steam, or a portion of metal intervening to prevent that contact, which, in technical language, are injection and surface condensation. The principle, then, is alike in each case; heat is extracted, or absorbed, by a cold power of continuous action; but mark the practical difference in arrangement. With the injection system, the cold water is converted into a spray of minute streams, or sheets, against which the steam rushes, and instantaneous amalgamation is the result, the water falling between the points of contact containing not only the heat, but the water also which formed the steam. An ordinary hollow vessel, of proportionate dimensions, with the injection-pipe, air-pump, and valves are all that is requisite. But with the surface condenser, tubes, circulating and air-pump valves, and casing are requisite. It becomes, indeed, a matter of surface for the cold water to act on, and the steam to be in contact with. You will remember I have told you that "time" for the absorption of heat is a great essentiality with marine boilers; and you will clearly understand me now, when I repeat that "time" bears the same relation for surface condensers, for the heat is extracted in either case, therefore the principles must be the same.

There are at present two kinds of surface condensation, internal and external; of course each has faults and advantages, to which I will briefly allude. To assist me in my endeavour to make myself understood, kindly direct your attention to the diagrams Nos. 17 and 18. You will perceive that with the steam inside (No. 17) the heat is absorbed by the water outside, in the direction of the arrows, which depict an expansion from the centre. Notice next No. 18, which shows the steam outside and the water in; here the heat is contracted to the centre, being a direct contradiction of the action in the former example. You will thus understand that with inside condensation a gain of area is effected, simply due to the direction of the rays of heat; they expand with the water outside the tube, but contract with the reverse locality. In the diagram No. 19 I have shown the horizontal action of condensation, proving clearly that taper tubes are as essential in surface condensers as in marine boilers.

I must now direct your attention to the great question of friction, and in so doing I will be as brief as possible. I will set aside, too, the cause for friction, for that I think you all know, and will therefore confine myself to the main effect, viz., the heat generated and the power absorbed. I think the generation of heat from friction is due to electric action, and the mechanical effect is that the atoms of the surfaces of the material in contact are disturbed, and are actually in motion so much as to grate against each other, and thus absorb the power which is required to keep up the speed of motion. I have had full evidence of this with heated bearings, for by strengthening the bolts, and a plentiful supply of spring-water, the two faces were reduced to their normal condition. I therefore permitted the metal to expand, or the atoms to be released from each other, and the cold water absorbed the heat caused by electric action.

The friction of the working surfaces in contact with marine engines is considerable; and I am afraid it is too often set aside, as unworthy of notice, that the lighter the running load of an engine is, the less the friction incurred, and the inertia to be overcome. Now there is no mystery in this, for it is indeed a matter of so many pounds weight to be overcome, or pushed forward and backward. And you will, I know, agree with me that the least weight of material having a retrograde motion, the lighter can the piston-rod, connecting-rod, and cross-head be formed. Remember that every pound of material shifted by the steam, requires an equivalent amount of fuel, and if you reduce the former, simultaneously the expenditure of the latter is reduced also. I could extend my views on this subject, but I have others of equal importance to lay before you, and I have given a table of the frictional surfaces of marine engines by three of the principal firms in London, which will give you more *bona-fide* information than any description:—

TABLE OF FRICTIONAL SURFACES.

Name of Detail.	Messrs. Penn's Trunk Engines, 500 h. p. nominal.	Messrs. Maudslay's Return-acting Engine, 900 h. p. nominal.	Messrs. Humphreys' Direct-acting Engine, 400 h. p. nominal.	Nature of Friction.
	Area in square inches.	Area in square inches.	Area in square inches.	
Steam Pistons	4884·6	6559·2	3984·3	Sliding.
Air-pump Pistons	753·6	832	1104	Sliding.
Steam Piston Rods, Stuffing Boxes	5390·84	1529·6	700	Sliding.
Air-pump Rods, Stuffing Boxes	354	600	309·6	Sliding.
Slide Valves, Rings and Rods	3546	4244	3622·52	Sliding.
Guides for Slide Rods	144	201·6	400	Sliding.
Connecting Rod Pins	396	681·5	175	Revolving.
Guide Blocks	none	899	742·5	Sliding.
Crank Pins	728	962·5	466·4	Revolving.
Crank Shaft Bearings	4550	5785	349·8	Revolving.
Eccentrics	716	1036	693	Revolving.
Eccentric Pins	57	110	40	Vibrating.
Link Block	48	50	72	Vibrating.
Feed and Bilge Pumps	753·6	796	637	Sliding.

Next you will find a table of the weights of the permanent load of marine engines; also of the several details, boilers, &c., kindly given by several notable London firms:—

WEIGHTS SUPPLIED BY MESSRS. WATTS.—DIRECT ACTING ENGINES, 976 H. P. ACTUAL.

	cwts.	qrs.	lbs.
Piston	19	2	26
One piston-rod	4	2	16
Cross-head and guide-block	4	3	6
Connecting-rod	10	0	2½
One main shaft with balance weights	60	2	0
One slide valve	9	0	0
One slide valve-rod	0	1	0
One guide or cross-bar	0	2	16
One link	1	3	24
Two eccentrics (2 0 18) and two rods (5 2 15)	7	3	5
Two plungers for air and circulating pumps	3	3	4

	cwts.	qrs.	lbs.
Six pieces of rods	1	3	16
Water in condenser	0	0	0
Two plungers for feed and bilge pumps	1	1	18
One turning gear wheel, with friction clutch and cone	45	0	0
Screw shafting	118	1	0
Screw propeller	43	2	0
Two engines 100 h.p. (nominal)	767	2	15¼
Condenser	245	2	0
Propeller and apparatus	159	3	6
Boiler	932	3	17
Fittings	117	3	26½
Water	0	0	0
Coal boxes	168	2	17
Donkey engine 9in.	32	3	2

Weight of Machinery and Boilers, 1,380 h. p. actual, fitted in the "Mary" and "Bolivar," Twin Screws, by Messrs. Dudgeon.

	Tons.	cwts.	qrs.	lbs.
Two pistons	0	19	2	0
Two piston-rods and guide-blocks	0	9	1	20
Two connecting-rods	0	11	3	0
One main shaft and crank	1	4	3	0
Two slide valves	0	5	1	0
Two " rods with pins, &c.	0	0	3	16
Two links	0	0	3	16
Four eccentrics and rods	0	8	1	0
Two pump-rods and pistons	0	1	1	0
Water in condenser	1	5	0	0
Feed and bilge plungers with levers	0	2	1	0
Turning wheel	0	10	2	0
Screw shafting	5	4	0	0
Screw propeller	1	8	2	0

Total weight of engines, condensers, and propeller, 63 tons; 1,380 h. p. actual; total weight of boiler, fittings, and water, 134 tons.

Weights Supplied by Messrs. Maudslay.—Return Action Engines, 1,350 h. p. actual.

	tons.	cwts.	qrs.	lbs.
One piston	3	10	0	3
Two piston-rods	2	4	13	3
One connecting-rod	4	16	0	0
One main shaft and crank	17	11	0	0
Two slide valves	2	14	2	0
One turning wheel	5	0	0	0
Screw propeller	23	0	0	0
Total weight of engines	283	0	0	0
" " boilers	373	0	0	0
" " mountings	253	0	0	0
" " propeller and shafting	114	0	0	0
" " water in boiler	190	0	0	0
" " shafting (screw)	62	0	0	0

Weights Supplied by Messrs. Rennie.—Direct Acting Engine, 1,900 h. p. actual.

	tons.	cwts.	qrs.	lbs.
One piston	1	18	0	0
Two piston-rods, cross-head, and guide-blocks	4	6	0	12
Two connecting-rods	2	19	0	4
Two slide valve rods	1	16	2	14
One main shaft and cranks, and four eccentrics	6	2	2	0
Four counter-balances and straps	3	2	0	9
Two air-pump rods	0	3	3	26
One propeller	5	8	0	14
One shaft in ditto	4	13	0	10
Four shafts	9	8	1	14
One feed and bilge pumps	0	1	0	0
One turning gear	0	4	3	26
One governor, complete	0	8	3	16
Total weight of engines and boilers	275	0	0	0

Before I dismiss this section I must notice the common error of the day. I allude to the term and its meaning—nominal horse-power. Now let us see what are the principles on which it is founded. First, a fictitious pressure of steam, or much below what will be actually used; second, a fictitious speed of piston, estimated from a less number of revolutions of the crank-pin than is intended in practice; third, a wide margin in relation to the heating-surface of the boiler, being a demonstration indeed of the proverb, that "charity covers a multitude of sins," so that by a plentiful supply of heating-surface, the nominal horse-power can be made to look small by the side of the actual. I think, therefore, we should deal with the facts, and not with nominal conclusions, for, after all, the truth must decide the actual result, and therefore why go outside, when, by keeping within the limit, a shorter route is certain? It is, indeed, a matter of grate and heating-surface with pressure of steam; and, deal with it how you may, it comes back to that, so that when we are designing our boilers and engines, the actual result is before us, and we treat the nominal as a toy of convenience. That the word nominal is conventional, commercially, I will admit, but when the actual horse-power is guaranteed also, I cannot see the use of the former, unless it be, as I said before, to make the actual result look larger by the side of the nominal assumption.

Section C.

The screw propellers of the present day may be considered as the common Griffiths, and the French, or *Mangin*. The first, as the late Mr. Roberts, C.E., used to say, "is the screw in its natural state; and if you alter it, it isn't a screw;" that gentleman undoubtedly was correct in the main, for neither the Griffiths nor the Mangin types are real screws in the strict meaning of the term; they are the result of stepping outside the truth of the helical line to indicate the faults in other quarters if possible. The Griffiths screw has the extremity carried forward to grasp the water; the shape of the blade is irregular, not unlike the section of a pear. The "Mangin" production has two pitches connected at the centre of the blade, the leading pitch being less than the trailing or following.

The principles of screw propulsion embrace those relating to hydraulics also, so that in proportioning the screw the lines of the hull should be considered. We must remember that the fore-body of the hull drags the after-body in principle, the former pushes the water aside, and the latter allows it to return to its usual condition, which is termed the after-current. Now it is this disturbed water the screw revolves in, hence I think we want a little better acquaintance than at present with the subject, for you all know that, although two ships' propellers and engines are duplicates, and tried side-by-side, the results of speed are unequal, although the number of revolutions are identical; for example, take our two armour-plated ships, the *Warrior* and *Black Prince;* both are similar in design, dimensions, and power, but the *Warrior* steamed at the rate of 14·356 knots per hour, while her sister only attained a speed of 13·604 knots. Next the *Archilles;* her tonnage has an excess of 82 tons over the *Warrior*, but a four-bladed Mangin screw. She attained 14·322 knots, or nearly as many as the *Warrior* with her two-bladed Griffith's screw. Turning from the single-screw propulsion to the twin type, I will allude to the *Viper* and *Vixen*, also in our navy; both are the same power, within seven horses indicated, but the speeds are nearly half a knot difference, the *Viper* running 9·06 knots and the *Vixen* 9·475 knots per hour. The hulls are nearly duplicates, the difference in the tonnage being only three tons. I may mention that there was no difference in the draughts, taken as a mean—the *Vixen* drew one inch more aft than the *Viper*, and the reverse forward.

My convictions on the subject are that it is the skin friction we overlook, and my opinion on this is confirmed by the very slight difference comparatively in the speeds

with full and half-boiler power. I will take the *Bellerophon* as an example. With full-boiler power she attained a speed of 14·201 knots, and with half-boiler power 12·164, the revolutions being 72 and 64 respectively. So that it is obvious that the friction on the fore-body skin must be increased immensely as the speed is increased, but not in any direct proportion to the power required. I will notice next the *Viper*. At full-boiler power the indicated horse-power of the port engine was 325·05, making 9·06 knots; with half-boiler power the same engine indicated 157·33, with a speed of hull of 7·347, the revolutions being 104·5 and 85·72 respectively. I might enumerate dozens of such examples to prove the requisition of noticing the skin friction in the calculation for the requisite size of the screw and proportionate power of the engine. Professor Rankine, in his excellent work, "Rules and Tables," states first, "Given the intended greatest speed of a ship in knots, to find the least length of the after-body necessary in order that the resistance may not increase faster than the square of the speed—take three-eighths of the square of the speed in knots for the length in feet" (Scott Russell's rule). Secondly. To find the greatest speed in knots suited to a given length of after-body in feet, take the square root of $2\frac{2}{3}$ times the length. Thirdly. For an approximate value of the resistance in well-designed steamers with clean painted bottoms, multiply the square of the speed in knots by the square of the cube root of the displacement in tons, but this resistance may vary from ·8 to 1·5 of that given by the preceding calculation.

In relation to the effective horse-power expended in propelling the vessel at a given speed, multiply the resistance of the hull by the speed in knots, and divide the product by 326; but more often, the Professor states, 200 is used as the divisor.

I know of no formula at present that gives us a lucid idea of the correct area for the blades of the screw proportionate to the forward form of the hull and the friction incurred. But I blame no one, for I have often tried the experiment, and failed. I believe the general practice is, as my own, to improve from the failure of previous productions; we cut off a corner of the blade or alter its pitch, or reduce the radius, as much to suit our tastes or experience as the knowledge we have of the future result. Of course the radius of the blade's edge, its width, its angle or pitch, and length on the line of keel, settles the area of the surface; but we require rather what that area should be beforehand for the purpose required.

Next, with reference to the diameter of the screw, some authorities state, "make it as large as you can," inferring that the lower half of the circle described by the screw is more effectual than the upper, which undoubtedly it is, due to the density of the water. If we want a proof of this we have only to consider that the currents caused by the hull are more disturbed at the surface or line of flotation than below it, therefore the deeper the screw is immersed, the more powerful agent it becomes. It is for this reason I have always advocated twin-screws; but before I enter on the subject, permit me to pay a tribute of respect to the originators of the system. I allude to the late Mr. G. Rennie and Mr. Roberts. Both have passed from us, but are not forgotten; and I am sure you will agree with me that it is to them we owe the root of twin-screw propulsion, which has been since so ably matured by Capt. T. E. Symonds, R.N., and the Messrs. Dudgeon. The former gentleman has been the principal exponent of the system for ships of war, and merchant vessels also, since the year 1862. He has also lately invented a novel mode of lifting twin-screws. Messrs. Dudgeon have brought the matter at issue to its present state by their bold but practical manner of treating the subject, their ships and engines taking the position of successful productions.

Now, with two screws in the place of one, we have a sub-division of the force applied. Taking the midship section of the hull as the transverse area of the resistance, what is the most correct position for the two screws? The answer, in accordance with natural laws, seem to me to be, the centre of the areas divided by the centre line of the hull. For this reason, I think the type of the engine should not settle the distance between the centres of the screw shafts, but rather that the latter distance is due to the the form of the hull, so that each screw shall be located centrally of the area it is propelling. Those who are strong advocates of the advantages of twin-screws for steering purposes, will naturally ignore my opinion, but in so doing will they not sacrifice the correct position for the centres of propulsion. I am confident, however, that the hull will be propelled at a higher speed when the screws are in the position I have advocated than otherwise, and the manœuvring powers will be but little if at all impaired to that if the screws were wider apart.

To enable you to appreciate the intrinsic value of twin-screw propulsion, I direct your attention to the diagram No. 1, where I have endeavoured to illustrate the probable action of the screw when turning from the hull or towards it. The principles I believe to be thus:—The screw is working in disturbed water, caused by the progress of the hull, and the least amount of disturbance added by the motion of the screw the greater propelling effect is certain. When the screw is turning towards the hull the water is dashed against it, and thus additional disturbance and skin friction are ensured.

When I state this, I do not overlook the fact that the screw is advancing; but, is not the hull also?—so that the disturbance is a continuation with the passage of the hull. The water agitated by the inward revolution of the screw, is not only dashed against the hull, but is forced between the centre line of motion before the screw has left it.

But in the case of the screw turning from the hull, the difference in the effect is evident; the fluid above the centre line of motion is forced from the hull, and, being lighter in density than the volume below, ascends, at an incline to the surface or line of flotation; it has performed its duty and departs from it, to make room for the new current, without adding any skin friction to the hull. It occurs to me that it is simply a matter of gravity or density of the various currents the screw revolves in, and the quicker and easier the screw revolves, the more power it developes. I believe it to be a question of speed, also proportionate to the pitch and depth of immersion, so that, in deducing the proportions of the screw, all these natural facts should not be overlooked. The action of the currents, at right angles with those I have just adverted to, is shown by the diagram No. 2. The surface current nearest the hull must be in contact with it; but those beyond gradually diverge outwards, which is my concluding proof that the propeller should turn outwards also.

I might have entered more into the details of all the matters I have this evening brought to your notice, but as I value your opinions, so do I now think the time has arrived for me to relinquish my claim on your patience, and solicit you to discuss my paper as you may think appropriate.

DISCUSSION.

Mr. JOHN C. WILSON said that, in his opinion, the paper had not touched upon the principles which ought to govern the construction of marine boilers. All the questions about combustion of the fuel, the size of the furnace, shape of the flue, size, proportion, and length of the pipes, were the mere a b c of the matter. The vital principle was, if possible, to obtain a thorough circulation of the water over the heated surface of the boiler, and there was more effect to be gained by that than by any other detail or mode of construction. When the heat was applied to an iron plate it was at once conveyed to the water in connection with it, and if there were no circulation the steam was generated, and re-

mained a certain time in that position, which it ought not to do. What was wanted was, that as soon as the heat was conveyed to the water, converting it into steam, that steam should at once be conveyed into the steam chamber, and that a fresh portion of water should immediately come in contact with the heated plate. When the steam was formed on the surface of the plate, it had to pass through a large body of water before it emerged into the steam space, and the result was what was called boiling, a process which was not at all wanted in a boiler for a steam engine. Mr. Burgh showed a certain plan of passing the steam through perforated plates, by which priming would be prevented, but did not state the reasons why it was so. When any valve was opened, so as to relieve the pressure, the steam rushed out, carrying the water with it, but by causing the steam to pass through narrow apertures, the steam escaped more slowly. He, therefore, considered that their attention ought to be principally directed, in all boilers, to get a rapid circulation of the water over the heated surfaces of the boiler, and to accomplish that, if possible, by natural means, without the aid of any special machinery.

Mr. Young agreed with the last speaker as to the importance of keeping up a circulation in the water. It would be a good thing if they did away with the idea of steam and boiling, and viewed the engine simply as an apparatus for getting the greatest amount of heat from the fuel and applying it to the point where it was to be utilised, viz., the crank shaft. There were two great causes of waste in steam engines—imperfect combustion to generate the steam, and improper use of the steam when it was produced. As far as he had been able to follow Mr. Burgh, he believed that gentleman had arrived pretty nearly at the theoretic truth.

Mr. Burgh said it appeared to him that Mr. Wilson was inaccurate in his view of the cause of priming. In his plan the openings for the escape of the steam were much larger in the aggregate than in the ordinary plan, but the reason of the priming was that the tendency of the water was to follow the steam.

The Chairman said that one feature in the paper which had struck him was the importance which the writer attached to perfect combustion, for which purpose he proposed a large combustion-chamber, as shown in the diagram. He believed a plan had been introduced by Mr. Wye Williams for introducing small jets of air, so as to afford oxygen to the fire.

Mr. Burgh drew a figure on the board to represent the plan adopted by Mr. Williams, one feature of which was a very large combustion-chamber.

The Chairman said the principal feature he remembered in Mr. Williams' plan was the adoption of a large number of small holes or wire gauze, which, when opened, insured perfect combustion, but when closed the combustion was slower and more perfect. As in burning ordinary gas the hydrogen was ejected into the atmosphere, whence it drew the oxygen to support combustion, so in this plan the air containing the oxygen was injected into the mass of burning hydrogen. He knew of instances where it had answered admirably.

Mr. J. C. Wilson illustrated his view of the cause of priming by a diagram, in order to remove what he believed was a misunderstanding on the part of Mr. Burgh. In an ordinary boiler there was no circulation whatever, the steam being formed on the under surface next the fire under pressure, and when a valve was opened the rush of the steam towards the opening carried the water with it. In a marine boiler the principle was the same; the steam accumulated over the surface of all the tubes, and when the pressure was removed, or an opening made, it rushed towards it, carrying the water with it. If the valve were opened gradually the objection was removed, because the pressure was not at once taken off.

The Chairman said the fact was that if steam were allowed to acquire velocity, it carried the water with it, but not otherwise.

Mr. Varley, in connection with the question of utilizing all the heat given off from the fuel, mentioned one or two kinds of boilers in which, by means of small conical projections, a greater heating surface was presented to the water.

Mr. Teulon said he had been somewhat disappointed in the paper, which purported by its title to point out the principles that should govern the future development of marine boilers, engines, and screw propellers, whereas it was principally confined to a description of their present state. True, one point was incidentally stated as the direction in which improvement should take place, and that was to make furnaces which should ensure slow combustion; all who knew anything of the subject were aware that in proportion as the fuel was consumed at leisure (so to speak), the greater would be the effect from a given quantity of fuel. In marine boilers, however, from various circumstances, they had to solve the problem of getting the greatest possible effect in the smallest space, and it was in this direction, he believed, that they must look for improvement. They must remember that in marine boilers there was not the opportunity for almost unlimited fire space as in land boilers. He agreed with Mr. Wilson as to the cause of priming, which was somewhat similar to the familiar instance of drawing the cork of a soda water bottle.

Mr. Pearsall said that he had an opportunity, a few days after the action between the *Kearsage* and the *Alabama*, of inspecting the former vessel, the boilers of which seemed to be made on a different principle to any he had seen in England. The tubes were vertical instead of horizontal, and the fire was outside instead of inside them, and, as one consequence of that, there was a large chamber or firebox. The American engineers said they went on the same principle as the English of a large heating surface, but they reckoned that the outside of a tube was larger than the inside. They also considered that, amongst other practical advantages, the tubes were much more easily cleansed.

Mr. Young said that this kind of boiler, known as Martin's boiler, was the invention of Earl Dundonald, and had been used in a great many English ships, the *Chanticleer* amongst others. He did not know why they had not been more generally adopted.

Mr. Girdwood said the main point to be gained was a large number of lbs. of fuel consumed per square foot of fire-grate. The boiler occupied a certain space, and on the question of whether 17lbs., or 30lbs., or 40lbs. of coal per foot of fire-grate was consumed depended the results that the boiler would yield. The plan for preventing priming, which had been described by Mr. Burgh, seemed very reasonable; and, with 17lbs. or 18lbs. of coal per foot of grate, would, no doubt, answer very well, but with 30lbs. or 40lbs. it would be perfectly useless, for the water was converted into steam so quickly, and in so small a space, that it was forced forward into the engine.

Admiral Ommanney said that in vessels of war, the great point was to keep the boilers below the water-line, so as to be out of reach of the enemy's shot; he should like to know if this were so in in the *Kearsage.*

Mr. Pearsall said he understood that the boilers were protected by coal bunkers in the usual way, and by having chain cables passed up and down on either side.

Mr. Girdwood remarked that in some boilers he had had to do with, they had obtained from 300 to 400 horse-power by the consumption of 17 lbs. of coal per square foot, and $4\frac{1}{2}$ lbs. of coal per horse-power, and in the same boilers with the consumption of 30lbs. of coal per foot, it had been at the rate of $7\frac{1}{2}$lbs. per horse-power, and by this they obtained more than double the power.

The Chairman said he believed the question of putting the fire inside or outside of the tubes had been well considered in this country, and there were probably some good reasons why the former plan was universally adopted, at any rate in locomotive engines.

Mr. Hancock thought one of the great objections to having the water inside of the tubes, and the fire outside, was, that there was such small water space, and in case of failure of the feed-pump, the water so soon fell below the proper level. Besides, there would be much more effect from the inside of the tubes being at an exceedingly high temperature, and having the larger surface of the outside to radiate from, than if the reverse were the case. There was also great difficulty in cleaning the tubes when they got coated inside by deposit from the water. He agreed with Mr. Burgh in his views as to priming, but there were two different causes producing the same result. There was, first, the priming which arose from the sudden opening of a valve, and secondly, that which was occasioned by the ordinary uniform working of the boiler, and this latter arose from there not being sufficient steam space. In a stationary boiler that could be obviated by having the steam space larger, but in marine boilers there was not the same opportunity, and he agreed with Mr. Burgh that the most reasonable way of preventing this priming was by drawing the steam from as large an area as possible, in fact, from every portion of the boiler rather than from one opening of perhaps 12 inches diameter. He did not quite catch what Mr. Burgh said as to incrustation, which was a very important subject. The matter deposited generally consisted of carbonate and sulphate of lime, and the conducting power of such a deposit was much inferior to that of iron. He believed the only effectual remedy was surface condensation, and if the injurious effect of the acid with which the water was charged, from contact with the grease, &c., in the interior of the cylinder, could be prevented by the use of some composition, or by the admixture of a certain proportion of sea-water, then a great point indeed would be gained.

The Chairman remarked that there was one important practical question which had not been touched upon, viz., the mode of feeding the furnaces. A few days ago he had seen a plan, introduced by Mr. Lermit, for feeding furnace-fires from the bottom by means of an Archimedean screw, which produced the most perfect combustion. The same method had been used for some time with great success in domestic fireplaces and kitchen-ranges.

Mr. N. P. Burgh, in reply to the observations made in the discussion, said, in answer to Mr. Wilson, that he (Mr. Burgh) considered that gentleman's ideas of priming were decidedly erroneous in relation to marine boilers, for usually the tubes and fire-boxes were arranged especially with a view to the circulation of the water, as shown by the diagram No. 1, in Section A., and thus the fault which Mr. Wilson pointed out scarcely existed in practice. The arrangement of the hollow perforated chamber at the roof of the boiler, alluded to in the paper, obviated also any of the evils from priming beyond the boiler, so that the water could not follow the steam under any circumstances to an injurious extent, if at all. Another gentleman alluded to the sudden exit of the contents of a soda water bottle when the cork was withdrawn, as the best illustration of the cause of priming. Mr. Burgh considered there was not the least analogy between the two. He believed that Mr. Varley was in error with regard to projections on the plate conducting the heat more readily, because the reverse was the case, and, in fact, the thinner the plate, so long as it was strong enough, the less it became burned. Another gentleman had objected that he had not alluded to principles, but he thought he had alluded to the principles generally admitted by engineers, and as an engineer he could not do otherwise. As to slow combustion, it was perfectly plain that if there were a certain amount of heat in the fuel, sufficient time must be allowed for it to be extracted, or there would be a loss. He could not imagine how it could be supposed that tubes, placed as thickly together as they would go, could be cleaned more easily outside than in. The best mode of keeping boilers clean was a very important subject, and the plan he advocated was to mix a certain quantity of sea water with the condensed water, thus forming a thin coating on the interior, which prevented any galvanic action. It was possible to so regulate the quantity of sea water admitted as to make this scale of deposit as thin as possible. As to feeding the boiler, he thought if the Chairman were at sea he would say let the mode be as simple as possible, because if it got out of order they would be in an awkward position. In conclusion, he expressed disappointment that there had not been a more animated and detailed discussion.

The Chairman thought Mr. Burgh need not be disappointed, because the reason so little had been said probably was that most of the audience agreed with the principles laid down in the paper. Moreover, perhaps the most valuable portions of the paper were those which had been omitted in reading, viz., the tables, which could not be made intelligible orally to a general audience. There were, however, one or two points upon which, perhaps, more might have been said; for instance, on the question of superheated steam, in which the Americans certainly had taught us a great deal. Then there was the question of superheating water, bringing it almost to a white heat, so that it could be flashed into steam instantaneously. This he had seen, when quite a youth, adopted by Perkins. The condition of water as a means of absorbing heat, and the facility with which it could be managed compared with steam, rendered this question of great importance, and he believed it was in that direction that progress must be looked for. Perhaps the most interesting subject practically was that of slow combustion, as affected by the proportions of the combustion-chamber and the arrangements of the fire-grate. Although theoretically the principles were well understood, yet in practice the various conditions under which furnaces had to be constructed would always render it difficult to ensure perfect combustion, but he supposed everyone would agree that slow combustion was the main requisite. If the fuel could be introduced (as he had before observed) at the bottom of the fire, so that all the products should pass upwards through the fire, it would be a great end gained. The only question would be whether the apparatus, which in his own experience answered perfectly well for kitchen and other grates, might not, perhaps, be too cumbersome in the much larger form necessary for steam-boilers. In conclusion, he remarked on the valuable nature of the paper, some portions of which would probably become standards of reference, and he was sure the meeting would feel that the author was well entitled to their warmest thanks.

A vote of thanks was then passed to Mr. Burgh, and duly acknowledged

The paper was illustrated by some working models of marine engines, sectional and complete, kindly lent by Messrs. Maudslay, Sons, and Field, the Thames Ironworks Company, Messrs. Dudgeon, and Captain T. Symonds, R.N.; as well as by a steam-engine indicator from Messrs. Elliott, Brothers. A large working model of the valve-link motion was also shown.

Fine Arts.

South Kensington Museum.—Great changes are impending over this Museum. The iron portion of the building, which gave to the structure the name of "The Brompton Boilers," is about to be removed, and again set up on a site, already designated, at Bethnal-green, there to form an auxiliary Museum of Science and Art for the East of London. The sum of £5,000 was voted last session by Parliament "on account" of a total estimate of £20,000, to defray the cost of this auxiliary museum for East London. The entrance to the South Kensington Museum is now brought more towards the centre of the permanent structure. The

new permanent buildings at Kensington, on account of which the grant of £32,500 was made last session, continue in steady progress. The decorations of the portions already erected possess novelties as striking as the courts hitherto opened to the public. Various artists were invited to give their assistance in carrying out the ornamentation of the lecture theatre and the buildings connected therewith. The decorations of the refreshment rooms, commenced by the late Mr. Godfrey Sykes, have been, since his death, entrusted to his pupils, Messrs. Gamble and Townroe, to whom are also delegated the ornamentation of the corridors and the lecture theatre. The firm of Morris, Marshall, and Co., known for revivals of ancient processes and for efforts to bring art into novel relations to domestic uses, has been occupied in the adorning of the dining room. Mr. Poynter, the young artist who became conspicuous in the last Royal Academy by his large picture, "The Israelites in Egypt," has also been engaged upon these new buildings. Other of the mural decorations are from the designs of Mr. Moody; and Mr. W. B. Scott, a poet as well as an artist, has given drawings for the staircases leading to the lecture theatre. The external architecture of the principal quadrangle has for some time been open to view. Mr. Townroe has furnished the designs for the mosaic work, in terra cotta tesseræ, for the lunettes, panels, and pediments in the front of the building. For the present, the collection of naval models, transferred some time since from Somerset-house to Kensington for the use of the students of the School of Naval Architecture, has been re-arranged over the southern arcades of the gardens of the Royal Horticultural Society. There, also, in the interim, are located the collection of animal products, and the Museum of Construction. These several collections are now open to all visitors, subject to the same regulations as the central museum. The entrance is from the Exhibition-road, by the access to the recent National Portrait Galleries. To the above new developments must be added the rise of the building for the Schools of Naval Architecture and of Science in the Exhibition and Cromwell roads. The architecture and decorative details of the western façade of these schools will be similar to the style of the principal quadrangle. These schools will comprise spacious class-rooms, professors'-rooms, chemical and metallurgical laboratories, libraries, specimen museum, together with a central lecture-room. The general plan of the new buildings, as finally revised by Captain Fowke, and now in part erected, was published in the report of the Science and Art Department last year. In that report it is stated that "the outside decorations will be executed in flat tertiary tints; those in hand are limited to the colours of ochre, brown, and black; and it is believed they will be as imperishable as the best brickwork, and not likely to be degraded by the dirt in the atmosphere, which it is certain that glass mosaics, with their comparatively rough surfaces, would be." The relict of the late Dr. Woollaston has just presented to the art library of this museum a valuable series of drawings of Greek and Roman mosaics to be found in Spain, France, Pompeii, Prussia, Halicarnassus, Switzerland, Rome, and Italy generally, Constantinople, Carthage, and also in various counties of England, which had been executed for Dr. Woollaston.

Manufactures.

Silk Manufacture in Italy.—At one time Italy had almost the complete monopoly for the production of silk, and the cities of Lucca, Florence, Genoa, and Venice supplied the whole of Europe with silk goods, and derived great riches from the trade. The silk industry very soon spread into other countries, and there now remains to Italy but the supremacy in the production of her raw material, and which all the other countries in Europe have not been able to equal in quality. Before the spread of the disease among the silkworms the annual production of raw silk in Italy, exclusive of the Venetian provinces, amounted to £6,705,720 sterling. In 1863, the production of cocoons was 508,222 cwt., to the value of £4,200,000, with the expense of about £960,000 for grains. In 1864, the production of cocoons in Italy, exclusive of the Venetian provinces, was only 222,126 cwt., of the value of £2,480,000; and in 1865, the production was 222,020 cwt., amounting to the value of £2,860,000. The number of reeling establishments in Italy are 5,519, of which 394 are worked by steam, and produce about 40,000 cwt. of reeled raw silk, to the value of £5,264,422; on this amount it may be presumed that about £980,000 are the profits for the proprietors of the reeling establishments, not taking into consideration the waste (floss), which may be estimated at £210,000. The throwing-mills yield about 2,719,336 lbs. of tram and 3,268,533 lbs. of organzine, amounting to the value of £7,860,000. The manufacture of silk stuffs is limited to plain goods, which are carried on in 260 manufactories, giving employment to about 20,000 persons of various trades. The most important manufactories are those of Como and Genoa, whilst from England and France silk stuffs were imported into Italy, in 1863, to the amount of £859,920; in 1864, to the value of £812,320; and in 1865, for £805,360.

Commerce.

Irish Butter.—The following appeared in the *Times* of November 20th:—"The butter reform movement is progressing steadily in the south of Ireland. The farmers seem generally alive to the necessity of retrieving their character in the English markets, and are receiving in a docile spirit any practical suggestions which are offered to them. On Saturday, November 16th, a numerous meeting was held at Bandon, under the presidency of the Earl of Bandon, to consider the propriety of establishing a firkin butter market in that town. Mr. Shea exhibited an improved firkin, which he stated had elicited the approval of English merchants to whom he had shown it. The size was much smaller than the firkin previously in use, and it was more suitable for shopkeepers and housekeepers in England. It was wider at the bottom than at the top, so that it could be more easily cleaned, and could not be rolled about as the present firkins are, in consequence of which they accumulate dirt. He recommended a mild cure, and complained that Cork market was not an open one, where any person could buy or sell, but was subject to regulations made by a self-constituted body, called the committee of merchants. The farmer who sent in his butter was obliged to hand it over to them, and had no voice in fixing the price. He mentioned other facts, to show that the farmer laboured under peculiar disadvantages in sending his butter to the Cork market. He therefore advocated the establishment of a permanent butter market in Bandon, and recommended that the farmers should bring their butter in packages of 14lbs. instead of in rolls, as at present. Mr. Sullivan observed, that when butter was selling at 20d. in London, and only 8d. or 10d. in Bandon, there must be something wrong. A committee was finally appointed to consider the matter, and report to a future meeting."

Colonies.

Queensland Sugar.—Some recent sales of Queensland sugars were effected at prices varying from £29 to £34 per ton. Each consignment was good of its kind, and the question of the capability of this colony to grow sugar cane and manufacture therefrom superior sugar, seems for ever put at rest. It has long been known that it

could grow the cane, it is now proved that the cane will yield sugar in a degree and quality not inferior to the cane of any other country. The impetus this fact is giving to agriculture is very marked. On all the rivers near the present sugar mills, considerable breadths of land are being brought under cane. A meeting of farmers was to be held on the Logan to make arrangements for the growth of the cane, with a view to the erection of a mill on that river. "There is in the cultivation of sugar cane here," says a Queensland paper, "the most inviting opening for British farmers of moderate capital. There are few places where an enterprising farmer with £1,000, or even less, can find a brighter prospect before him than by settling down in the neighbourhood of one of the sugar mills and turning planter. The growth of the cane is by no means more difficult than that of mangolds, while the variations of the climate affect this crop almost less than any other."

Notes.

Utilisation of the Sewage.—It appears by the report of the Metropolitan Board of Works that in reference to the company to whom the concession of the northern sewage was granted, their results on 210 acres of sand and poor land to which sewage was applied, have been most satisfactory. The crops which have been raised from land manured with sewage have exceeded the most sanguine expectations. The principal crop grown is Italian rye-grass; and it is stated that on one piece which was sown in August, 1866, and which has received about 4,000 tons of sewage per acre, the crops were as follows:—Eight tons per acre early in April, 10 tons in the middle of May, and about 12 tons in the week ending 22nd of June. On other pieces the crops were even heavier. It also appears that great success has attended the growth of mangolds, potatoes, flax, lucerne, cabbage, celery, and strawberries. The most promising experiment, however, was the wheat crop, on which the sewage was poured four times during the early growth of the crops.

Railway Across the Col de Tenda.—A memorial has lately been presented by the Chamber of Commerce of Cuneo to the Minister of Public Works at Florence, urging him to bring before Parliament the project of connecting Cuneo and Nice by way of the Col de Tenda, passing by Ventimiglia, when it would join the littoral line. A branch line is proposed to be constructed from Cuneo, passing through Mondovi to Ceva, when it would join the partly constructed Turin and Savona Railway. This line would put Turin in communication with two fresh sea-ports, Savona and Ventimiglia, and would connect the towns of Northern Italy with Marseilles.

Correspondence.

Industrial and Scientific Education. — Sir, — I have seldom more keenly felt the infirmity of my chest, which prevents me from raising my voice at a public meeting, than I did on the evening of the 11th inst., when I was thus debarred from acknowledging the courteous manner in which Mr. Davidson was pleased to mention my humble exertions, and from endeavouring to afford him that support which his able advocacy of industrial instruction entitled him to claim from those who had devoted some amount of attention to this important subject. It was some consolation to perceive that, among the arguments opposed to him, few were of a nature to carry much weight with them, whilst several served rather to supply additional evidence of the great truths with which he had endeavoured to impress his audience. I had intended touching on a few of those arguments in the present letter, but I feel that this has been rendered superfluous by the publication in the Society's *Journal*, of Mr. Wallis's supplement to the debate, and of Mr. Smiles's admirable discourse at the Huddersfield Mechanics' Institute. Documents like these, following as they do on the powerful expressions of opinion at the late meeting of the Associated Chambers of Commerce, and backed as they soon will be by the testimony of the working men sent over by the Society to study industry and its training at Paris, cannot fail to prepare our members at large for an earnest consideration of the great questions to be discussed at our intended January Conference, and for an intelligent appreciation of the opinions which we may then expect to hear pronounced by some of the most competent men of the day. It is to be hoped that on that important occasion, the governing principle will not be to select contested points, for the sake of argument, but to adopt at once, in a conciliatory spirit, those upon which all are agreed, and, taking these as a base of operations, to unite cordially in putting the shoulder to the wheel. Among the important points on which those who have devoted special study to the requirements of our national industry, and even those who have merely perused with attention the evidence given in the pages of our *Journal*, can scarcely fail to be of one mind, are the following:—1. "Knowledge," as Professor Tyndall appropriately reminds us, "is power;" and in the long run, cleverness guided by routine must yield the palm to cleverness guided by brains. 2. Setting aside divergent opinions as to the rank which English manufacturers might have occupied at the late Paris Exhibition, if they had been so inclined, it is an undeniable fact that foreign competition is making successful inroads into markets where we have long reigned supreme. 3. Allowing the rapid progress of foreign manufacturers in branches of industry which we have been accustomed to call our own, to have been greatly due to the distance at which they were behind us, and to the advantage of copying models so perfect as those we provided them with, yet it is within probability that this progress, promoted by every advantage which a well-organised educational system can afford, will continue whether we go ahead or not. 4. Again, whilst we duly recognise in our working men qualities which defy competition on equal ground, we must take into account, at the same time, the advantages possessed by continental industry in the cheaper rates of most of the necessaries of life, to say nothing of the greater ingenuity displayed in economising them. 5. Without calling in question the suitableness of our present plan of elementary education for effecting the purpose had in view by those who established it, we may confess that it is neither sufficiently broad in principle, nor sufficiently extended in its sphere of action, to form the groundwork of a national system of industrial training. 6. The present apprenticeship system, whilst it presents too many valuable points, and is too popular to be superseded, requires a thorough and careful revision. 7. The establishment of a satisfactory national system of industrial training, will involve much beyond what the best organised apprenticeship can be expected to realise. It will require in addition a responsible centralised agency, supported by the patriotic efforts of all classes of the community, and especially of all existing institutions, or bodies having a bearing in this direction. 8. The great advance in art-industry, which we owe to the efficient system of art-training organised under the direction of Mr. Cole, sufficiently indicates what might be expected from a similar manifestation of government activity, differing, of course, in plan according to the difference of purpose, but conducted with equal intelligence and energy. 9. Good local results might be expected from a liberal co-operation on the part of the respective guilds and trades' corporations. 10. Though no foreign educational system is likely to suit, *in toto*, the wants and notions

of this country, nor any institutions susceptible of being introduced, without considerable modifications, yet there can be no doubt that, by studying foreign systems and institutions with a willing mind, we may derive from them many a valuable hint, and gain wisdom from borrowed experience. I feel confident that great practical benefit may be expected from so opportune a gathering of eminent and special men as that to which we are now looking forward, provided well-trodden ground be not trodden over again, and a certain number of fundamental points, such as the foregoing, can be agreed upon, *in limine*, as being sufficiently elucidated by the evidence already published, and sufficiently accepted by general consent; so that the brief appointed period of three days may be devoted to actual progress in the elaboration of what may be termed the "ways and means" of industrial training.—I am, &c., T. Twining.

Twickenham, 17th Dec., 1867.

MEETINGS FOR THE ENSUING WEEK.

Thur ...Royal Inst., 3. Prof. Tyndall, "Heat and Cold" (Juvenile Lectures.)
Mathematical, 8.
Fri. ......Quekett Microscopical Club, 8.
Sat ......Royal Inst., 3. Prof. Tyndall, "Heat and Cold." (Juvenile Lectures.)

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 4th December*, 1867.

20. Bill—Totnes, &c., Writs.
19. Halifax, Bermuda, and St. Thomas Packet Service Contract.
North America (No. 2, 1867)—Further Correspondence.
Abyssinia—Return of Names of Prisoners, &c.
Foreign Office—Names of Clerks who act as agents for Officers holding Diplomatic or Consular Appointments.
Public Petitions—Second Report.

Delivered on 5th December, 1867.

21. Bill—Church Rates Abolition.
23. ,, Railway and Gas Shares.

Session 1867.

238. Criminal Offenders (Scotland)—Corrected Pages.

Delivered on 7th December, 1867.

1. Bill—Artisans and Labourers' Dwellings.
9. ,, Turnpike Trusts.
10. ,, Church Rates Commutation.
19. ,, Life Policies Nomination.
21. Metropolitan Public Schools—Letter from Mr. Ayrton.
30. Carlow Lunatic Asylum—Correspondence.
Private Bills (Session 1867-8)—Statement.

Session 1867.

579. Poor Relief (Metropolis)—Return.

Patents.

From Commissioners of Patents' Journal, December 13.

Grants of Provisional Protection.

Aprons, bibs, &c.—3170—S. Simon.
Bark, &c., making extracts from—3358—A. V. Newton.
Barrels, facilitating the flow of liquids from—3367—R. H. Bentham.
Bedsteads—3383—J. R. Towers.
Bells—3416—C. Hargrove and S. Hargrove, jun.
Bones, &c., grinding—3393—J. H. Johnson.
Boots, &c., folding and pressing the edges of elastics used in—3375—E. T. Hughes.
Braces—3446—J. Sanders.
Brake-washers—3399—W. E. Gedge.
Bricks, hollow—3377—J. H. Johnson.
Buckets, &c., handles for—3418—J. H. Dean.
Buildings, metallic, &c.—3428—R. Porter.
Buildings, &c., ventilating—3361—J. S. Smith.
Buildings, &c., ventilating—3397—J. J. Parkes.
Cables, paying out, &c.—3390—M. F. Maury.
Cannons, tubular—3241—E. Farrington.
Casks, metallic—3450—R. R. Gray.
Chronometers—3396—A. M. Clark.
Cloth, &c., dyeing—3419—W. Schofield.
Clothes, washing—3395—A. V. Newton.
Cotton seed, obtaining oil from—3388—T. Rose and R. E. Gibson.
Cotton, &c., apparatus for preparing—3338—H. Greenhalgh.
Digging machines—3199—J. T. B. Porter.
Earthenware, constructing articles of—3380—J. R. Pratt.
Engines, steam—3379—E. Wood.
Fabrics, clamping and stretching woven—3454—F. Jolly.
Fabrics, cutting—3372—W. Cotton.
Fabrics, &c., boiling and washing—3385—W. R. Lake.
Fabrics, &c., drying and stretching woven—3401—T. Briggs, jun.
Fish-hooks, manufacturing—2479—A. Fenton and J. Sandilands.
Food for children, &c., warming—3310—T. G. F. Dolby.
Fuel, &c., drying artificial—3420—D. Barker.
Gas, regulating the supply to burners—3415—E. Price.
Globes and glasses—3404—S. E. T. Steane.
Grain, decorticating and drying—3424—J. Hadley.
Horses' bits and stirrups—3438—H. F. Gardner.
Horses' shoes—3368—W. Palmer.
Lace—3444—F. R. Ensor.
Lace, &c., ornamenting—3452—F. B. Baker and L. Lindley.
Lamps, miners' safety—3376—T. S. Horn.
Magnesia, preparing sulphate of—3389—C. Albisser.
Matches—3336—R. M. Letchford.
Meat, preserving—3323—W. Mort.
Metal cases, &c., opening—3365—M. A. Hamilton.
Meteorological instruments—3335—W. F. Stanley.
Motive-power apparatus—3402—W. Starkey.
Neck-ties, &c., fasteners for—2723—T. and O. Vaughton.
Oils, utilising mineral and other—3434—J. G. Hope.
Presses, hydraulic—3392—W. C. Houghton.
Printing machinery—3387—J. Fraser and G. Duncan.
Railway carriages, &c.—3398—W. E. Gedge.
Railway waggons, couplings for—3407—R. F. Compton.
Rocks, &c., cutting—3311—A. Munro.
Saccharine solutions, clarifying—3405—W. R. Lake.
Seeds, separating and cleaning—3373—T. Rose and R. E. Gibson.
Ships' signals—3391—H. S. Cowan.
Snow and ice, melting—3456—J. F. Clarke.
Sofas, &c.—3412—T. F. Widenham and J. Reynolds.
Spinning machinery—3411—W. Priestley and W. Bower.
Sprinklers for powdered substances—3374—E. T. Hughes.
Steel, &c., manufacturing cast—3440—J. Gjers.
Steel, &c., moulds for casting—3400—R. McClure.
Stone, cutting—3354—C. Coates.
Sugar, manufacturing—3417—W. R. Lake.
Tables, &c., mechanism for expanding—3410—J. Fitter.
Tea and coffee pots—3370—E. T. Hughes.
Telegraph posts—3406—S. Sharrock.
Telegraphs—2909—W. R. Lake.
Telegraphs—3317—E. T. Hughes.
Tobacco pouches, &c.—3197—R. P. Faucheux.
Tramways—3291—L. B. Joseph.
Type composing and distributing machines—3366—A. Mackie.
Umbrellas—3442—W. Sangster.
Umbrellas, &c.—3382—J. Scholefield.
Unguents, preserving—3378—J. M. Napier.
Warp ends, joining—3177—J. H. W. and A. W. Biggs.
Warp ends, joining—3426—J. H. W. Biggs.
Water-closets, &c.—3430—J. H. Wilson.
Water-meters and water-power engines—3369—M. H. and L. H. Larmuth.
Wool, &c., preparing—3371—T. and B. Carter and J. Lisle.

Invention with Complete Specification Filed.

Railway and other tickets, dating—3465—J. Adams.

Patents Sealed.

1403. A. Clark.	1773. W. Cooke.
1748. G. McKenzie.	1774. D. Sowden & R.C. Stephenson.
1750. R. Beard.	1775. Sir T. Tancred.
1754. C. Erba.	1777. W. Fairley.
1755. C. and S. A. Varley.	1781. J. Edwards.
1759. R. W. Barnes.	1783. J. G. Jones.
1765. J. Welch.	1807. W. Clarke.
1769. G. T. Bousfield.	1894. J. G. Tongue.
1770. M. Gray.	2212. J. M. Hocking.
1771. M. Gray and L. Gibson.	2745. T. Prideaux.
1772. M. Gray.	

From Commissioners of Patents' Journal, December 17.

Patents Sealed.

1786. D. Jones.	1837. E. P. Gleason.
1788. L. Simon.	1839. W. E. Newton.
1790. J. Coppard.	1846. T. Crow.
1793. H. C. Hurry.	1849. A. Aitchison and T. South.
1795. J. H. Johnson.	1851. W. T. Watts and D. J. Fleetwood.
1797. D. Jones.	1936. H. Davey and D. Davy.
1803. H. K. York.	1944. D. Davy.
1804. H. G. B. Röber.	1949. W. E. Newton.
1819. G. Dickie.	2611. C. Holste.
1821. F. Reddicliffe.	2975. C. D. Abel.
1830. S. Hall and W. H. Parsons.	

Patents on which the Stamp Duty of £50 has been Paid.

3137. Z. Eastman.	3108. J. A. Pols.
3083. C. Kendall.	3130. B. Dobson, W. Slater, and R. Halliwell.
3103. C. P. Coles.	3126. J. L. Norton and W. Ainsworth.
3105. J. and J. Leeming and J. Lister.	3160. H. Bird.
3099. G. W. Belding and D. E. Holman.	

Patents on which the Stamp Duty of £100 has been Paid.

3027. R. Davison.	3086. G. Davies.
3085. G. Davies.	

Journal of the Society of Arts.

FRIDAY, DECEMBER 27, 1867.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now in the press, and will be published in a few days, by the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Technical Education.

The Council feeling the great importance of this subject, have resolved to hold a Conference at the Society's house, on the 23rd and 24th January next, the particulars of which are explained in the following circular:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., 9th December, 1867.

Technical Education.

Sir,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to invite your (Chamber of Commerce or other body) to appoint its President or other representative, to attend a Conference which is to be held here, on Thursday and Friday, the 23rd and 24th of January next, to consider and suggest what measures may be taken to promote the industrial and scientific education of the various classes of the community.

The Conference will commence its sittings on Thursday, the 23rd of January, 1868. The Chairman of Council will take the chair at 12 o'clock precisely.

At as early a period as possible, the Council will issue to each gentleman who accepts their invitation to the Conference a programme of the probable course of its proceedings; and, to enable the Council to do this in a satisfactory manner, I am to request you to inform me, with the least possible delay, whether a representative from your [ ] will be able to attend the Conference; whether your [ ] has any special resolutions to suggest, or any particular points to which it desires to direct attention; what general measures for the promotion of education it may conceive to be requisite; and what institutions of a specific character are needed in your own neighbourhood to give the greatest practicable facilities for the acquisition of knowledge applicable to your local industries.

The object of the Conference is to ascertain, not merely what the Society of Arts, Manufactures, and Commerce, but what the nation at large can do to promote technical education among the workmen, the foremen, the overlookers, and the employers in Arts, Manufactures, and Commerce; and it is hoped that an expression of opinion by this Conference may tend in some degree to diminish the difficulties with which the solution of this vital question of national education is at present confessedly surrounded.

I am, your obedient servant,

P. Le Neve Foster, Secretary.

The foregoing circular has been forwarded to:—

The Mayors of the Towns which are the principal seats of manufacture in the United Kingdom.
The Presidents of the Chambers of Commerce and Agriculture.
The Presidents of all Societies and City Companies which have co-operated with the Society in respect of Education or Art-workmanship.
The Presidents of Institutions in Union with the Society of Arts.
Her Majesty's Inspectors of Schools, Factories, Mines, and Collieries.
Professors at University, King's and other Colleges.
The Examiners of the London University.
The English Jurors at the Paris Exhibition of 1867.
The Society's Judges in Art-Workmanship.
The Society's Examiners in Education.
The Society's Visiting Officers.
The writers of letters to the Schools' Inquiry Commission.

And many other gentlemen connected with education.

Members of the Society taking a special interest in this subject are invited to attend.

Examinations, 1868.

In addition to the prizes announced in the Programme of Examinations, the following are offered:—

The Worshipful Company of Coach and Coach Harness Makers offer as prizes—

1. A Silver Medal in Freehand Drawing; and
2. A Bronze Medal in Practical Mechanics;

To any candidate, being a workman or apprentice employed in the coach-making trade, who obtains the highest number of marks, with a certificate, in these subjects respectively.

The medals will be presented by the Master of the Company in open court.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Saturday, the 30th of November, at which there were present—Mr. Harry Chester (in the chair), Sir W. H. Bodkin, Mr. P. McLagan, M.P., Mr. J. T. Ware, Mr. W. H. Michael, Mr. E. Wilson, Mr. E. W. Hollond, Mr. F. S. Powell, M.P., Sir R. Montgomery, K.C.B., Captain Grant, and Mr. James Greenwood.

Mr. James Greenwood (a member of the Committee) having volunteered information which he had collected with regard to public markets in London, stated that he had taken considerable interest in the subject of the costermonger trade and in markets for the poor, and was prepared to give the Committee such information as he

had collected. On the Saturday night previous (said Mr. Greenwood) I visited Whitecross-street, which may be regarded as a market for the poorer classes of that district of London. I found that the street contained 300 shops, 150 on each side. I counted the number of stalls in the street on that night, and found there were 25 stalls for the sale of wet fish, 21 for dried fish, and nine for wet and dried fish together, making 55 in all. In addition to these there were 60 fruit and vegetable stalls, three butchers' stalls, and two stalls for the sale of cheesemongery. I counted no fewer than 38 stalls, of a similar kind to those of the costermongers, opposite the owners' shops and off the kerbing. Shopkeepers of all descriptions had stalls opposite to their respective shops, in common with those of the costermongers—butchers, fishmongers, greengrocers, and even haberdashers and crockery dealers. Those stalls belonged to the owners of the shops opposite which they stood, and were served by their own people. I likewise found—and that is an important thing—nine stalls for the sale of Ostend rabbits, at each of which there was considerable business done, at prices from 1d. to 1½d. per lb. less than was being charged at the shops. They were a perfectly fresh and wholesome article of food. The rabbit-season is now coming towards its full. I took the trouble to count the number of people who came out of Whitecross-street, carrying market-baskets, &c., between eight and nine o'clock that night, and found that they numbered 1,300. The price of fish ruled pretty much as follows (fish being scarce that night, and fetching higher prices than usual):—Fresh herrings eight for 4d.; plaice 2d. per lb.; sprats 1d. per lb. There was a large supply of conger-eels, which were sold at 2d. per lb. The price of fish at Billingsgate on that day week was, for plaice, 11s. per trunk. Formerly all the plaice was sent to the market in baskets or pads, but now they are, to a considerable extent, sent in what are called trunks (wooden boxes). A trunk contains a little more or less than 1 cwt. of fish, so that at that price in the market the costermonger could very well offer to sell plaice at 2d. per lb.; but the ordinary costermonger-price for plaice is about 7s. per trunk. The class of fish dealers above the costermonger do best when the price of fish is a little above the costermongers' price. If fish is very cheap it does not suit the ordinary fishmonger, but when it is just above the costermongers' price then is his harvest-time. When it is dear he dares not touch it, and when it is very cheap he cannot get it, because it is all bought up by the costermongers. Codfish fetched, in Billingsgate, this day week, 15s. each, and four days previous to that 23s. each. Codfish is an article that does not often get into the hands of the poor at these markets. There were but few soles on sale that night, and they were dear. I found meat on the night in question remarkably cheap, but of decidedly inferior quality. It is astonishing to me how it passes the inspectors: and the same remark applies, to a great extent, to the meat exposed in Newgate and other markets. I should like to know where the inspector draws the line. There were tons of meat that evening in Whitecross-street which almost made one shudder to contemplate.

Q.—Was the description of meat you speak of as sold by the costermongers of this bad quality?

Mr. Greenwood—No. That sold by the costermongers afforded a rather pleasant contrast to that in the shops. The meat on the barrows was decidedly better quality than that in many of the shops. Shoulders of mutton were 5½d. per lb.; legs, 6½d. per lb. The quality of meat I have spoken of in the shops was sold at from 3½d. to 4d. per lb.; shoulders of mutton were sold at that price, and the ruling price of legs of the same description of mutton was 5d. per lb.

Q.—Was the meat in your opinion unwholesome from being putrid, or was it from the quality of it being bad?

Mr. Greenwood—It was fresh, but very poor; watery, and the fat of a reddish colour. There are several decent butchers' shops in Whitecross-street, but I found that their prices differed very considerably from those of the inferior shops. People seemed to be attracted by the price to buy anything in the shape of meat. The prices between the better shops and the inferior differed as much as 1½d. to 2d. per lb.

Sir W. Bodkin inquired whether the sale of meat by costermongers formed a large part of the trade of this market?

Mr. Greenwood—There were only three stalls. I think it is quite a new thing; I never saw it before. Almost every one of the 1,300 people took away some kind of provisions in bundles or baskets. The large proportion of the stalls consisted of movable barrows or trucks, with flat boards placed upon them; some were built on trestles. I should say, out of the whole 102 stalls, not more than half-a-dozen were moving up and down the street. The goods were in many cases protected by an awning over the barrow. That was not the case with the fruit and vegetable stalls. The class of people constituting the 1,300 I have spoken of were for the most part of the decent working order. I did not notice any preponderance of Irish; they seemed to be composed of the inhabitants generally of the locality—men and women. There was some amount of drunkenness amongst the crowd. There are at least two public-houses to one baker's shop in the street. There was a great deal of crowding, and but little bad language. Almost the whole of the roadway was occupied by the crowd of people, as well as the footway, and very few vehicles passed that way. The whole street seemed to be occupied by the business of the market. It would manifestly be to the advantage of the wife of the decent workman to visit such a place for marketing, as she could buy good articles so much cheaper than in a more select thoroughfare. I heard but very little bad language, and there was but little rough usage. The people seemed all intent upon the business that brought them there. The dried fish on sale consisted of haddocks and herrings. There were whelks, also, which people ate at the stalls.

Sir W. Bodkin—Could you judge at all whether the people who attended this market lived in the neighbourhood of it, or whether they came from a distance?

Mr. Greenwood—There is no reason why they should come from a distance, because almost every district is provided with a market of a similar kind to this—some larger and some smaller.

The Chairman—In what you saw of the business of the costermonger, was there anything which you consider would be less conveniently carried on in a proper covered market place, provided with suitable small stalls?

Mr. Greenwood—Not if it were known and properly understood to be a costermongers' market.

Q.—If a proposition were made to establish a market just outside the street, instead of in a public thoroughfare as it is now, is there anything which you think would prevent its being successful?

A.—The probability is that if the costermongers were provided with a building, the people would cease to regard them as costermongers. The poorer class believe in the ability of the costermonger to sell goods at a lower rate than the shopkeeper; they know that he has neither rent nor taxes to pay, that his system is small profits and quick returns, and that the profit he is content with is small indeed; but if you collect the costermongers together, and put them under one roof, the poor people might not deal with them to the extent that they now do under the open street market system.

Q.—The suggestion applies not to any one part of London alone, but to different parts. If they could sell their goods at various places provided for them instead of in the open streets, do you see any reason why the market-place plan should not be carried out?

A.—Poor people believe in the barrow-man.

Mr. Michael remarked, that the moment the conveniences suggested were provided some additional price

must be put upon the articles sold to pay the interest on the capital so expended, and that would make the prices higher.

Q.—If you were invested with summary powers would you be inclined to make any great alteration or not in the system which you saw on this Saturday night in Whitecross-street market?

A.—I think if costermongering is to exist as an institution, I would abolish the shopkeepers' stalls as an unfair competition. If you recognize costermongering, I say let the people have the full benefit of it. At the same time I think it is a system rotten at heart.

Q.—Are you aware that in foreign countries those who sell provisions to the poor carry on their trade for the most part in protected places?

A.—I am not aware.

Mr. Michael remarked that there were markets of a similar kind to our own in every country place on the Continent, and it was only in the larger towns that covered market places were provided. In ninety cases out of a hundred, the markets were held in places without covering. There was, he said, one thing to be kept in view in what they did. They must remember that the shopkeeper had to pay rent, rates, and taxes, for the support of public and local institutions, and therefore it bore hardly upon him, if they prevented him from competing with the costermonger, by prohibiting him from putting up a stall opposite his own shop. Therefore there ought to be no undue monopoly on the part of the costermonger in the case of fixed street markets, but the trade should be thrown open as much as possible for the benefit fort heglnaee public.

Mr. Greenwood—The more of costermongering you have, the greater is the reduction in the price of provisions. If you allow the shopkeeper to become a costermonger as well, you destroy the balance of equitable price that the energy and perseverence of the costermonger has established in these poor market-places, and the public must, to some extent, be losers. Although the costermongers have no prescriptive rights to any particular position in the street for placing the barrows, the same spot is generally occupied by one person by mutual consent. If I went to the market next Saturday night, I should, probably, recognise the same persons in the same position as I before observed them.

The Chairman—Are there any master costermongers, so to speak, who are the owners of several stalls in the same market?

A.—There are what are called barrow-masters among the costermongers. I know an instance in which one man has as many as 60 barrows, and as many loads of goods for sale every day during the fruit season.

Q.—Have you any suggestions to make for the improvement of this kind of trade?

A.—I can give the committee a little information with regard to another market.

Q.—I will first ask you whether you saw any large amount of bread sold in the market you have been speaking of.

A.—No extraordinary quantity. As regards bread, I may mention that the attention of the people seems to be so much directed to the article of meat, that they lose sight of the equally important one of bread. The present price of bread is 8½d. per 4lb. loaf. Flour is on an average 50s. per sack. A sack of flour in the hands of an honest baker can be converted into ninety quartern loaves, bnt with the addition of 6 lbs. of rice he can make ninety-eight quarterns with it. The wholesale price of rice would be about a penny a pound. The way that one baker is enabled to sell a halfpenny per loaf cheaper than his neighbour is this—having made his loaves, he will put them into an oven at twice the heat it should be, so that a crust is quickly formed on the outside, while the moisture, which means weight, is contained within the loaf; so that the interior of the loaf will be 80° or 90° of heat below that of the oven when it is fit to take out. Therefore it is not so much a matter of adulteration of the bread as a trickery in the baking, and people prefer crusty loaves because they imagine them to be better baked and will therefore weigh lighter. There is no reason why bread should be sold at 8½d., when flour is 50s. per sack. The co-operative system has been started in many quarters. In some cases the society purchases its own flour, and the Society of London Bakers in the neighbourhood are willing to manufacture and bake the flour at the rate of 6s. per sack, and convert it into ninety quartern loaves. Flour being 50s. per sack, and bread 8½d. per loaf, it is manifest that the baker is getting as large profit out of the poor as the butcher is said to have done. Including the rice he would get a profit of about 13s. 9d. per sack of flour used. A small admixture of potatoes is generally used, but with the addition of the rice eight more loaves are obtained at a cost of sixpence to the baker. Some bakers sell at a penny per loaf below others. It is like porter and gin, you can have it at what price you like. I have omitted to mention, with regard to Whitecross-street, that potatoes formed a most important article in that market. For Yorkshire flukes and regents the highest price I saw was 3lbs. for 2d.; that was very cheap. The shopkeepers' price for the same quality of potatoes would be, at least, 1¼d. per lb., and these potatoes were as good as could be bought. I went to Newgate Market between six and seven o'clock on this same Saturday evening, and there I found, as a rule, the meat was as ill-looking and nasty as in Whitecross-street. There were a few good butchers' shops open, but all those which have a reputation for good meat were closed, and the market, for the most part, was left in the hands of those who were not particular what they sold. The consumer can never get the pick of the market; first come the large West-end dealers, then the ordinary butchers, then the dining-room keepers have their pick, and by that time there may be some decent meat left, but there is comparatively little of the first quality left. I found meat was selling in Newgate Market on that evening wonderfully cheap, as regards the lowness of the price; for instance, shoulders of mutton at 3½d., and legs of pork the same; in fact, you could buy such meat at almost any price you offered. The stock at each shop is regulated to the average trade done by them on Saturday night. I noticed that the class of customers at Newgate Market was different to that which frequented Whitecross-street. They were of a more respectable class. I endeavoured to count the people coming out of the Warwick-lane entrance to the market, but it was impossible to do so with accuracy. I judged that if 1,300 people went into Whitecross-street in the hour, fully 1,500 people passed out of Newgate Market in the same time. Almost everyone went away with meat of some description. They were for the most part of the better class of mechanics. It seems to me that the late outcry about dear meat has been of immense benefit to the butcher who deals in inferior meat. There are so many pegs on which to hang excuses for the questionable appearance of the meat. If the meat looks red in the fat and smells stale, it is the result of packing and coming from the country, the butcher declares, and people come to the market expecting to find the meat in that condition. People who buy meat in Newgate Market would not look at the same quality of meat in a butcher's shop in their own neighbourhood. There were some shops in which there was meat which I should not object to have at my own table, and 7½d. per lb. was charged for a good Southdown leg of mutton. In that case I have no doubt it would be meat left over from the day's market. I believe it is the general impression on the mind of the public that the meat on sale on Saturday nights is that left over from the regular market, but I have no doubt that it is meat bought expressly for the Saturday night's Newgate Market. I should say that scarcely at one shop in twenty was there meat which a decent middle-class

butcher would offer in his shop. In no case did I see a good-looking leg of mutton sold at less price than 7½d. per lb.; and I saw a great many sold at 5d. It may happen that the shambles are sublet for the evening, and the names of respectable dealers may be over the stalls, and in that way it may be a confidence is inspired which the facts do not warrant. I may remark that I saw no signs of any kind of inspection in the market. The rents of the shops in Newgate Market are very heavy. The meat in both markets seemed to me to be of precisely the same quality, and, as I before said, I believe it is procured expressly for these markets. I had not an opportunity of visiting any other market on that night.

The Chairman—In reference to the expression you made use of—that the costermonger system is in your opinion rotten at heart—was that in regard to the vices of the system or otherwise?

A.—It is rotten at heart, because it is identical with depravity and ignorance. It is the ordinary pastime of this class of men to spend the whole of the Monday in tossing for money, and other kinds of gambling, which are carried on in the low beer shops. On one occasion I heard of one of these men borrowing his friend's robin trap, on the ground that he had lost all his money in tossing for three Mondays running, and wished to get away from temptation and save his money for stock buying.

Sir W. Bodkin remarked that, as far as his experience went, the costermongers as a class were honest and industrious men, and they had often contributed to the apprehension of people charged with offences against the law. He had also remarked that they exercised, for the most part, great kindness to the animals they employed in their avocations. He believed that feeling had been promoted by the donkey show which took place a few years ago at the Agricultural Hall.

Mr. Greenwood remarked that he believed it was the exception that any number of the class in question could read and write. For the most part their children were brought up in the same state of ignorance as their parents were. This was in a great measure, perhaps, to be attributed to the very early age at which the children of these people could be made to assist in some way in the family earnings.

The Chairman inquired whether that remark did not apply, more or less, to all kinds of irregular labour?

Mr. Greenwood—The genuine costermonger is bred and born to the business. It is not so with other classes of labour. People who have been brought up to ordinary forms of labour are often glad to obtain precarious employment in the docks at three-pence an hour. Take 100 dock labourers and the same number of costermongers, and you will find a much larger amount of education among the former than in the latter.

Mr. Michael understood the observation of Mr. Greenwood to apply rather to the men than to the system itself. He would ask whether there was anything inevitable in the system of selling articles from barrows in the streets for the benefit of the poor which was objectionable in itself?

Mr. Greenwood—You would find nobody, who was not bred to the business, who would undergo the hard labour of the costermonger for so little profit. A street seller of fish will be in Billingsgate at four o'clock in the morning, and is sometimes out till nine at night. You could not abolish the costermongers and put a better educated class in their place.

Q.—Is it necessary to the condition of the costermonger that he should be an uneducated and rough person?

A.—It would seem so. No better class would take it up.

Q.—Supposing there were laws which were applicable to the dwellings of these people, by which they were made decent and respectable, would not that tend to prevent one of the evils of which you complain?

A.—If it were possible, no doubt. Their dwellings might be improved, but they would never patronize what are called "model dwellings." The costermonger does not believe in being "modelized."

Q.—In the event of the itinerant part of the business of the costermonger being superseded, do you think it would be injurious to the best interests of the poor?

A.—Decidedly, I think it would be injurious.

Q.—What is your experience as to the prices at which the costermongers sell their articles to the poor compared with those of the lower class of shopkeepers into whose power the poor would fall supposing the costermonger were superseded?

A.—I will answer that in this way. If you go to Whitecross-street and find fish—plaice for instance—selling at 2d. per lb., you find the same kind of fish selling at the same price at the fishmongers' shops, whereas if the costermonger did not sell at 2d., the fishmonger might charge 4d. per lb., and the fish was just as good in the one case as the other. There exists an example of this. Strutton-ground, at Westminster, is a market-place for the poor, but of late the costermongers have been turned away from it. Fish at the Strutton-ground market, as sold at the fishshops there, is fully thirty per cent. dearer than it is in Whitecross-street, where the barrows are allowed.

Q.—Have you ever observed any difference between the class of costermongers in one locality compared with those of another?

A.—The costermonger of the West-end would be pretty much the same class of man as his brother of the East-end. I do not class those persons who hawk vegetables—having a shop at the same time—in carts through a certain quarter, where they have made a trade in that way by calling at private houses, with the costermonger proper. The habits and manner of the true costermonger distinguish him from every other trader; he is identified by a peculiar mode of dress, and a settled method of tying his neckerchief—a fashion which descends from father to son.

Q.—Are the Committee to understand that, in your opinion, if by legislative or other means improvement could be made in the dwellings and social condition of the costermonger, a corresponding improvement in the class of people following that occupation might be effected?

A.—As men they would be improved undoubtedly, but as costermongers they would be damaged.

Q.—Do you think their present state of degradation is necessary to enable the poor of the metropolis to obtain their food as cheaply as they do now under the costermonger system?

A.—I do not say that it is essentially necessary that the costermonger should live in a hovel, or that he would decline to sell fruit if he were not permitted to deposit his remaining stock at night in the room occupied by the family. But if you bring the costermonger to a sense of his degradation, he would soon discover that it was inseparable from his occupation, and do his best to cease to be degraded, and, consequently, he would cease to be a costermonger. You would teach him to be something better, and the poor would, in the end, be the losers.

Q.—Do you regard costermongering and degradation as co-efficient terms?

A.—I cannot avoid that conclusion, however much it is to be regretted. The nature he inherits from his father, the costermonger, is coarse, and to a certain extent brutal, and he is very unlikely to encounter refining influences in his peculiar sphere of life. He is an out-door drudge sixteen or eighteen hours out of the twenty-four, as is his wife, probably, so that, in a manner of speaking, he is a man without a home.

Q.—Is it not the fact that, as a rule, they make considerable profits?

A.—I think not. I should say his profits on the average of the year are not more than a guinea per week, and he is in the streets sometimes from five o'clock in the morning till eight and night o'clock at night, in all weathers. It is a life of considerable

hardship. They employ their children at much earlier ages than 12 or 13; they go out "barking," *i.e.*, shouting the articles for sale, as early as six or seven years of age.

The CHAIRMAN—Are you at all prepared to say that the costermonger is more indifferent to the education of his children than other persons of the same grade? You have heard the opinion of the Assistant-Judge as to their honesty as a class?

A.—I do not dispute their honesty. A man may be honest and ignorant at the same time. I do not say he is wholly indifferent to the education of his children, but he makes the children of use at such an early age that they cannot get much education.

The CHAIRMAN—Can you give the Committee any further suggestions for the improvement of this market traffic, or the substitution of anything of a better kind?

A.—It is a difficult question. I am quite sure that it is not more markets that are required, but a less number of middle men. People go to Newgate Market with an erroneous idea that they can procure there wholesome food at wholesale prices. If you establish a new market, and fit it with advantages which Newgate market does not possess, people would not flock to your new market as they do now to Newgate market. My experience of the costermongers of London is that they for the most part sell very good articles, but people who buy of them do not expect to receive standard weights and measures of the things they buy. When they ask the price of cherries and are told 2d. or 3d. per lb., they do not expect to get much more than half-a-pound; and the same applies to quantities of measure. It seems to be a "recognised swindle." As they live from hand to mouth, the articles they sell are generally fresh and of good quality.

Mr. Greenwood, having promised to communicate to the Committee the results of further investigations into the market system, was thanked for his information, and the Committee adjourned.

CANTOR LECTURES.

"ON ART; ESPECIALLY INCLUDING THE HISTORY AND THEORY OF SCULPTURE." BY RICHARD WESTMACOTT, ESQ., R.A., F.S.A.

LECTURE 3.—FRIDAY, DECEMBER 20.

MR. WESTMACOTT said it seemed to be agreed that, as regards art in England, the great want of the present day is education. To induce people to care to be educated they must be interested; and it was to show them there was this interest in art, beyond its material attractions, that he had dwelt on the important functions of ancient sculpture and its history and progress, from the fifth century before the Christian era down to its decline in the late Roman period. To bring the subject more home to modern feeling, he should now make a rapid survey of its history from the revival to the end of the last (the eighteenth) century. It is, however, scarcely correct to call this a revival. It was rather a new birth, so different and distinct was it from the older art in its material presentation. It had one advantage in common with the most archaic sculpture. Its impulse was religious, but materially it had no beauty. The neglect of ancient examples in this particular—for remains of fine works must have abounded, to say nothing of the living Nature before their eyes — suggests that this proscription of the beautiful and even ordinary true forms was intentional. The avoidance of this in Pagan art is quite intelligible in the professors of the new and purer faith, but scarcely so the willing adoption of decidedly ugly and ill-proportioned forms. The controversy which raged so long between the Eastern and Western Churches throws some curious light on this subject. The former insisted that sacred personages should not be represented beautiful and attractive; and even the figure of Christ was to conform to this rule, inasmuch as it is said in Isaiah, "He hath no form of comeliness," &c. The Western Church advocated the opposite doctrine, and the result is seen in the art that grew out of the two systems. The ecclesiastical art of the present day, in the former cradle and school of the beautiful—the East—is as rude and gaunt as it was in the earliest time; while in the West the contrary principle, afterwards established by the authority of Pope Adrian, led to the subsequent excellence of the school of Italy. The earlier painting and sculpture employed in the Gothic period scarcely deserves the name of fine art, wanting as it is generally in almost all art qualities. It is true it was only used for decoration; but still it professed to imitate something, and this should have been Nature. Wells cathedral is one of the oldest edifices in England which is richly ornamented in this way, and it exhibits crowds of statues on its exterior. These are of the most primitive character —out of proportion, and, in execution, rude in the extreme. The contrast, as regards the accessorial art connected with Gothic architecture, is remarkable when compared with that employed by the great Greek artists —in the Parthenon, for instance. Here the most perfect architecture of its kind, was enriched with expressive sculpture of the most perfect forms in nature; and it is this combination or union that constitutes the highest form of art. The short duration of Gothic architecture, and the constant changes it underwent, may account, in some measure, for the incompleteness of the imitative arts in connection with it. It must be borne in mind that in the short space of about three hundred years it passed through many phases—from the Romanesque to the pointed, or early English style—from that to the florid or decorated, and then to the perpendicular, when it may be said to have collapsed altogether. So unstable and unfixed in its own principles, it scarcely allowed of perfection in the arts associated with it, though those arts had a fixed standard, had that standard been followed. No person of sensibility, or who has any genuine feeling for the beautiful and picturesque, can deny the charm, or altogether resist the fascination that is found in the best examples of true Gothic architecture. Much of this may be owing to religious association; much to the imagination, which is pleased to conjure up anew, and picture to itself visions of the olden time. But there is, unquestionably, also a positive claim to admiration, in the originality, the bold fancy, the variety and play of parts, the contrivance of scenic effects in the perspective views, and in the striking contrasts in *chiaro 'scuro*, which are so remarkable in the monuments of this peculiar style of art. Still, with all these admissions, the lecturer said he was bound to protest against the outrages committed against truth and fitness, and, indeed, common sense, which were so constantly seen in the Gothic use of accessorial imiative art. This fault was the more to be regretted, because there were, many redeeming indications of grace and feeling in the sculpture, especially in drapery and in the sentiment of monumental design. But how the fitness of nature was abused is seen when human faces, of saints, kings, nuns, and ecclesiastics, are found employed as corbels and brackets to bear weights, or as terminations to dripstones, or as gurgoyles or draining pipes; or when entire or truncated figures, angels or others, are seen suddenly starting from walls; their drapery clinging to them in stiff horizontal folds instead of falling by any law of gravitation; or standing figures thrust into arched hollow mouldings; or others dislocated and distorted to accommodate them to fill up spandrils of arches or other spaces. These incongruities are the more curious and striking because it has been seriously asserted by the admirers and advocates of mediævalism that these were the days when religious art was practised with a devotion, and a feeling of truth, purity, and of pious impulse, unknown at present. It is a mistake. Students of Gothic art must know instances enough which contradict this theory, not only as regards truth in imitation, but in the scan-

dalous and even indecent sculpture still to be met with in screens, stall seats, and other parts of some of the most admired Gothic churches. These exhibit proofs of a license, in this respect, which certainly would not be thought of in these degenerate days, and more especially as decoration in places devoted to religious worship. Still, there was a promise of excellence in this Christian art. There often was much gracefulness in composition, and, in the draperies especially, elegance and beauty. Some places showed very superior art to others, as for example Lincoln; and there were signs of improvement of the most encouraging kind. Unhappily, a revolution, fatal, as it turned out, to the progress of art, changed the character of the age. This was occasioned by the passion created for classical studies, by the discovery of manuscripts and remains of Greek and Latin literature, in the 15th and 16th centuries. The educated and influential classes devoted themselves to this new attraction, insisting that everything should be done to establish a pseudo-classical taste. The Italian language had to give way, in polite correspondence, to the Latin; and in this ill-directed enthusiasm the philosophy, faith, and, at last, even the morals of the ancients were accepted with all their consequences. The Medici family, the great patron of this movement, and the infidelity and dissoluteness of the courts of Florence under Lorenzo, and of Rome under the Popes Leo X., Clement VII. (Medicis), and others, were, as is well known, the scandal of Europe. Art, and more especially sculpture, was influenced by this fashion, and became conventional and academic. From Michael Angelo and Giovanni di Bologna, to Bernini and Roubiliac—all men of undoubted genius—each artist but added contributions of a false and spurious style, neither purely classical nor, on the other hand, appealing to modern feeling. Some of the works of the leading sculptors were here described, and the genius and versatility of Bernini in particular, dwelt upon. As is usual, the imitators of these greater men only copied their faults, and by the end of the eighteenth century all true art-sentiment seemed extinct. This was the state of art when Flaxman and Canova stepped in to stem the torrent of false and bad taste. Canova was deservedly eminent in a certain class of art; and he suppressed the extreme flutter and mere executive display of the Bernini and Roubiliac schools. But his own style was somewhat mannered and meretricious. Flaxman founded his works more on the examples of the school of sentiment and simplicity inaugurated by the Pisani and their scholars; and showed the value of those qualities, contrasted with the academical pretension and the mere workshop merit that had so long prevailed.

Mr. Westmacott concluded with some remarks on the late rise of art in England compared with other countries,—Italy, France, and Germany. In the course of these, and in commenting on the inferiority of English art, he exposed the absurdity and unfairness of the charge that the Reformation was the cause of a retrograde movement in art among us. England had no art to retrograde, or to be injured at that date. All, or almost all, we had was by foreigners, who were certainly free from the supposed influence of the Reformation. They brought here the bad style of art universally prevalent on the Continent—that is, their own. In the churches of Italy, and in St. Peter's especially, the very worst taste prevailed, as may be seen in the meretricious, and sometimes even offensive, art that was allowed to appear there in ecclesiastical buildings. Certainly we had nothing of our own of this kind, whatever shortcoming in other respects might be laid to our account. The lecture closed with some general observations on the general tone of art-feeling in England at the present time.

The Chairman said he felt sure the meeting would not disperse without authorising him in their name to thank Mr. Westmacott for the very interesting and able lectures with which he had favoured them. By the terms of the will of Dr. Cantor, the encouragement of art was among the objects included, and though we had had on former occasions courses of lectures on the application of art to industry, yet this was the first time the Council had chosen a course on Art proper. The success which had attended the course just concluded by Professor Westmacott, whether tested by the ability and learning displayed by the Professor, or shown by the full attendance in the room, fully justified the Council in the step they had taken. He begged, therefore, to propose a vote of thanks to Professor Westmacott for the eloquent and able addresses with which he had favoured them.

A vote of thanks was then passed unanimously.

PREMIUMS AND REWARDS.

From the first institution of the Society of Arts, the practice of issuing to the public a list of subjects for which the Society offers premiums and medals, has been followed. The object sought to be attained by the issue of such lists is twofold:—First, the placing before the public, in as concise a form as possible, lists of such subjects as have been felt at the time to be required to aid the extension of the industries of the country, either by new developments of our own natural products, or by improving the present methods of utilising them; and, secondly, by calling attention to the products and processes employed in foreign countries, thereby causing such investigations as may tend to introduce into our own country fresh industries, thus benefiting our own population, and, at the same time, extending the means of supplying commercial products in the markets of the world.

The premiums offered by the Society of Arts must not be looked upon now as formerly. In many instances they were put forward and were intended to give an increased value to the article produced in the market, as the award of bounties by Government, to encourage the exportation of our corn, our linen manufactures, and for the improvement of our fisheries, and other articles, was a recognised principle of political economy. In the year 1824 the Government paid no less a sum than £536,228 9s. 7¾d. as bounties, but the more extended knowledge of the true principles of political economy has led to their entire discontinuance. The Society of Arts, in proposing again to prepare a list of premiums for issue to the public, must not be looked upon as desiring thereby to encourage the production of articles of commerce upon an artificial basis. Its object is to draw the attention of the public to what may be considered as desiderata, at the present time, and, when accomplished, to give, by the award of its medals, that publicity to them and stamp of excellence which may assist the inventors in reaping a commercial reward. The object the Society has in view is, by adding in some cases a small pecuniary grant, in addition to its medals and honorary rewards, to hold out to the scientific man, and persons of but small capital, the prospect of the return of some portion of the outlay which may be incurred in carrying on investigations with a view to the development of new sources of industry. In carrying out such investigations some cost is, in many cases, necessarily incurred; and even where the result is successful, in many cases commercial advantages and pecuniary profit are by no means speedily attained.

It has been considered that the present is a peculiarly favourable moment for the preparation of a fresh list of subjects for which to offer both premiums and bounties. The holding of another Universal Exhibition of the industries and products of the world in Paris this year has afforded to all engaged in industries opportunties of making comparisons. Many wants have been felt to exist on the part of our manufacturers, and many suggestions have been induced in the minds of those who have visited that Exhibition, which, if placed before thinking men, may be productive of much good to the industry and commerce of this country.

It has been determined, therefore, to ask such members as may have visited the Paris Exhibition—as well as jurors, manufacturers, and workmen, who have observed the deficiencies of our own producers, as well as the adaptability of many foreign products to our own industries—to favour the Society by forwarding such suggestions as they may be able, with a view to their incorporation in the proposed list.

The Society will also be glad, should any members desire to offer special prizes for a particular line of investigation, to receive donations to be offered as special prizes. The system has long since been carried out by the Society, and, in some cases, with most beneficial results to the country at large. It may be at once admitted that no pecuniary grant made by the Society can in itself be considered as an equivalent for the successful solution of such problems as the conversion of peat into an article of commerce as a substitute for coal, to be used as a fuel in the conversion and working of our iron industries, for, at the present time, though thousands of pounds have been expended in experiments, the problem has not yet been solved commercially. Electricity has already been largely applied in aid of our industrial resources, but discoveries are continually being made which may lead to further developments of its powers. Attempts have been made of a very promising character to apply it to the production of fabrics in the loom, but which have not yet been commercially carried out, either here or on the Continent. Our Coventry manufacturers are at a loss to find employment for their workmen; the demand has ceased to a great extent for the products of their looms, and even in reference to the use of the common looms, France is far in advance of our own country. It is believed that if our men of science and mechanics could be induced to combine, an entirely new class of products would result. A new industrial art has of late years shown a tendency to be received favourably by the British public, but the cost of hand labour in its production has hitherto hindered its application; but it is believed that if a mechanical appliance could be brought to bear in the setting of tessera in the production of geometrical designs for pavements and floors, great economy would be effected, and a much extended use of tessera would be the result. Our colonies and the tropics produce many of the most luscious fruits. It is felt that many could be preserved, either simply or in combination with wheat flour, and introduced into this country either as articles of commerce, or as the means of establishing fancy trades in the form of fruit biscuits.

It is not the desire of the Society of Arts that inventors or investigators should be deprived of the commercial advantages resulting from their skill and industry, and no one receiving a medal or reward from the Society is prevented from protecting his discovery by patent.

It is hoped that members will come forward, as have others in foreign countries, and aid the Society by pecuniary donations in securing the advantages which may otherwise be lost for want of the immediate probable return which the man of science and the young man, or men with but small capital, may require as an inducement to pursue investigations which may ultimately redound, not only to the advantage of the individual, but to the benefit of the community.

Fine Arts.

South Kensington Museum.—In addition to the attractions offered to visitors during the Christmas holidays by the collections at the South Kensington Museum, the Committee of Council on Education have pushed forward the arrangements for the exhibition of the purchases made at the Paris Exhibition, which have recently arrived in England. These latter, as well as some valuable loans, have been temporarily placed in glass cases, and opportunities during the holidays will be thus afforded to the public to view these treasures. The loans acquired from the gallery of the "Histoire du Travail" at the Paris Exhibition, although not numerous, are of a highly interesting character, not only from their being extremely curious and rare as works of art, but chiefly from the fact that they are the property of foreign governments. A most admirable system of international intercourse with foreign powers in relation to works of art may be thus said to have commenced. In the Loan Court are to be found the Crystals lent by the Austrian Government. They consist of five pieces; one piece, standing about 3 feet high, is handsomely carved, and for size is the most important. The enamelled gold work which surmounts the crystal is a delicate piece of execution; and the vase with two handles, richly cut, is a marvel of skilful and dexterous workmanship. Without the evidence of the presence of this vase it would be hard to conceive that any workman could have, out of a simple rock crystal, produced so charming a result. In the case next to the crystals are shown curious specimens of very ancient gold-work, discovered at Petrossa, in 1837, and lent to the museum by the Roumanian Government. The date assigned to their origin is about 450 A.D. The work is considered as probably that of Gothic tribes, and the style of the design is called Byzantine. The shapes of the objects, the setting of the stones, and the remarkable pierced work should be carefully inspected. The largest piece is a salver, about 2ft. 3in. in diameter, with a somewhat rudely stamped ornament round the circumference. A patera is in a good state of conservation, and is, apparently, a capital illustration of the style of art employed at that period for gold-work. Adjoining the Loan Court is a portion of the museum assigned to purchases, and here, under glass cases, at the north end of the court, may be found the purchases made from the Paris Exhibition. Of the principal purchase, exquisitely carved and inlaid with precious stones, the spinette by Anniballi de Roxis, Milan, 1577, standing by itself, it is impossible to give an adequately written description. It originally formed part of M. Clafison's collection of musical instruments, which has since his death been purchased by the Conservatoire de Musique, at Paris. This spinette the authorities of that establishment did not purchase, and this year it was exhibited in the Italian section of the Exhibition. As a work of art it is unrivalled in the museum. Next to it, but of a totally different genre and date, is the famous inlaid and sculptured wooden cabinet by M. Fourdinois, which elicited so much admiration from visitors to the Paris Exhibition. The Italian peasant jewellery, bought from Signor Castellani (through whose means the spinette referred to was likewise acquired), occupies four cases, and has much interest for our jewellers, who would do well to adopt many of the elegant designs to be found in this collection. There is a small assemblage of musical instruments of foreign countries. This, however, is but a part of what was purchased at Paris. The instruments from Japan and China are very eccentric. Beyond this case are specimens of Turkish popular jewellery, and a Norwegian marriage crown. The form of the Danish silver parcel-gilt drinking-vessel is curious, but seems awkward. It is of modern execution but of ancient design. The artistic fans, from the atelier of M. Alexandre, are well represented by eight elegant examples, of which the more noticeable ones are by Messrs. Alexandre, Froment, Frossoy, and Regina. Opposite the inlaid cabinets from Copenhagen stands a very fine vase, of French manufacture, in modern enamelled earthenware, of Persian design, by M. Collinot. The style of this piece of pottery is excellent. A collection, comprising chiefly modern French porcelain, German glass, Austrian ormolu, and French bronzes, complete the artistic purchases from the Paris Exhibition.

In the north great court some very accurately working models of mechanical contrivances, cog-wheels, pistons, &c., &c., by Von Schröeder, of Darmstadt, are exhibited temporarily.

Manufactures.

The Influence of Chemical Knowledge on Sugar Manufacture.—*The Produce Markets Review* says:—"Of all countries England is the most interested in sugar, not only as the greatest consumer, but as owner of some of the richest producing countries in the world, yet no nation displays greater ignorance or apathy with regard to this subject. Like the Lotos eaters, we are content to listen to the distant waves of progress, confident that the protective system of sugar duties will keep the boundaries of our fool's paradise inviolate. But the old proverb, "Where ignorance is bliss 'tis folly to be wise," has certainly no application to commercial matters, for the country that remains in ignorance, whether it be from choice or from indifference, is sure to fall into the rear. In no part of the world is scientific knowledge on mechanical subjects turned to such practical account as in England, and many of our greatest men have made science the handmaid of commerce by applying scientific discoveries to the purposes of every-day life. The telegraph, and more recently the aniline dyes, and Bessemer's iron-working process, are a few instances among many; but sugar, of which the manufacture is completely a chemical process, is entirely overlooked by our *savans*—and yet there is a wide and almost unlimited field for chemical science in perfecting sugar manufacture, which has hardly advanced from its barbarous infancy of crushing mills, windmills, and open pans. The problem of sugar making, which has yet to be solved, is this:—To extract all the saccharine matter as it exists in the cells—that is in a pure condition, and white in colour—without extracting the injurious salts or acids which coexist side by side with the sugar, and to do this at as small an expense as possible. A problem scarcely less important is the power of detecting by chemical analysis the exact proportion of extractable saccharine matter in any sample of sugar, for it must be observed that the per-centage of extractable saccharine matter is a very different thing from the saccharine strength shown by the polarising saccharometer. We do not hesitate to say, that any chemist who would solve these two problems would render a service to the sugar world of similar importance to that rendered to the world at large by the discovery of the steam engine. While our English chemists are mute upon the subject, the ablest chemists of France and Germany have for the last eighty years been employed in solving the delicate problem of the crystallisation of sugar, and the result of their labours, so far, may be seen in the vast continental beet sugar crops, which are entirely due to the labours of a generation of chemists which has hardly yet passed away."

Commerce.

Russian Commerce.—In Mr. Bogdanoff's lithographic sheet, printed at Saint Petersburg, and privately circulated, is found the following account of the progress of commerce in Russia during the last ten years. The total value of the imports has grown from 132,339,600 roubles in 1857 to 180,573,208 roubles in 1866, but this progress has not been regular, the years 1858, 1862, and 1865, exhibiting a falling off as compared with those which preceded them. The exports increased during the same period, from 157,742,536, to 201,349,471 roubles, with similar fluctuations, the greatest being in 1863, when there was a falling off to the extent of nearly twenty-seven millions. The imports and exports of the precious metals show extraordinary changes; thus the imports fell from 16 millions, in 1857, to 8½ millions in the following year, and to 2¾ in 1859; in 1860 they rose again to 7 millions, and they have since diminished to little more than 2 millions; the exports of the same period show great fluctuations; they were less than a million in 1857, nearly 18 millions in the following year, 26 millions in 1858, 6 millions in 1860, nearly 60 millions in 1863, and only 21 millions in 1864; last year amounting to 25 millions, against little more than 2 millions imported. The general exports of last year were made up as follows, omitting small figures:—Wheat, 73½ millions of roubles; flax, 19 millions; linseed, 16¾ millions; wool, 15½ millions; tallow, 12¾ millions; wood, 10 millions; hemp, 9¾ millions; bristles, 3¼ millions; cattle, 3 millions; tow, 2 millions; skins, 1¾ millions; rough metals, 1½ millions; hemp yarn, 1½ millions; precious stones, 1½ millions; butter, 1¼ millions; potash, 1¼ millions; cordage, 1¼ millions; furs, 1¼ millions; the other items are each under a million in amount. The following are the chief items of import:—Raw cotton, 35½ millions; worked metals, 10½ millions; machinery, 10½ millions; tea, 9 millions; raw metals, 9 millions; colours, 8½ millions; sugar, 7 millions; oil, 7 millions; liquors, 7 millions; wool, 5½ millions; fruit, 5 millions; woollens, 4¼ millions; coffee, 3¾ millions; cotton yarn, 3½ millions; fish, 3½ millions; silks, 3½ millions; tobacco, 3¼ millions; silk, 2¾ millions.

Cotton Growing in Italy.—Professor Guiseppe Balsamo, of Otranto, has just published a paper on certain experiments of artificial fecundation effected by him on the cotton plant. The Neapolitan province of La Terra di Otranto has been a cotton-growing country from time immemorial; but the sorts of cotton grown there are not the best, being the *Gossypium herbaceum*, or the short staple, and the *Gossypium siamense*, which is somewhat better than the former, but far inferior in length, fineness, suppleness, and gloss to the *Gossypium barbadense*, commonly called the Sea Island or long-staple. During the American war Signor Balsamo tried various kinds of transatlantic cotton, and distributed the seeds among the farmers of his province. New Orleans and Louisiana cotton throve well, but Sea Island failed in most instances, for the reason that its pods open in the months of September and October, when the autumnal rains prevail, which spoil the down. Signor Balsamo then thought that perhaps a hybrid of the short and long staple might be obtained which would ripen earlier, and thus avoid the dangerous season. He accordingly set to work, and obtained six hybrids from the *Gossypium siamense*, *Gossypium barbadense*, and *Gossypium rufum*, or nankeen. The latter, being coloured, offered the advantage of showing, by its reddish hue, in what proportion it entered into the composition of the hybrid. The oblique position of the stamina rendered it difficult to cut them off without letting part of the pollen fall upon the pistil; nevertheless, Signor Balsamo succeeded in preventing this, and in bringing the anthers of the one species in contact with the pistils of the other. The operation of fecundation was effected about noon, as being the most favourable moment for the emission of the pollen. Various circumstances may contribute to failure, such as rain, which will even prevent natural fecundation; and high winds, which, by carrying off a great part of the pollen, may render this operation wholly or partially abortive. The cotton obtained from those hybrids was of excellent quality, showing a decided improvement of the inferior sorts.

Colonies.

South Australian Raisins.—This colony, says the *South Australian Advertiser*, can grow the best kind of grapes for raisins, and its fine atmosphere renders it easy to dry them perfectly. All that is necessary to do this is to have a few sheets of galvanized iron laid on supports out in the sun, and arranged so

that they can be carried under cover at night, to prevent them suffering from dews. The grapes have only to be placed on the iron plates and turned a few times, and the natural heat of the sun will convert them into fine raisins. We have seen and tasted native-grown and manufactured raisins equal in all respects to those imported; and the only thing they wanted to enable them to compete successfully with the best of those imported, was to be exhibited in a presentable form.

The Cotton Exported from Queensland during the year 1866, was valued at £19,618; say 196,704 lbs. of clean cotton, valued at £19,218, and 10,568lbs. of unginned cotton, valued at £400. Up to August 20 this year, 262,644lbs. of clean cotton, valued at £17,738, of this season's crop, have been shipped. Since that date upwards of 200 bales have been exported, and a considerable quantity has still to be shipped.

Labour in Queensland.—A Brisbane paper says:—"The introduction of South Sea Islanders as labourers for our stations, farms, and cotton and sugar plantations is still giving rise to considerable discussion. There is little doubt on the minds of most people, not directly interested in the traffic, that, as at present carried on, it is little better than the system of African slavery as it existed in America a century ago, and up to the present our Government has seemed to wink at the system. It is more than probable, however, that before the end of the present session they will be compelled, by independent members of the House, to take some steps, either to put an end to the traffic altogether, or to make provision for its being carried out in a proper and legal manner."

Publications Issued.

Gutch's Literary and Scientific Register and Almanack, for the year 1868. (*W. Stevens.*) This is the 27th year of the publication of this work, which, in addition to the usual almanack and pocket-book diary, contains tables, facts, and information of various kinds in a scientific point of view, useful for reference by the engineer, architect, chemist, mechanic, and others.

Vivien and Guinevere. By Alfred Tennyson, illustrated by G. Doré. Folio. (*Moxon and Co.*) This work is illustrated by eighteen engravings on steel, by Baker, Barlow, Brandard, Finden, Godfrey, Greatbach, Jeens, Mote, Ridgway, Saddler, Stephenson, and Willmore. The book is of no ordinary character, combining as it does labours which may be termed international. The poetry of the English laureate is enhanced in value by the drawings of the distinguished Frenchman, transferred to steel by the eminent men named above. The work bears evidence of great care and judicious supervision on the part of the editor, and has been produced at large cost by its spirited publishers.

Notes.

"Mock Auctions" and the City Police.—The City police have received orders, in cases where "mock auctions" are held, to announce the fact in a loud voice at the door of such places, as a warning to persons entering as purchasers. During the last few days this practice has been adopted in front of a house in Victoria-street, Farringdon-road, which is said to be used for the above purpose. Crowds of people have witnessed the scene, the pavement being nearly rendered impassable by persons staring at the strange spectacle.

Consumption of Meat at Milan.—During the past month (November), the total number of head of cattle slaughtered for food was 5,419—that is to say, 679 bullocks, 2,527 calves, 179 bulls, 487 cows, 989 pigs, and 558 goats, kids, sheep, and lambs.

Education in Prussia.—Of the 2,938,679 children who frequented the primary schools in Prussia in 1864, 2,509,482 spoke German, 384,475 Lithuanian, 13,441 the Wend tongue, 9,917 the Moravian, 1,895 the Walloon, 1,745 the Tchèque, and 593 Dutch. The Wend language was spoken in the districts of Frankfort-on-the-Oder and Liegnitz, Moravian in that of Oppeln, Walloon in those of Dusseldorf and Aix-la-Chapelle, Tchèque in those of Breslau and Oppeln, and Dutch in those of Dusseldorf.

Public Libraries in Europe.—The following are the number of volumes contained in the principal libraries in Europe:—The total number of volumes contained altogether in the public libraries of France amounts to 6,233,000 volumes. Great Britain possesses 1,172,000 volumes. Italy, 4,150,000 volumes. These are in general collections of no ordinary character, being composed principally of ancient, religious, and ecclesiastical works, many of them being very rare. These collections contain a very small number of modern works. The public libraries of Austria contain 2,488,000 volumes; those of Prussia, 2,040,000 volumes. In Russia, 852,000 volumes, a small number as compared with the population of the country. The public collections in Bavaria amount to 1,268,500 volumes, and in Belgium to 510,000 volumes. Thus, in round numbers, the public libraries of Europe contain about 20,000,000 of volumes.

Railways in Roumania.—The government of Roumania is still engaged in carrying out the project for a railway from Tchernowitch to Galatz, with branches to Jassy and Bucharest. According to the plan decided upon, these lines are to join those of Austria at Suciava. The works will be commenced in the spring. By the construction of this network, the principalities will be enriched with an important means of communication, and the town of Galatz, in particular, will find in it the elements of a considerable extension of its commercial relations.

Agricultural Literature in Italy.—The Minister of Agriculture and Commerce, with a view to promote more generally a knowledge of the theory and practice of agriculture amongst the agricultural population, has offered a prize consisting of a gold medal and a purse of 1,000fr. (£40) to the author of the best Catechism of Agriculture (Catechismo Agrario) during the coming year.

Museum of Fire-Arms.—An institution for this purpose has been established, immediately adjoining Rye-lane railway-station, at Peckham. Its object is to supply a want, which is much felt by all who are interested in the use of fire-arms and their accessories, viz., an establishment that provides facilities for their inspection, comparison, and impartial trial. It is intended to have a permanent exhibition of specimens of every known principle and system applied to guns, rifles, carbines, pistols, and all other small arms; also samples of all explosive compounds, projectiles, cartridges, cartridge cases, cartridge machines, wadding, &c., &c., with the accessories, implements, and tackle used therewith, also models and illustrations of the various contrivances for the successful breeding and rearing of game, vermin-traps, and poaching preventives. A shooting range is attached to the Museum, for the trial of small arms, new or improved explosives, projectiles, &c., &c., provided with instruments and appliances for correctly and scientifically ascertaining their relative and comparative merit as regards velocity, penetration, pattern, recoil, and other important elements necessary to the perfection of really useful and efficient weapons. A library will be attached to the institution. The institution will collect, for the use of subscribers, information on all new and improved principles, processes, and inventions which have reference to fire-arms; on the bearing and influence of the Game-laws; the prospects of the shooting season, and all kindred matters. Subscribers of one guinea per annum will be entitled to the benefits of the institution.

The Mont Cenis Tunnel.—At the close of November 4,446·80 metres out of the whole 12,220 metres of

this tunnel remained to be pierced. The progress made during the month being 109·10 metres, and the total length of tunnelling done up to 30th November is 7,773·20 metres.

Correspondence.

Recent International Monetary Conferences.—Sir,—I have read Professor Levi's letter of the 10th instant, and think he is very much out in his reckoning when he suggests that "the best thing we can do in international coinage is to take the ten-franc piece as the future unit for British coinage." This he defines as a gold coin, to be called a ducat, of one huudred pence, or eight shillings and fourpence, divided into ten silver ten-penny-pieces; and he deprecates any interference with the penny, which he wishes jealously protected as if it were a coin of sterling value instead of a base-metal token. But he seems to ignore that the pure gold in a ten-franc piece weighs 2·9032245 grammes, and therefore differs only by 0·37372 of one grain troy from the weight, *not* of eight shillings and fourpence worth, but eight shillings' worth of pure gold according to the English Mint price. The effect of the equation involved in his plan, 10 francs = 8s. 4d., or 25 francs = £1 0s. 10d., would be to reduce the intrinsic par of exchange between Great Britain, on the one side, and the countries of the Monetary Convention, viz., France, Italy, Switzerland, Belgium, the Papal States, Greece (and by-and-bye Austria, &c.), on the other side, from 1 pound sterling = 25·2079 francs as it now stands, to 24·1996 francs. So that, whilst he alleges the impossibility of declaring by law (it would be more correct to say by royal proclamation) that the sovereign of the future should be coined to weigh 25 francs exactly, in its pure gold value, instead of 25·20, and whilst he turns away with aversion from the 20 centimes reduction advocated by some of us, from an international point of view, as a sacrifice worth making once for all, he looks with satisfaction on the alleged practicability of his ducat-plan, which would be tantamount to a reduction five-fold as great, namely, of 100 centimes. He omits, however, to inform us how we are to retain a single sovereign of our standard gold circulation in the face of so Quixotic a gift of 40 per mille premium to its exporters or exchangers for 10-franc pieces. True, he writes about the holders of sovereigns being entitled, in changing them for the new coins (*i.e.*, for the golden ducats or 10-franc pieces) "to be allowed the difference in the respective values, a proper table being issued by authority, specifying the exact equivalent." The penny with him must not be touched, being "the standard" best known to millions of our working classes, consequently the "proper table" contemplated can only be a statement, in a tabular form, that 10 francs, or one golden ducat, of international coinage, equal 100 of the present pence, or eight shillings and four pence of present British currency, and *vice versa*. The tide of the precious metals, its ebb and flow, can of course be influenced solely within very narrow limits. Small alterations, particularly if within the limits of a fair charge for seignorage, have been made before now by many countries, and even by Great Britain, without creating a drain of metallic circulation, and when the coinage existing at the time, and affected by the slight change, has been a comparatively old coinage, like ours, considerably deteriorated by ordinary wear and tear, the risk of loss from such alteration, carefully limited for a great national object, has not been found at all considerable. On such grounds, an alteration at present to the extent of 20 centimes worth of pure gold in the sovereign might, and I believe would, be found practicable, whilst the larger alterations involved in the ducat scheme would be quite unmanageable by any regulation or tariff of allowance. Nothing of the kind, for example, could have prevented the export of 1,692 million francs of balance over imports of silver which occurred in France from 1852 to 1864. The ordinary current premium upon silver coin was as much as 25 to 30 per mille, and it gave the holders a very handsome profit in parting with their franc pieces to refiners and exporters, so that France was drained of every silver coin of full weight. We need not be surprised at the panic felt when the agio on silver ran up to 60 or 70 per mille at Marseilles, and when some thirty departments complained to the Ministry of Finance of the pressing scarcity of silver change and of the serious interruption it caused to trade. Regulations began to be talked of, and a majority of the French commission of inquiry recommended a temporary restoration of the exploded and anti-economical policy of an export duty on silver. This was wisely over-ruled, as it was seen to be hopeless in the face of so large an agio on silver, which would have rendered any regulation nugatory. Professor Levi, in another part of his letter, writes that his gold ducat is a token-coin. This is an erroneous term for any coin of undebased intrinsic value. And, as the ten-franc gold piece current amongst the people who are parties to the Monetary Convention of December, 1865, is a coin of full intrinsic weight, the integrity of which concerns some 72 millions of inhabitants, and will soon concern 100 millions and more, this circumstance alone quite puts the projected ducat out of court, if it is to be a token only, and not an international unit of coinage. Any novel unit of gold coinage, differing widely from what particular nations have been accustomed to, is quite unmanageable. Let us take example by the fate of M. Michel Chevalier's pet project in this respect, which has signally failed and broken down under discussion. The plan was to call in and re-coin all the 20-franc and ten-franc pieces, and to substitute new coins for the vast and compact gold circulation of the countries comprised in the Monetary Convention of December, 1865, estimated at about 220 million pounds sterling, of which France alone had coined 5,000 million francs, or 200 million pounds' worth, since 1850. The new coin, or unit, was to contain five grammes of gold, nine-tenths fine, representing $15\frac{1}{2}$ francs in value, and based upon the proportion of gold to silver, viz., one to $15\frac{1}{2}$ in the old French mint legislation, in which the one-franc piece contained five grammes of silver, nine-tenths fine. Then M. Chevalier would, besides, have had ten-gramme gold pieces. Thus, in the philosophic search after impossible metrical unison in all things, we should have lost the convenient multiples of five, as existing in the present 20 and ten-franc pieces, and should have, substituted in their places, $15\frac{1}{2}$ and 31-franc pieces. The true desideratum in international coinage is not, as Messrs. Chevalier and Levi would appear to assume, the introduction of any new coin or single unit to supersede existing leading units either in circulation or in account. All that is aspired to is to obtain, by reciprocity in slight concessions between nations, the establishment of perfectly accurate, well-defined, and easily calculated proportions between the values of coins of one country as compared with those of other countries, such, for example, as are shown in the annexed table or diagram, which, in the briefest possible manner, explains the facility with which the coins, both of circulation and of account, of 350 millions of the human family, might be made mutually interchangeable and convertible by the abolition of comparatively slight alterations in the fractional differences of their current coinage. It is a hopeful sign of the progress making in this cause of international coinage, to notice the warm interest which the Governments of Europe—with the sole exception of that of Great Britain—are taking in it, and to observe how prominently the President of the United States has introduced it into his Message, delivered only a few days ago. In our own country we have had admirable articles in its favour in the *Economist* and the *Edinburgh Review.*

Diagram of International Gold Coinage

Of Seven Denominations—Five now adopted by nearly 100 million people—Two in use by 30 million people, and the whole Seven Denominations suited, in combination, for use by 350 million people.

	Gold Coins of the Convention of December, 1865, with the addition of British Coins at 25 fr.=£1.	Weight in Gold of uniform fineness. (nine-tenths.)	Weight of Pure Gold.	Table for Conversion of each Denomination into the others.				
				Pound Sterling. British, Austrian, Portuguese.	Dollar. American.	Thaler. North German.	Florin. South German, British. Rupee. Indian.	Franc. French, Italian, Swiss, Belgian, Roman, Austrian, Greek, &c.
		Grammes.	Grammes.					
A	100 francs	32·25806	29·03225	4·	20·	$26\frac{2}{3}$	40·	100·
B	50 francs .... / Double Sovereign	16·12903	14·51613	2·	10·	$13\frac{1}{3}$	20·	50·
C	25 francs .... / Sovereign	8·06451	7·25806	1·	5·	$6\frac{2}{3}$	10·	25·
D	20 francs........	6·45171	5·80654	·8	4·	$5\frac{1}{3}$	8·	20·
E	$12\frac{1}{2}$ francs ...... / Half Sovereign ..	4·03225	3·62903	·5	2·5	$3\frac{1}{3}$	5·	12·50
F	10 francs........	3·22580	2·90322	·4	2·	$2\frac{2}{3}$	4·	10·
G	5 francs	1.61290	1·45161	·2	1·	$1\frac{1}{3}$	2·	5·
			Fractional Table for use in accounts.	·15	·75	1·	1·50	3·75
				·1	·50	$\frac{2}{3}$	1·	2·50
				·04	·08	0·26	·40	1·

Note.—The coins marked B, C, and E, would include the British coinage under the terms of the Convention of December, 1865. The weights of the present sovereign and half-sovereign may be stated, for comparison with the intrinsic weights in column 4, at 7·318444 and 3·659222 grammes, respectively. The coins A and B, of say £4 and £2 respectively, are permissive under the Convention, and included in its schedules, but they are too heavy and large to be convenient types, and may be classed rather amongst medals and pattern pieces, like the £5 pieces and double sovereigns in our numismatic cabinets. The working gold coins of the Convention are, therefore, only three in number, D, F, and G, the napoleon, half-napoleon, and quarter-napoleon. Add to them the new sovereign and half-sovereign, C. and E, say under the names of victoria and half-victoria, at 25 francs and $12\frac{1}{2}$ francs exactly, and the Anglo-French monetary system will carry the civilized world with it. The only denomination in the above diagram which presents the least complexity in its decimal conversion into the other denominations is the thaler of North Germany or Prussia. But there is a great movement, and much writing going on in the German press generally, in favour of the gold franc system for the German coinage of the future.

The Chambers of Commerce are taking up the subject, and at a conference between their delegates and the Metric Committee of the British Association, and Council of the International Decimal Association, I had the honour to propose the following resolution, which was carried, and is referred to in article in the *Revue des Deux Mondes*, from the accomplished pen of M. Laveleye :—" That in the opinion of this meeting the International Monetary Convention lately entered into by France, Italy, Belgium, and Switzerland, for the purpose of giving a common weight, fineness, and currency to their standard coins, is deserving approbation as a measure calculated to facilitate and extend the commercial, banking, and exchange operations between these nations themselves and foreign countries having dealings with them; and this meeting is further of opinion that the conditions of the International Monetary Convention, so far as they may be found applicable to the metallic currency system of the United Kingdom, are well worthy the consideration and support of all who are interested in the progress of, and intercommunication between nations." The International Decimal Association subsequently resolved, before sending its delegates to the Monetary Conference meetings in Paris, that in its opinion, " if in order to make the sovereign internationally current, it should be found necessary to reduce it to the value of 25 francs in gold, the commercial and monetary advantages attending such a step are sufficiently great to be more than equivalent to the consequences of the slight diminution in the weight of the pure gold contained in the sovereign." I have been much interested in the remarks of the President of the Chamber of Commerce of Liverpool, Mr. Muspratt, in your own columns, and I have learnt the opinion of the president of another chamber of commerce, that the latter attaches such great importance to international coinage, that he considers it of more value to the world than even the introduction of the English tariff into the laws of all European countries. I have much more to say, if time permitted, on the subject both of these recent monetary conferences, and of how practical and practicable an improvement would be the equation of 25 francs equal to 1 pound exactly, instead of the present costly, inconvenient, and anti-international equation of 25.2079 francs equal to 1 pound. — I am, &c., Frederick Hendriks.

Palace-gardens-terrace, W., 15th December, 1867.

Industrial and Scientific Education. — Sir, —I ought, perhaps, to have noticed, in my letter of the 17th inst., the following, as one of the causes of divergency in the opinions expressed concerning industrial instruction. The industrial community presents two main divisions. In the one are the great manufacturing establishments, which supply the home and foreign markets; in the other are the more or less independent artisans, who, distributed throughout town and country, minister more directly to our daily wants. Both categories of industry display endless varieties, which cross each other, and baffle definition; but generally speaking, their educational requirements present notable differences which appear to be too frequently overlooked. Many manufacturers find that it answers their purpose best to split up processes into small distinct tasks, each of which is allotted to a band of living automatons. Consequently, the orator whose thoughts are turned in this direction, will demand high class technical instruction for managers and foremen, but will not care much to see

science spread further. The mind of another speaker is perhaps bent towards independent handicrafts; he sees what a blessing a scientific training would be to the working man himself, and what a comfort his increased knowledge and ingenuity would be to those who employ him, and cannot conceive any limitation to the benefits of technical education. Of course, the economists, to whom we look up for a general scheme of technical instruction, will fairly and fully consider the varied requirements of all sections of British industry, and endeavour to suggest such a system as may place knowledge of the right kind within reach of the whole industrial community, from the lowest to the highest, *cuique suum*. I adverted, towards the end of my letter, to the valuable guidance which may be derived, in the formation of such a system, from studying the experience of other nations in the way of technical training. It is my strong conviction of the importance of this investigation, that has induced me to forward to you from time to time abstracts of the information supplied to me by my continental friends, as, for instance, the summary of Belgian technical institutions, which appeared in Vol. XIII. of the *Journal*, p. 650, and the account of the French ones, printed in the same volume, p. 673. I hope soon to be able to add some ufeful information concerning German technical schools, to that with which we were favoured by Mr. Davidson, and in the meantime I beg to offer you a few extracts from my letters on the "working classes of Nassau," which, having been printed for private circulation only, may be assumed to be unknown to the great majority of our members. My plan will be to select, and in some instances to comment on those passages which bring into relief the general principles and practice of German industrial education. In the Duchy of Nassau, as well as in other parts of Germany, the education of the industrial classes is provided for by a complete system of elementary schools, extending to the smallest village, under the direction of Government. All children from six to fourteen years of age are obliged to attend these schools, unless they frequent some other institution. No child is allowed to remain without instruction. The time of attendance is short for children of early age, but is gradually increased to the following scale, with a few deviations in country districts. In the morning from seven to ten in summer, and from eight to eleven in winter; and in the afternoon from one to four, except Wednesdays and Saturdays, which are kept as half-holidays. The names of children failing to attend are noted down, and their parents subjected by the burgomaster to a fine, which is increased on recurrence of neglect. The children learn very quickly to read by a kind of phonetic system, *Anschauungs Unterricht*, or visual instruction, is used in a variety of ways for assisting the memory, and facilitating the expansion of the intellect. I particularly wish to draw attention to the foregoing paragraph, because one of the strongest arguments against the introduction of science into the English system of elementary education, is that there is no time for it. The answer is that time can be made for it in two ways: firstly, by curtailing some of those studies which we have the authority of the Rev. Mr. Rogers for considering as perfectly susceptible of curtailment; and secondly, by improvements in the modes of teaching, and in educational apparatus. The appreciation of models, diagrams, and other appliances for visual instruction, has greatly increased within these last fifteen years; but what has been done by educational societies and publishers for supplying them, is very far from adequate. In many instances the cheapness of the illustrations serves to show what might be done on a comprehensive scale, whilst their want of sequence, and too often their inaccuracy, demonstrate the necessity for a centralized management and a systematic supervision. Both of these there would be no difficulty in establishing, without any undue interference with trade, if responsibility were not unfortunately shunned by those government authorities in whom it would be most efficient and most respected. On leaving school at fourteen years of age, the scholar should be able to read German, in German and Roman type, fluently, and with proper emphasis and expression; should be skilled in the rules of common arithmetic; be able to write compositions on subjects of business, with good orthography; and be possessed of some knowledge of geography, natural history, geometry, &c. The charge to the parents for this instruction is from one to four florins (or 1s. 8d. to 6s. 8d.) per year, for each child, which amount is paid into the treasury of the parish. The latter provides, under control of Government, for the salary of the master, as well as for school requisites of every kind, and also for the building of the school-houses. Poor communities receive subsidies from the government treasury. — I am, &c., T. TWINING.

Twickenham, Dec. 24th, 1867.

MEETINGS FOR THE ENSUING WEEK.

TUES ...Royal Inst., 3. Prof. Tyndall, "Heat and Cold." (Juvenile Lectures.)
THUR ...Royal Inst., 3. Prof. Tyndall, "Heat and Cold." (Juvenile Lectures.)
SAT ......Royal Inst., 3. Prof. Tyndall, "Heat and Cold." (Juvenile Lectures.)

Patents.

From Commissioners of Patents' Journal, December 20.

GRANTS OF PROVISIONAL PROTECTION.

Blasting materials, &c.—3458—J. H. Johnson.
Boilers—3413—J. C. Woolfield.
Boilers—3472—J. W. Kenyon and R. A. Armistead.
Boots and shoes, elastic springs for—3445—C. Paley.
Boxes, circular—3449—R. M. Letchford.
Candle-dipping machine—3490—J. Beatty.
Chairs, dentists'—3484—J. B. Morrison.
Condensers—3470—E. A. Pontifex
Cooking apparatus, &c.—3451—E. T. Hughes.
Cotton seed, &c., cleaning—3443—N. Grew.
Doors, &c., springs for—3496—W. H. Cooke.
Engines and boilers—3489—W. Brown and C. N. May.
Engines, heated air or gas—3466—A. C. Sterry.
Engines, &c., hand garden—3423—R. W. Page.
Excavating machines—3500—W. R. Lake.
Fire-arms, breech-loading—3492—R. Warry.
Furnaces—3468—T. J. Leigh.
Galvanic batteries—3476—H. J. F. H. Foveaux.
Games, constructing the parts of certain—3251—R. Garbett.
Horse shoes—3422—G. Philcox.
Horses, &c., shearing—3498—W. Clark.
Injector, Giffard's—3169—J. Gresham.
Iron, &c., manufacturing—3502—C. Martin and W. Barrett.
Lamps, miners' safety—3427—F. Foster.
Leather shaving and dressing—3429—W. B. Leachman and J. Holroyd.
Liquids, filtering—3474—C. Kerby.
Paper bags, manufacturing—3030—H. A. Bonneville.
Paper, &c., water-proof—3437—J. Thorpe.
Printing press, &c., delivering sheets of paper, &c., received from a—3330—T. J. Mayall.
Railway trucks, couplings for—3478—J. Evans.
Railway wheels—3488—J. Rae and G. Miller.
Railways—3433—J. Eckersley and D. Martin.
Reaping machines, &c.—3441—R. Hornsby and J. E. Phillips.
Spinning machinery—3408—T., W. W., and J. F. Holmes and J. B. and D. Lancaster.
Tables—3431—S. Vaile.
Traps, vermin, &c.—3435—W. Shave.
Tubes, brass and copper—3480—R. W. Lindsay.
Warps, waxing—3447—T., G. B., and B. Stephenson.
Wearing apparel—3486—J. Blakey and H. B. Fox.
Weighing apparatus—3494—J. A. Munn.
Winches, steam—3425—G. Breen.

PATENTS SEALED.

1679. J. Sheldon.
1824. O. R. Chase.
1828. T. Wilson and W. Hall.
1834. T. Rafferty & J. H. Storey.
1836. J. K. Field.
1841. H. Rushton.
1844. J. Wilkinson and W. Grimshaw.
1845. J. Webster.
1847. J. E. Whiting.
1867. J. G. Rowe.
1932. J. Elce and P. Williams.
1962. W. E. Newton.
1966. H. Ruddick.
2171. R. Reid and E. H. Craigie.
2612. W. Le Duc.
2847. R. Brotherton and J. Waldron.

Journal of the Society of Arts.

FRIDAY, JANUARY 3, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's pubblishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Technical Education.

The Council feeling the great importance of this subject, have resolved to hold a Conference at the Society's house, on the 23rd and 24th inst., the particulars of which are explained in the following circular:—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., 9th December, 1867.

Technical Education.

Sir,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to invite your (Chamber of Commerce or other body) to appoint its President or other representative, to attend a Conference which is to be held here, on Thursday and Friday, the 23rd and 24th of January next, to consider and suggest what measures may be taken to promote the industrial and scientific education of the various classes of the community.

The Conference will commence its sittings on Thursday, the 23rd of January, 1868. The Chairman of Council will take the chair at 12 o'clock precisely.

At as early a period as possible, the Council will issue to each gentleman who accepts their invitation to the Conference a programme of the probable course of its proceedings; and, to enable the Council to do this in a satisfactory manner, I am to request you to inform me, with the least possible delay, whether a representative from your [ ] will be able to attend the Conference; whether your [ ] has any special resolutions to suggest, or any particular points to which it desires to direct attention; what general measures for the promotion of education it may conceive to be requisite; and what institutions of a specific character are needed in your own neighbourhood to give the greatest practicable facilities for the acquisition of knowledge applicable to your local industries.

The object of the Conference is to ascertain, not merely what the Society of Arts, Manufactures, and Commerce, but what the nation at large can do to promote technical education among the workmen, the foremen, the overlookers, and the employers in Arts, Manufactures, and Commerce; and it is hoped that an expression of opinion by this Conference may tend in some degree to diminish the difficulties with which the solution of this vital question of national education is at present confessedly surrounded.

I am, your obedient servant,

P. Le Neve Foster, Secretary.

The foregoing circular has been forwarded to:—

- The Mayors of the Towns which are the principal seats of manufacture in the United Kingdom.
- The Presidents of the Chambers of Commerce and Agriculture.
- The Presidents of all Societies and City Companies which have co-operated with the Society in respect of Education or Art-workmanship.
- The Presidents of Institutions in Union with the Society of Arts.
- Her Majesty's Inspectors of Schools, Factories, Mines, and Collieries.
- Professors at University, King's and other Colleges.
- The Examiners of the London University.
- The English Jurors at the Paris Exhibition of 1867.
- The Society's Judges in Art-Workmanship.
- The Society's Examiners in Education.
- The Society's Visiting Officers.
- The writers of letters to the Schools' Inquiry Commission.

And many other gentlemen connected with education.

Members of the Society taking a special interest in this subject are invited to attend.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, Dec. 4th. Present—Mr. Harry Chester (in the chair), Captain Grant, Messrs. H. C. E. Childers, M.P., W. H. Michael, J. T. Ware, E. Wilson, and G. F. Wilson, F.R.S.

Mr. Michael laid before the Committee the following report upon McCall's Australian boiled beef and the condensed milk of the Anglo-Swiss Company:—

Boiled Beef.

I have examined and tried two tins of this beef, 4lbs. in each, cost 7½d. per lb. The meat is of first-rate quality, and the fat so much diminished in the tins as not now to be in any way excessive or wasteful. The meat is so much cooked in its preparation that any further application of heat deteriorates it and diminishes its usefulness as an article of food. It is quite fit to eat as it is found in the tins, cold, but few persons would like it in that condition, and it is very desirable that further attention should be given to the method of preservation, in order to provide an article which could be converted into stews, curries, &c., without disintegration, which is now inevitable if it is further cooked.

Condensed Milk.

This is milk evaporated and, by the addition of sugar, converted into a syrup, appearing like very light-coloured honey. It is pleasant to the taste, and, when diluted with water, can hardly be distinguished from sweetened milk, the only perceptible difference being a slight cocoanut flavour. Under the microscope it showed abundant crystals (sugar) and shrivelled globules. Upon the addition of water these by endosmosis became rapidly filled, and after the lapse of a few seconds it could not be distinguished from a specimen of fresh milk. For all purposes in which milk is required this will be found an admirable substitute where fresh milk cannot be procured. The

only drawback to its use is its great sweetness, which would be an objection with persons who dislike sweetened tea and coffee. I should suggest the desirability of a largely diminished use of sugar where the preparation is not to be subjected to the high temperatures of southern latitudes, and that there should be two kinds sold, one for use on the continent of Europe and one for ships' stores. When better known, this preparation will command an extensive sale.

The Secretary laid before the Committee his report on the Mège Mouriès process of preparing flour and making bread, as used in the "Scipion" at Paris:—

Mège Mouriès Process for the Manufacture of Flour and Bread.

Having learnt that this process, to which Professor Wilson drew the attention of the Committee last April, was in operation at the Scipion establishment in Paris, I took the opportunity of my stay there during the summer to visit the manufactory. It is a large milling and baking establishment, under the charge of the municipality of Paris, from whence bread and flour are supplied to the barracks, schools, hospitals, and charitable institutions under the direction of the Government. The mill contains 12 pairs of stones for grinding, with the other necessary machinery for converting the produce into flour, and the bakery is of corresponding size. Being duly furnished with an introduction, from my friend M. Le Play, to the director of the establishment, I was shown the whole process, and every explanation was afforded me. Before entering upon a description of the special machinery used it will be necessary for me to give the Committee some information supplementary to that afforded by Professor Wilson, and in doing so I must, with the permission of the Committee, to some extent repeat a portion of the details given by Professor Wilson, in order that those reading the present report may have the whole subject before them in the one document, and may be thus enabled to follow the steps of the special process adopted at the Scipion for carrying out M. Mège Mouriès' discoveries. The Committee will recollect that Professor Wilson drew their attention to the structure of the grain as demonstrated by M. Mège Mouriès, viz., that it consists of an internal farinaceous mass, or true grain, covered with three outer skins, of the same character as the straw, but of no value in a nutritious point of view. These three skins, when the grain passes under the stones for grinding, are torn into the scales of various sizes, known under the general name of bran, and are readily separated by the usual process of "dressing," as the sifting process is termed. As regards the farinaceous matter which lies beneath these skins, it consists of layers, increasing in nutritious quality and in hardness as they recede from the centre. When the whole grain passes under the stones the central layer gives the whitest flour, or "farine de blé," as it is termed; the intermediate layer furnishes the next quality, the "gruaux blancs;" and the third layer, which is harder and near the external skins, gives the "gros gruaux," mixed with some portion of bran. In the usual process of manufacturing flour, those of the "farine de blé" and the gruaux blancs form together the flour of best quality, and thus the two internal layers only of farinaceous matter are used, leaving the third layer mixed with a certain amount of bran, for the food of animals only, it being found that any attempt to use this, though known to be nutritious, resulted in the production of brown bread. This, it was supposed, arose from the admixture of the bran, but on investigating the subject, M. Mège Mouriès discovered that this brown colour did not arise from the mere addition of the brown particles of the bran, but from a special fermentation which was set up when this portion of the grain was used. He found that this outer or third layer of farinaceous matter, though of highly nutritious character, was surrounded with a thin membrane or skin, which he termed the "embryonic" skin, and that next to this skin was a layer of cells containing a substance which he called "cerealine," and that this "cerealine" was the ferment which set up the special action producing the brown colour in the bread. M. Mège Mouriès divides the produce of the grain thus: the three outer skins, or bran proper, form 8 per cent. of the whole grain; the flour derived by the usual process, from the two inner layers only, 70 per cent., and the remaining portion from the outer layer, now available only for animals, 22 per cent. It is the flour from this latter portion, so valuable in a nutritious point of view, which it has been the object of M. Mège Mouriès to utilize for the food of man. He found that by taking the finest and whitest wheat flour, without any particle of bran, and adding to it the cerealine, he got a brown bread; whilst taking the lower class of flour with bran in it, and carefully preventing the action of the cerealine, he obtained a comparatively white loaf. He originally proposed a process of decortication, by means of which the three external skins, or bran, were got rid of before the grinding, and then the "true grain," consisting of the three farinaceous layers before alluded to, was ground into one mass at one grinding, thus obtaining the whole of the nutritive portion of the grain. The problem was how to utilise this, containing as it did the most valuable portion of the grain, and at the same time get rid of the action the "cerealine." This he accomplished by a process of bread-making, in which, taking advantage of certain chemical reactions, the action of the cerealine was repressed; but inasmuch as that process is no longer used, but a simpler and readier means has been adopted of obtaining the required result, it is needless to go into it. The decortication which he originally proposed, and which, after all, only got rid of the bran at an earlier stage of the process, is difficult, and has never been adopted at the Scipion. The brans were taken out by the usual process of dressing, and the "gruaux," as they are now, containing the cerealine, were allowed to mingle with the other descriptions of flour; and the chemical process above alluded to, for arresting the action of the cerealine in making the bread, was adopted, and thus the whole was utilised. This mode of making bread, however, as I said before, is now no longer used; indeed it never was carried out to any great extent. In order that the Committee may understand the process now at work, I will draw their attention shortly to the details of the manufacture. The corn, after passing through the mill-stones, comes out as meal, containing all parts of the grain ground to various degrees of fineness. It then undergoes the operation of "dressing," as it is termed; that is, it passes through a special process of sifting, by means of which the meal gets divided into its various qualities of fine flour, seconds, &c., and brans of different sizes, or, as the French term them—Farine de blé; 1st gruaux; 2nd gruaux; gruaux bis and the brans. This sifting is effected owing to the fact that the third or outer layer is much harder than the others, and by after operation of grinding, is in a coarser state than the interior portions. Thus it is easily understood how the separation is effected. Now, the farine de blé and No. 1 gruaux are derived from the interior layers of farinaceous matter; the 2nd gruaux and the gruaux bis are mainly derived from the third layer of which I have spoken, containing a large amount of nutritious matter, but mixed with a certain quantity of the finer particles of bran. In the ordinary methods of manufacture the 2nd gruaux would be re-ground and dressed, and some of the bran particles got rid of. A certain small amount of flour would be thus obtained, but with the bran particles would still remain a very large portion of the farinaceous and nutritious matter. Under the improved process both the 2nd gruaux and the gruaux bis are re-ground, and, by a special arrangement, the principle of which I will describe, the particles of fine bran, formed of the inner skin of which I have spoken, and

portions of the "embryonic" membrane, containing the principal part of the "cerealine," are got rid of. M. Mège Mouriès found that the gruaux contained this membrane in two different states, the one adhering, in which case the cells of cerealine are not penetrated by the water of the dough, in consequence of which its action becomes so slight as not to be of any importance; the second, where it is separated, having been torn off in the process of grinding, in which state its action soon affects the whole of the dough.

This latter portion is extremely light, and advantage has been taken of this property to construct a machine, termed an "aspirator," by means of which this portion is got rid of, leaving the other portion, containing valuable nutritive matter, available for mixing with the other parts of the flour, thus adding materially to the produce of the grain.

The machine is of this character. It consists of a horizontal wire sieve, boxed round with a casing of wood, with tiers of shelves over it, so arranged that the current of air, of which I shall presently speak, is conducted over each in turn before it escapes from the machine. This sieve or sifter is agitated by the machinery, and upon this the re-ground gruaux are allowed to fall, and the separation of any larger particles of bran takes place by the ordinary operation of sifting. The finer portions of bran, however, pass through, and the light parts of the embryonic membrane would go through with the flour were it not that whilst this action is going on a current of air from a fan, carefully adjusted, is made to pass upwards through the sieve, and the lighter particles, to which I have alluded, are carried away, and deposited on the shelves. We thus get the valuable portion of the 2nd gruaux and the gruaux bis free from the cerealine in an active state. The produce thus obtained is then mixed with the other flour, and bread is made in the usual way.

M. Mège Mouriès tried an experiment with the small particles thus eliminated. He took flour of the best quality and mixed five per cent. of these particles with it; the result was brown bread. He then took dough made of first quality of flour, and added to it the gruaux blancs and bis deprived of these particles, but still containing three per cent. of bran, and the result was good white bread.

I may add that on examining the flour made on the plan I have described, it was quite possible for a skilled eye to detect a certain yellowish tinge in it as compared with the best white flour, and this, no doubt, was owing to the small portion of fine particles of bran necessarily left in it, but the bread was excellent, both in colour and flavour. The bread made at the establishment is of the same quality as that usually sold by the bakers in the shops for household use.

The saving was stated to me to be at the rate of three centimes on the loaf of 1 kilo in weight.

McCall's Australian Boiled Beef.

The Committee have been favoured with the following report by Dr. A. S. Taylor, F.R.S.:—

The tin of preserved meat sent to me on the 16th November was opened this morning. The contents, consisting of beef partly cooked, were in a good state of preservation. They consisted of lean and fat without bone, mixed with a small quantity of gelatinous liquid. The fat was in larger proportion than I expected to find it. I estimated that it amounted to from one-fourth to one-fifth of the bulk of the solid contents. The greater portion of the fat was in large masses, hard and firm, and of a pale yellowish colour. I should not consider it eatable, and if it was not removed before the meat was further cooked, it would render it oily or greasy and unpalatable to most persons.

The meat when cut was moderately firm, like unsalted boiled beef. It had preserved the reddish brown colour which it acquires by partial cooking, and this colour was uniform throughout its substance. It had the smell and taste of cold stewed beef: there was no smell of decomposing animal matter. It was palatable, and I doubt whether any persons, not informed of its real nature, would have supposed that it had been preserved in a tin for some months. I infer that it has not been overheated in the preserving process. The meat was firmer and had more flavour than a sample which I tasted at Mr. Shaw's last summer. The fibre rendered rapidly of a blue colour a mixture of freshly precipitated resin of guaiacum and autozone, showing that the heat to which it had been exposed had not been sufficient to destroy the red colouring principle of the blood. The gelatinous liquid, like most cooked liquids, had a slightly acid reaction.

A quantity of beef was slightly stewed, and it was found to have the usual taste of stewed beef. Excepting the introduction of so much fat, I believe this to be an improvement on the method of preserving adopted in the early part of the year. The fat requires to be still kept under. It adds weight but not nutriment to the contents of the tin, and, I think, it would only be appreciated by such people as the Lapps or Esquimaux. It should be converted into soup in the colony. If sent over here in such large proportion to the lean, it will not serve as food, but only add to the contents of the cook's grease-pot.—Alfred S. Taylor, M.D., F.R.S.,

13, St. James's-terrace, Regent's-park, Dec. 15th, 1867.

The Committee met on Wednesday, 11th December. Present—Mr. Benjamin Shaw (in the chair), Mr. J. T. Ware, Mr. G. F. Wilson, F.R.S., Mr. Samuel Gurney, M.P., Mr. E. Wilson, Mr. E. W. Hollond, Mr. E. C. Tufnell, and Mr. C. Wren Hoskyns.

Mr. Robert Atkin attended to explain the details of a project for the transport of live cattle from the River Plate to this country.

Mr. Atkin stated that he proposed to construct a steamship capable of carrying a cargo of 1,500 head of cattle, at the cost of £80,000, also four barges, to be used for the embarkation of the cattle, which would enable the whole cargo, when collected together at the port of embarkation, to be shipped in one day. He also proposed to provide a steam-tug to tow the barges. The barges would be so constructed as that when they were brought up alongside the wharf the cattle could walk on board for transhipment to the vessel. The cost of the four barges and the steam-tug he calculated at £20,000. He further proposed the purchase—which could be made at an extremely low price in that country—of 20,000 acres for pasturage of the cattle collected in the country, and the growing of seed and other descriptions of food for their support during the voyage to this country. The land purchase he estimated at £5,000. Mr. Atkin put in the following statement:—

A statement showing the practicability of supplying England with sheep and wholesome food by carrying cattle from the River Plate, in South America, to Milford Haven.

Cost of steam-ship capable of carrying 1,500 head of cattle	£80,000
Steam-tug and 4 barges, capable of bringing 1,500 head of cattle alongside in one trip	20,000
20,000 acres of land, and implements for producing the food, and preparing the cattle for the sea voyage	10,000
Expenses.	
Insurance on ship £80,000 at 5 per cent.	4,000
Depreciation of value at 10 per cent.	8,000
Wages, at £500 per month	6,000
Provisions for 120 men, at 6s. per week 52 weeks	1,872
Wear and tear, and other expenses	3,000
Coals, 12,000 tons per annum, at 12s. per ton	7,200
Cattle, 1,500, at £2 per head, six trips per annum	18,000
Food for 1,500 head at £1; six trips per annum	9,000
	57,072

Receipts.

Calculating 9,000 head of cattle at £10	£90,000
Deduct for loss 20 per cent.	18,000
	72,000
Deducting all expenses	57,072
Profit	14,928

Upwards of 18 per cent. on £80,000.

As regards the £30,000 invested in land, tug, and barges, it is calculated that cattle can be purchased at £1 per head, and as £27,000 has been charged to the ship, that would leave £18,000 to the land, tug, and barges, for producing food, preparing the cattle, and shipping them. And as the ship has been charged with sufficient coals to steam her out and home, she could save a considerable amount by using her sails, and could supply the tug every voyage. In the meantime, between the trips, the tug and barges could get employment, and earn freight.

An additional profit would be realised by the land in supplying the ship's crew with food of all descriptions, besides sending in the ship extra food for feeding the cattle in England.

Mr. E. Wilson inquired whether the cattle would be shipped in a fattened condition, fit for slaughtering.

Mr. Atkin replied that the cattle, when brought in, weighed from five to six cwts., and they would then be depastured for some months on the land which it was contemplated to provide for that purpose—the 20,000 acres. The average duration of the voyage would be 21 days. He saw no reason, with the system of stowage that would be provided in the vessel specially constructed for this trade, why the cattle should not be maintained in a fat condition during the voyage. Under the system he proposed he believed cattle could be brought from the districts of the River Plate with less deterioration than was the case with cattle now brought from the northern ports of Europe.

Mr. E. Wilson expressed an opinion, from his practical knowledge of wild animals, that animals taken wild from the plains, and suddenly placed in confinement, would be greatly deteriorated in condition by the voyage to this country, closely packed as they must necessarily be on board ship.

Mr. Atkin believed that with the complete arrangements that would be provided for ventilation, cleanliness, and feeding, the cattle would suffer very little, if any, in their physical condition. The 1500 head of cattle would be disposed on three decks, and a lower deck would be appropriated to the stowage of water and provisions for the cattle. The food provided would be Indian corn, linseed, and chaff, mixed together. It was equally adapted for sheep. A liberal allowance had been calculated in the expenditure, so as to ensure the best description of fodder. The cost of the cattle abroad would be about £2 per head on board ship, and he valued them at an average of £10 per head in this country, which gave £8 per head for carriage, feeding, and profit. As calculated, the margin of profit to the exporters would be from eight to ten per cent., with the most liberal allowance for expenses of all descriptions. That profit was estimated after making full provision for wages of seamen, &c., and for wear and tear. He also allowed 20 per cent. for losses.

The Chairman suggested the propriety of an experiment on this system on a small scale, in order to test the practicability of bringing live stock from such a distance and from such a climate in a healthy condition.

Mr. Atkin said it would not pay to do it on a small scale.

The Chairman thought the required capital would hardly be subscribed until, by an experiment on a small scale, it was shown that the thing was practicable. He inquired whether Mr. Atkin saw any probability of doing that?

Mr. Atkin replied—No doubt it would be the best plan, but on a small scale it would not pay. He added that he had no results to lay before the committee of an actual experiment of importing live cattle from the River Plate; but live stock had been taken there from this country. In carrying so large a number of beasts as he proposed there must necessarily be close stowage of the animals. He proposed to swing them as soon as they got on board, but not so as to take them off their feet. It would merely serve to steady them, and keep them from falling when the vessel rolled. He had had no personal experience in the treatment of wild cattle under the circumstances proposed. He saw no reason why the condition of the animals should not be improved during the voyage, looking to the superior description of food that would be given them, and the means of ventilation and thorough cleanliness that would be adopted.

Mr. E. W. Hollond remarked that, in the passage from the Plate there were only three or four days of very hot weather. With a steamer the tropical heat would be passed through in a shorter period than that. He agreed with Mr. Wilson that the great difficulty was in dealing with the cattle fresh from the Pampas.

The Chairman said it was obvious that cattle taken from their wild state would require to undergo a process of feeding to bring them into a condition fit for meat to be consumed in this country; and some time would be required to get them accustomed to the artificial food with which they must be supplied on the passage to England.

Mr. Atkin said a portion of the 20,000 acres would be appropriated to the cultivation of seed foods, and the cattle would be gradually brought to the change of food previous to their being shipped. On the subject of the stowage of the cattle in the vessel, Mr. Atkin stated the animals would be ranged heads together, for the convenience of feeding.

Mr. E. W. Hollond inquired whether Mr. Atkin had received any opinions as to the practicability of his plan from the stock collectors and others of Buenos Ayres, &c.

Mr. Atkin replied that he received communications from various consulates, and also from Mr. Neale, of Monte Video. The price at which the cattle could be shipped he had obtained from the captains of vessels trading to those ports. Mr. Atkin thought, after the twenty-one days' voyage the animals would not be very wild, and there would be a surplus of food to which they would have been accustomed on the passage on which they could be fed for some time after their disembarkation. He repeated his opinion that the animals would improve in condition during the voyage. He had never lost any live cattle that he had taken to sea with him in ships he had commanded.

Mr. Wren Hoskyns remarked that, as a rule, cattle sulked and refused food after being deprived of their liberty.

Mr. Atkin said he had carried similar cattle from Wellington to Auckland without any difficulty, but not on the large scale that was now proposed. Being swung he thought the cattle would not be injured, as a portion of their weight would be upon their legs. It would ease them and tend to keep them quiet. The capacity of the vessel would be 6,000 tons; she would carry a crew of 120 men, and the speed under steam and canvas was calculated at twenty knots per hour; under steam alone, which would be used only as auxiliary in passing through calms, the speed would be fourteen knots. Advantage would be taken of the north-east trades to save the fuel, of which the stock must be sufficient for the outward and homeward voyages. Steam-power would therefore only be auxiliary.

On the subject of the transport of horses from Australia to India, it was mentioned that the number conveyed in one vessel did not exceed 50 or 100.

The Chairman said he understood that Mr. Atkin had

some communication to make to the committee with regard to increased supplies of fish.

Mr. Atkin said, with regard to this subject he proposed to build a class of vessels of about 150 tons, fitted with wells, to keep the fish alive, with steam-power adequate both for working side-screw propellers and for lifting the trawl net. The trawl itself would be much larger than any now in use worked by manual labour, and by that means larger quantities of fish would be taken from deeper water than was now fished, and from which the best fish were obtained. He thought the great object would be to ensure certainty of a large supply of fish. The class of fishing vessels he proposed would be able to keep at sea in all weathers, and the fish would be kept alive till they were landed. He had fished with a trawl in 100 fathoms of water. He considered the fishing vessels at present used were too small, as well as the trawls which they used. He was well acquainted with the fisheries of the North Sea and the Baltic, as well as on the coasts of India and China, and he considered the Chinese left us in the shade entirely in their fisheries, both in the rivers and in the sea. The present small fishing vessels had not power to drag such a trawl as would ensure much larger catches of fish from deeper waters. The nets he proposed would be stronger as well as larger than those ordinarily employed. Mr. Atkin expressed his opinion that, by means of this enlarged scale of operations, great additions might be made to the supply of oysters from beds at present inaccessible. The English and French oyster fishermen dredged only to a depth of about 30 fathoms, but no doubt much larger supplies might be obtained from beds which would be found in deeper water. He proposed that dredging should be carried on upon a larger scale, and employing larger dredges to be worked by steam power, which could also be applied to the working of a side screw as auxiliary propulsion of the vessel. He believed that large oyster beds existed on the Dogger Bank. As oysters were now selling in London at 2d. each, it would be worth while to increase the supply and reduce the price. He proposed to adopt the plan which was carried out in America—viz., when any large supply of oysters was obtained, to take the fish out of the shells and pack them in cases. In New York, oysters treated in that way were sold at 4d. per lb., which was remarkably cheap compared with the price charged in this country.

Proceedings of Institutions.

Science Classes, Royal Arsenal, Woolwich.—The 5th annual distribution of prizes and certificates, awarded by the Society of Arts, and by the Science and Art Department, South Kensington, to the successful students of the Royal Arsenal Science Classes, on the results of examinations held in May last, were distributed in the lecture-hall of the Arsenal Mechanics' Institute, on Thursday evening, the 21st November, by John Anderson, Esq., president of the institute and of the committee or local board, the members of the board present being Messrs. Oram, Baker, Davidson, McGrath, and W. D. Keeble, the secretary. Before proceeding to distribute the prizes, Mr. Anderson delivered a very lucid and stirring address to the students and friends present. He spoke of the advantages offered by the Science and Art Department, and the Society of Arts, to the youth of our day, throughout the United Kingdom of Great Britain and Ireland, and urged the necessity of a larger amount of technical education amongst all classes of artisans, and especially engineers, if England were to retain her hitherto exalted position among the other nations of the world—remarking that this education should be so general as to prevent its recipients feeling themselves above the labour of the workshop. Mr. Anderson then gave a very interesting and instructive account of the machinery department of the Paris Exhibition, remarking, with much regret, that our own country had not made such progress in this department during the last few years as had been made by other countries, with which England compared so well in 1851. By way of illustrating this, he stated that two very large contracts for locomotive engines, &c., amounting, respectively, to £160,000 and £325,000, recently tendered for by several European countries, both went from England—the one to France, the other to Austria, and this, apparently, through England's inability to compete with those powers. The president then stated that such exhibitions as the Paris one might be considered to bear a somewhat similar relationship to nations as the science class examinations all over the kingdom bore to the students, and although he had to speak in somewhat unfavourable terms of England in some branches of engineering at the Exhibition, he was pleased to find that, coming nearer our own homes, and in the matter of these science examinations, the Royal Arsenal classes showed such favourable results, as set forth in some statistical tables prepared by Mr. W. D. Keeble, the secretary. A vote of thanks was then given to Mr. Jones, F.R.A.S., the principal of these classes, for his highly satisfactory conduct of them during the past year. Mr. Jones, in reply, said, in addition to his thanking the meeting for its kind expression of thanks to him, he felt much indebted to Mr. Anderson for his excellent address, which was likely to produce a very wholesome effect upon those for whom it was intended. In acknowledging a unanimous vote of thanks to the committee, Mr. Oram said that he wished Mr. Anderson's very excellent address could have been heard throughout the length and breadth of the land, as he (Mr. Oram) believed it would have a very salutary effect amongst young engineers and artisans generally, in improving their condition as educated, skilful, and promising workmen; and he hoped that England would soon regain the position which she had so long enjoyed in engineering and other branches of industry. This concluded, perhaps, the most interesting and instructive meeting that has ever been held in connection with these classes since their commencement, in 1862.

EAST LONDON MUSEUM OF SCIENCE AND ART SITE BILL.

Mr. Antonio Brady, a member of the Council, has recently issued the following letter, relating to the Bethnal-green Museum, to promote which the Council has voted a sum of £100:—

Sir,—As one of the promoters of the above bill for securing to the artisans of London (who mostly reside at the East-end) the blessing of industrial and art education, permit me, through your columns, to call Lord Redesdale's attention to one of the many misapprehensions into which he has inadvertently fallen, and thus unhappily deferred, we will hope only for a short time, the realisation of this great scheme, which, fostered by the far-seeing wisdom of the Government, I had hoped was on the point of being accomplished. I still trust that as soon as Parliament re-assembles this bill may be passed, so that our artisans may in future be in a position to compete with foreign nations on more equal terms than at present. While foreign nations possess better means of art education our workmen are at a great disadvantage in the race of free trade.

The proposed museum is no local affair, but designed as a national establishment, to give means of utilising some of the treasures now stowed away in cellars for want of space to exhibit them.

Lord Redesdale takes exception to the Bill, "that it does not provide as to who the trustees of the museum are to be;" and adds, "Was Parliament to give powers of purchase to a trust not yet formed?" This is

the point on which I submit his lordship is mistaken, as I will try to explain. The facts are simply these:—The three gentlemen named in the Bill offered to raise funds to pay for the site in question if it was acceptable to the Government. This was in the time of the late administration, so it is no party question; and Lord Granville, then Lord President, accepted the offer, and a report was made to Parliament recommending the scheme. This report, and the correspondence relating to it, will be found in the 13th Report of the Science and Art Department. The ministry was changed, and the scheme slept, until, on the part of myself and colleagues interested in this matter, I had the honour of renewing the offer to the present Government. After very full inquiry and mature deliberation, the Cabinet approved the plan, and Parliament voted the necessary funds. On our part, we submitted to the Government the agreement for the purchase of the land, which we had conditionally entered into with the trustees. This draft having been approved by the Government, a regular deed, under seal, was executed by every person interested in the matter, and the local papers have been warm in its praise. No Government ever did a more popular or a more gracious thing for the million at the East-end.

Counsel, however, at the last moment, raised some legal and technical objections to the title, which it was thought could best be remedied by a short Bill, which was prepared accordingly by Mr. Reilly.

The Bill recites that the three gentlemen named in it may purchase, but only for the purposes named in the deed of purchase, and that the trustees may sell, but only in order that the land may be handed over to the Government for the purposes of the intended museum.

Now what Lord Redesdale seems to have overlooked is the fact, that, by Royal Charter, bearing date the 30th of April, in the 27th year of Her Majesty's reign:—

"The Lord President of the Most Honourable Privy Council for the time being, and the Vice-President of the Committee on Education of the Most Honourable Privy Council, also of the time being, shall be a body corporate, under the name of the Department of Science and Art, having a perpetual succession and a common seal, with a capacity in that name to sue and be sued, make contracts, purchase, take, hold, and enjoy for the purposes of science and art, as well goods and chattels, 'as lands and hereditaments,' not exceeding fifty acres, without license in mortmain. And the said charter of incorporations further grants unto the said Department of Science and Art full licence and authority, for the furtherance of science and art, to accept any trust, whether subject or not to special conditions, &c., &c."

Now all that the proposed act is intended to do is to enable the three gentlemen named in the Bill to make over this land to the Science and Art Department for the purposes named.

The proper office, I have reason to believe, certified that the promoters of this Bill (myself and others) had complied with the standing orders as to notices to the public; and the only reason that we or the Government had for pressing this Bill forward was the hope of providing labour during the coming winter for many deserving poor, now, unhappily, out of work; a reason which, I feel sure, would commend itself to the heart, not only of Lord Redesdale, but of every other person interested in this great work. The other matters referred to in his lordship's speech will probably be replied to on the re-assembling of the House, and, in the meantime, the great cause of industrial and art education will, I trust, be advanced by the discussion to which the grave matters involved in this movement for the benefit of our working classes is sure to give rise.—I have the honour to be your obedient servant,

Antonio Brady,
One of the Promoters of the Bill.

Maryland Point, Stratford, December 14, 1867.

UTILIZATION OF SEWAGE.

An experiment of some importance is now being carried on at Asnières, near Paris, on a field of about two acres and a-half in extent, and situated about 300 yards distance from the mouth of the great *egout collecteur*. Two portable engines are employed daily in pumping 500 cubic mètres of sewage-water into a receptacle at one end of the field. A part of this water is applied to various crops—vegetable and cereal—and the remainder is treated with chemical agents for its purification. The former application is considered as fully confirming the opinion that sewage-water may be advantageously applied either to crops or to the direct fertilisation of the soil itself, without communicating any bad taste to the vegetable products, or in any way vitiating the surrounding atmosphere. Some fine specimens of beetroot, yellow turnips, artichokes, and other vegetables thus irrigated were shown at the late exhibition on the Champ de Mars. These products were grown at Clichy, but they were not accompanied by sufficient data to render them scientifically and practically useful, and therefore the authorities of the city of Paris have set on foot the experiments already referred to, in order to obtain definite results connected with this important question. It is the expressed opinion of M. Le Chatelier, a mining engineer engaged in the experiments of purification of the sewage, that the cultivated lands around Paris can never absorb a considerable portion of the sewage water; one difficulty arises from the cutting up of the land into small allotments, which increases the cost of distribution; a second from the fact that the principal arable lands lie on high plateaux, whose slopes lie often in directions contrary to that of the streams; and, lastly, the distance from the sea removes the possibility of getting rid of the excess of water in that direction.

As regards the purification of sewage water, M. Le Chatelier considers sulphate of alumina as the most effective agent. He says that by employing, in small doses, ferruginous sulphate of alumina, obtained by treating *bauxite*, a common mineral found in the south of France, with sulphuric acid, or by washing the ashes of the Picardy alum works, the water of the sewers may be purified almost completely, and in a relatively short time. The quantity of sulphate of alumina required is stated to be between 100 and 200 grammes (one-fifth to two-fifths of a lb.) per cubic mètre of the sewage water to be purified. The average amount of impurities per cubic mètre in the sewage water of Paris, is found to be as follows:—

	Kilogrammes.
Mineral matter	1·902
Organic „	0·599
Soda	0·103
Potash	0·022
Phosphoric acid	0·012
Azote	0·033
Total	2·671

They contain in solution carbonates of ammonia, lime, and magnesia, as well as small quantities of sulphate of ammonia, and earthy and metallic salts. A precipitate of alumina and aluminate is thrown down, which also encloses light matters in suspension in the water; oxide of iron is likewise precipitated, and, completely neutralising the sulphuretted hydrogen, assists the deposition. Thus we have at the same time decolorisation, clarification, and disinfection.

The experiments which have been made are not, however, deemed conclusive, and a fresh series are now under hand in a smaller reservoir, which has a surface of about 250 square mètres, and receives 50 cubic mètres of sewage water per hour; the water, after four hours' treatment, is said to pass off through a filtering medium in a very satisfactory condition. There remains, however,

the economical question. This process of purification would require basins of many acres in extent, besides the erection of pumps and steam engines, in addition to the still heavier expenditure for the chemical agent employed. The cost of the sulphate of alumina is between one and two centimes per cubic mètre of sewage water, so that the quantity required to purify 200,000 cubic mètres per day would cost between £80 and £160.

The remaining question is whether the matter precipitated would find a market as manure; but the amount of the chemical agent employed would alone give this precipitate a minimum value of four shillings per cubic mètre, while the supply from 200,000 cubic mètres of sewage water alone would be no less than 400 cubic mètres per diem; and when it is remembered, moreover, that this manure would contain 72 per cent. of inert mineral matter, against 25 per cent. of organic matter and 0·75 per cent. of azote, it seems very doubtful whether a market could be found for such a product.

There is no question of the immense importance of the subject, and it is to be hoped that the experiments now being made will at any rate assist in bringing about some advantageous application of such precipitated matter, and thus prevent the pollution of rivers and the extermination of the fish which inhabit them. The Seine at Paris is now relieved of the sewage water of the metropolis, which is thrown into it below the city, but, on the other hand, it still receives the impurities which are poured into it by all the sewers between Paris and the source of the river.

Fine Arts.

A Picture by Sir Thomas Lawrence placed in the Louvre.—It has often been remarked that no pictures of the English school are to be found in the Louvre, and, in truth, the Great Gallery contains only one work, a picture of dead game, by an Englishman, if we except Bonnington, who is generally classed with the French school. The picture by Sir Thomas Lawrence, just acquired, is a portrait of Madame Ducrest de Villeneuve, wife of the Rear-Admiral of that name.

Modern French Pictures.—The famous picture of Ingres, "La Source," which was seen in London at the Universal Exhibition of 1862, forms part of the collection of the Comte Duchâtel, which is about to be dispersed by the auctioneer. The sum which the painter received for this work is said to have been £4,000, and it is expected to fetch a much higher price at the coming sale. The well-known picture by Ingres, "The Odalisque," was purchased by the late Comte de Portalis for £480, and was resold not long since for £2,000. The "Napoleon" (1814), by M. Meissonnier, which was to be seen the other day at the Champ de Mars, was recently sold for £4,000; and it is said that the same artist has received a commission for a companion picture at the price of £6,000.

Manufactures.

The Manufacture of Candles in Italy.—The manufacture of tallow candles, at one time very considerable in Italy, has lost a great deal of its importance since the introduction of stearine candles, and more especially of lighting by gas. In Piedmont and Liguria the number of manufactories of tallow candles is 202, employing about 280 persons, and producing 570,000 kils. (1,254,000 lbs.) per annum. In the province of Milan, in Lombardy, there are 12 manufactories, working about 600,000 kils. (1,320,000 lbs.) of raw tallow every year, and their annual produce may be estimated at 1,200,000 frs. (£48,000). From 50 to 60 workmen are employed, whose wages average from 1·20 to 2·50 frs. per day. In the Romagna, the Marches, and Umbria there are 11 manufactories, producing yearly to the amount of 320,000 frs. (£12,800). Tuscany exports annually 450,000 kils. (990,000 lbs.), and the Neapolitan provinces, 847,000 kils. (763,400 lbs.) of tallow. The manufactory of stearine candles of Messrs. Lanza, of Turin, employs from 100 to 150 workmen, and 970,000 kils. of tallow, of which about half is imported from abroad. It produces about 800,000 packets of candles, weighing half a kilo. There is also another manufactory of some importance at Turin. M. Manganoni, of Milan, manufactures 9,000 kils. of stearine candles, amounting to the value of 1,080,000 frs. per annum. These candles are sold retail at 2·85 frs. per kilo. At Mira, near Venice, there is a manufactory employing 90 men and 70 women, producing about 160,000 lbs. of candles per annum, which are in great part exported to Brazil and the Antilles. In Tuscany, at Leghorn and Pisa, about 800,000 kilos. (1,760,000 lbs.) of stearine candles are produced yearly. The candles made at Naples are sold at 2·70 per kilo. The following shows the value of the imports of stearine candles in Italy:—

	Quantity. Kils.		Value in Frs.
1863 ..	484,600	..	1,425,000
1864 ..	497,600	..	1,468,000
1865 ..	446,700	..	1,317,000
Average kil. ..	476,300	.. Frs.	1,403,000
Lbs.	1,047,860	.. £ ..	56,120

Manufacture of Small Arms in Italy.—In Italy there are three manufactories of small and side arms belonging to the Government—at Brescia, Turin, and Torre Annunziata; there is also a workshop for the repairing of small arms in the arsenal at Genoa. None of these factories are worked by steam, but they possess a water power of 234 horses. The number of workmen, both civil and military, amounts to 1,460. The wages of the former average from 1 to 3 frs. per day, although some earn as much as from 5 to 7 frs. The military workmen receive from 60 to 70 centimes per day. The quantity of iron and steel used is 2,207 quintals (220 tons), of the value of 190,000 frs. per annum; 209 quintals (20 tons) of copper and gun-metal, amounting to 26,000 frs. The wood used for making the stocks costs 75,000 frs. Thus the raw material employed annually in the three factories amounts to 586,000 frs. (£23,440). The following are the principal annual productions of the three manufactories:—

	No.		Value. Frs.
Guns (new)	18,259	..	671,000
,, (repaired) ..	125,129	..	354,000
Swords (new) ..	49,000	..	443,000
,, (repaired) .	15,427	..	25,000
Bayonets (new) ..	3,672	..	20,000
Scabbards for ditto	60,000	..	94,000
Tools (such as nipple, wrench, &c.)	10,000	..	45,000

Besides these, the furniture and other accessories of 60,000 guns, valued at 308,000 frs., must be added, which forms a total value of 1,960,000 frs. The cost of labour was 920,000 frs., and the annual consumption of fuel may be estimated at 114,000 frs. Amongst the branch factories, there is the foundry at Mongiana, in Calabria, and of San Giovanni, at Teduccio. The first is worked by two steam-engines and seven water-wheels, amounting to 116 horse-power, and employing 1,126 workmen. It produces annually:—

				Value.
Hollow and solid shot ..	No.	.. 4,902	..	103,500
Soft iron	Quint.*	.. 740	..	32,000
Bars for gun barrels	No.	.. 1,465	..	4,500
Furniture	Quint.	.. 72	..	8,600
Gun barrels	No.	.. 800	..	27,000

* Quintal: 1 cwt. 3 qrs. 24½ lbs.

The total value of the products of the various branch establishments amounts to 330,000 frs., and the raw materials employed cost 227,000 frs. At the establishment of San Giovanni, at Teduccio, they make locomotives and machinery for coining. The war materials manufactured are chiefly bullets, grenades, and other projectiles; cost, 234,000 frs. The rifling of cannons is estimated at 158,000 frs. The introduction of rifled arms in the Italian army, and for the national guard, has caused during the last few years a great importation of foreign guns, especially from the well-known establishment at St. Etienne, in France, and from Switzerland. From 1861 to 1865 inclusively, the following are the imports of fire and side-arms:—

	No.	Value.
Gun barrels	155,949	2,689,000
Pistol barrels	53,709	433,000
Guns for regulation	863,491	23,411,000
„ sporting	17,631	615,000
Sword blades	——	340,000

With the exception of a small quantity sent to Turkey, the exports of firearms are of little importance. During the same period (1861 to 1865) 25,829 regulation guns, 736 sporting guns, 37,700 pistol barrels, and 3,665 gun barrels, amounting in all to the value of 1,270,000 frs. (£50,800), were exported.

Commerce.

The Railways and Telegraphs of the World.—In 1866 the total length of railways opened for public traffic throughout the whole world amounted to 87,578 English miles, and are divided amongst the various nations as follows:—

	Miles.
United States of America	32,742
Great Britain and Ireland	13,476
Germany (including Austria)	13,392
France	9,142
India	3,434
Italy	3,284
Spain	3,161
Russia	2,815
Canada	1,968
Belgium	1,618
Sweden	1,040
Switzerland	795
Holland	711
	87,578

The cost of the 13,476 miles of the English railways up to the present time amounts to £455,000,000, whilst the 13,392 miles of railway in Germany cost only £96,750,000. The 9,142 miles of railway in France cost £280,000,000. The total length of telegraphic lines throughout the world is upwards of 178,056 English miles, consisting, on the average, of a triple line of wires. The following is the length of lines in the various countries, according to the latest returns:—

	English miles.
1866. Germany	28,347
1866. Russia	22,992
1866. France	18,694
1866. Great Britain and Ireland	16,297
1866. Turkey	8,665
1863. Italy	8,216
1865. Sweden	3,507
1861. Belgium	1,089
1866. Switzerland	2,160
1865. United States of America	52,957
1865. Canada	5,050
	167,974

To this must be added the two Atlantic cables, the total engths of which are about 4,317 English miles (3,754 nautical miles), and the total length of the other submarine cables amounts to near 5,765 miles.

Colonies.

The Land System in South Australia.—A colonial paper says that the time has really arrived for a complete change in the principle upon which the public lands of this colony are sold. Hitherto the law has provided that those lands shall be sold to the highest bidder, no matter what use he may intend to make of them. The state may know that he is a mere speculator; that he has no intention of settling upon the public lands; and that his sole object is to sell them again, when he may wring a larger price from the hands of the man who really does wish to settle upon them, but who is unable by any means in his power to get the farm which the Government auctioneer is offering, without either bribing the speculator first, or paying him an advanced price afterwards. In fact, the principle of the present system is this—that land is £1 per acre, and that the farmer shall have it at that price if nobody else wants to pay more. But practice shows that somebody else always does want to pay more whenever the unfortunate agriculturist makes a bid, and the result is that he is virtually driven from the auction-room, which is therefore abandoned to the agents and speculators. The returns show that the average auction price of country land has ranged from £1 3s. per acre in 1860, to £1 14s. 5d. in 1865; whilst the average price of all lands—including town and suburban—has during the last ten years not been more than £1 5s. 11½d. per acre. The whole of the difference, then, between the auction-price of country sections and the price which the farmer pays must find its way into the pockets of the speculators, who thus drive a thriving trade upon the necessities of those who ought to be able to obtain their farms at £1 per acre direct from the Government.

Land Laws in South Australia.—The returns which have been laid on the table of the Assembly concerning the migration of settlers to the other colonies seem to be conclusive as to the existence of some discontent at the state of the land laws in this colony. It appears that the Government sent the following questions to sixty District Councils:—"1. Are you aware of any farmers having left or being about to leave your district during the present year with the intention of settling in New South Wales or Victoria? 2. Were they tenant-farmers or freeholders? 3. Of what nationality? 4. Can you assign any reason for their leaving?" The result of the sixty circulars sent out is as follows:—Eleven District Councils have replied that some settlers have left, and that others are about to follow; thirty-eight have replied that they are not aware of any departures; one has replied that two families have come from Wentworth to reside in the district; and the remaining ten have not replied at all. Judging, then, from the comparatively small number of districts that have complained of migrations, the "exodus" would seem to be a trifling matter. But when the particulars are looked into it will be seen that the class of people who have left are those which the colony can ill-afford to spare, and that altogether they number some 74 families.

Obituary.

Duc de Luynes and de Chevreuse.—The late duke was said to be the richest of all the old nobility of France, as he was certainly the most munificent patron of the arts. His Château of Dampierre, not far from Versailles, one of the most famous show-houses in the country, contains a fine collection of paintings, sculpture, and works

of art and *vertu* of all kinds; and his collection of medals and antiquities, presented to the nation some time since, forms a special department of the Bibliothèque Imperiale of Paris. Every intellectual labour found a patron in the late duke; he aided greatly in the restoration of the art of glass-staining; he gave a sum equal to a thousand pounds to anyone who invented a new process in photography, and threw it open to the world; when a famous medal was stolen from the old collection of the Bibliothèque Imperiale the duke took great trouble to find a similar one, purchased it for the sum of seventy-two pounds, and presented it to the director, M. Naudet, saying that a public collection had greater claims than a private one; a large number of splendid books owe their appearance to his munificent aid; the Château of Dampierre is surrounded by admirable roads, all made at his own and his father's expense; one of these is thirty leagues in length; he made more than one excursion in the East for scientific purposes, and aided many other explorers; and he was himself a distinguished artist, writer, and connoisseur, but so retiring that he could never speak in the chamber. When the late troubles broke out in Rome, his son and his nephew joined the pontifical army as volunteers, and the duke tended the sick, and died, at the age of 65, through a cold caught by giving his cloak to a wounded soldier.

Theodore Rousseau, one of the most celebrated landscape painters in France, and a constant exhibitor. He had suffered sadly for several months, and died recently at his house, at Barbizou, on the skirts of the forest of Fontainebleau, whence he drew his inspiration. By his will, all the works remaining in his possession are to be collected and photographed, and, if circumstances permit, they are to be published in a collected form, after the manner of the "Livre de Verité" of Claude Lorraine, or of the "Liber Studiorum" of Turner. M. Rousseau was only fifty-five years of age.

M. J. P. Flourens, professor of comparative physiology at the Museum of the Jardin des Plantes of Paris, where he succeeded Cuvier in 1830, perpetual secretary of the Academy of Sciences, member of the Académie Française, and of the principal scientific societies of Europe; author of "De la Vie et de l'Intelligence," "De la Longévité Humaine," "Théorie Expérimentale de la Formation des Os," and many other works. The deceased was born in 1794.

Notes.

Scholastic Registration Association.—The annual general meeting of this association, open to educators and persons interested in education, will be held on Wednesday, 8th January, at eight o'clock p.m., at the house of the Society of Arts, John-street, Adelphi, London, W.C., by permission of the Council. The Rev. William Haig-Brown, LL.D., F.C.P., Master of Charterhouse, will preside, and the honorary secretary will give a statement of the objects, constitution, and operations of the association. Several questions of the highest importance will be introduced for discussion, and it is earnestly hoped that all who are interested in the advancement of education and the prosperity of the profession, will attend and take part in the proceedings. The following will be the principal resolutions:—"That education is entitled, as much as medicine, divinity, or law, to be regarded as a distinct profession, and that liberal culture and special training are as much required by the educator as by the physician, the lawyer, or the divine." "That a Scholastic Registration Act, by giving to educators a legally recognised position, would tend to increase their efficiency, and, by discouraging unqualified persons from engaging in the business of teaching, would gradually raise the standard of education throughout the country." "That as the need of special training for teachers of both sexes is now practically recognised in the case of schools for the poorer classes, a similar provision ought, *à fortiori*, to be made for teachers in schools of the middle and upper classes, involving as these do a greater variety of subjects, and a greater depth and breadth of instruction."

Newspapers in Roumania.—There are now about twenty daily newspapers in Roumania. They have but a limited circulation. The *Monitordl*, the official organ, has only a circulation of 4,000 per day; the daily circulation of all the others put together does not amount to more than 10,000 copies. The organ of the reds is the *Roumainl;* that of the conservatives the *Independenza Romana*, which is printed in the Roumanian and German languages. There is also a German lithographic sheet, the *Rouman Correspondence*, the anti-Jewish *Trompetta*, the *Gazzetta de Jassy;* and the *Moldavia*, the organ of Moldavian separatists. Of these the first four are published at Bucharest, and the others at Jassy. There are also several local journals,—two published at Jassy, four at Bucharest, three at Galatz, and one in each of the district capitals.

Effect of the Late Storm on the Champ de Mars.—The storm which swept over Paris a fortnight since is found to have caused destruction to the extent of more than four thousand pounds in the reserved garden attached to the late Exhibition. The roof and a portion of the side of the great conservatory were torn off, and nearly the whole of the fine palms and other tropical plants cut to pieces. The roof of the restaurant was also carried away, two sheds and a large corrugated iron roof destroyed, and a small glass-house entirely destroyed by the falling materials.

The Calais Life Boat.—It will be remembered that the fine life-boat exhibited by the Royal Life-Boat Society, at the late Paris exhibition, was presented to the sister society of France, with a recommendation that it should be stationed at Calais, where many shipwrecks of English vessels had occurred. On the second of last month (December), this boat was first called into use during a terrific storm, when it was the means of saving the lives of six sailors from the wreck of an English brig. A good action does not always bear fruit so soon.

Colonisation in the Caucasus.—The Russian journal *Moskowa* states that the Government intends to try the experiment in the spring of establishing Czech colonies in the Black Sea districts. Land in the Caucasus is to be offered gratis to Czech settlers; but they are not to be allowed to sell any portion of their land for the first ten years of their stay. The Government will also lend them money for farming purposes, and to enable them to build schools and other public establishments.

Loan for the City of Paris.—The authorities of the City of Paris have, it is said, arranged with the society of the Crédit Foncier for a loan of 380 millions of francs (£15,200,000), with a view of making certain reductions in the octroi duties on coal and other raw materials which press very heavily upon the factories in the outskirts of the town, and have caused many to be closed. The society is to find the necessary funds during the next ten years, and the city is to repay the loan in fifty years. This arrangement will give the city of Paris a balance in hand of one million sterling per annum to cover the loss caused by a diminution of the duties in question. Amongst other changes the octroi duty on wine, it is expected, will be reduced to half its present rate. The state, being in receipt of a certain per centage of the octroi duties, will bear its proportion of the cost of the arrangement, which will be carried out partly by Imperial degree and partly by a legislative act. The duties in question fall very heavily on the poorer portion of the community as well as the manufacturers, and their reduction will be one of the most popular measures ever effected; it is unfortunate, however, from the nature of the duties, or rather from their mode of collection by officers stationed at all the barriers of the metropolis, that the diminution of the amount of the duties increases, *pro rata*, the expenses of collection.

Introduction of Telegraphic Dispatch Stamps in France.—This important change, which has already been noticed in the *Journal*, came into operation on the first day of the new year. There are four kinds of stamps prepared, of the respective values of 25 and 50 centimes, and one and two francs each, the colours being carmine, green, chamois, and violet. Generally, prepayment by these stamps will be obligatory. Stamped dispatches may either be deposited in the boxes prepared for the purpose, or handed to the clerks at the post offices, who will give receipts for them. When the price of the dispatch exceeds ten francs for France, or twenty francs for abroad, payment is to be made in cash. If the stamp is lower in amount than it should be, the difference, with a fine of fivepence added, will be demanded of the person to whom it is addressed, and on his refusal to pay, it will go to the dead office. But this only applies to France; no telegram will be sent abroad if not fully stamped. The cover containing the dispatch must be stamped in the ordinary way like a letter.

Direct Paris and Hamburg Railway.—A new line of railway, of great importance to the north and west of Germany, has just been conceded by the Prussian Government, after a previous understanding with the authorities of Hamburg, Bremen, Oldenburg, and the company owning the line from Cologne to Minden. This new undertaking, which is chiefly known as the "Direct Paris and Hamburgh Railway," will start from the latter place, and pass by way of Bremen and Osnabruck to Cologne. By uniting the three great ports of Germany, Kiel, Hamburg, and Bremen, with the coal districts of Westphalia, of which the town of Dortmund is almost the centre, it will allow German coal to be brought direct to those towns. The cost of carriage will be but small, and the produce of the mines will find a ready market on the coasts of the North Sea and Baltic; it will, moreover, furnish a new element of freight to the shipping of Bremen, as the German vessels trading to India and China, finding within reach the Westphalian coal, will carry it to those distant countries, where supplies of fuel form one of the most productive resources for merchant shipping. These results, if not as certain as accomplished facts, are, at least, highly probable. Although the line of railway is not definitively traced out, the works will be commenced immediately, and there are hopes that the whole will be terminated in less than five years.

Production of Amber.—The little fishing village of Schwarzort, situated on the shores of the Baltic, between Memel and Dantzic, about two leagues to the south of the former place, has within the last three years acquired a certain importance, owing to the discovery of a large bed of amber. This bed is situated near the Cape Korning, and is believed to be extensive. Four steam dredgers are employed for the collection of the amber, as well as a considerable number of dredgers worked by hand. The amber is found almost uniformly in separate nodules, with lignite disseminated in the sands at a depth of from ten to twelve feet. The dredging is carried on day and night, by shifts of eight hours each. About 400 persons are employed at this work, and their wages are on the average 22 silver groschen (2s. 2d.) per shift. The quantity of amber collected is considerable, amounting to about 288 lbs. per shift, and for six days' work 5,184 lbs. The sand, after being dredged up, is sent on shore, when it is washed in order to find the amber.

Correspondence.

SCIENCE CLASSES.

Sir,—At our last educational conference I directed attention to the failure of science classes in Yorkshire. Since then, my attention has been constantly directed to the subject of technical education, but I should not have troubled you with any communication thereupon at the present time had not a "comparative statement, showing the present state of scientific instruction in Lancashire and Yorkshire," been published in the *Journal*. At the conference I gave utterance to my conviction, that before any satisfactory results can be gained in science classes, primary education must be more widely extended, and the quality thereof considerably improved. I further affirmed that the present science class scheme of the Department is a miserable failure, as regards its present influence upon technical education. I substantiated my statements by official statistics, proving that although there was a yearly increase in the total number of science pupils, yet this increase was mainly due to the establishment of new classes, and not to a healthy increase of pupils in classes already established. I also pointed out the meagre results of the teaching in science classes. By a glance at the report of the Department it will be seen, that in the majority of classes established in 1866 there was a decrease of pupils in 1867. As regards the results of instruction, a pleasing delusion is given by the total number of pupils under instruction, the number of papers worked at the examination, amount paid to teachers, and sums awarded in prizes. But let the totals be analysed, the subjects of instruction specified, and the centres of industry noted in which the results are gained, and the delusion will give place to the conviction that, notwithstanding all Departmental advocacy, the present science classes are exerting but the smallest influence upon the technical education of the community. As Lancashire has been brought to the front, I am quite willing to take my stand upon the results gained in that county, and by noticing the progress of its science classes, and the results produced, as certified by the examinations of the Department, to substantiate my assertions.

By reference to the last "Science Directory," it will be seen that out of 47 schools enumerated in the "comparative statement," only 33 are returned in the report of the Department for 1866. Of these 33 schools 18 had a less number under instruction in 1867 than in 1866.

	1866.	1867.
Accrington	23	21
Blackburn Mechanics' Institute	20	16
Bolton, Bridge-street	65	60
,, Independent School	34	13
,, Mechanics' Institute	95	79
Burnley Literary Institute	70	55
,, Westgate	20	12
,, Mechanics' Institute	60	48
Clitheroe	30	12
Droylsden	69	37
Haslingden	29	19
Manchester Mechanics' Institute	388	239
,, Corporation-street	42	36
Nelson-in-Marsden	36	27
Newton Heath	16	12
St. Helen's	22	19
Salford	53	44
Wigan	30	23

In four the numbers were stationary:—

Ashton-under-Lyne	20	20
Burnley Grammar School	50	50
Oldham Science and Art School	100	100
Pendleton	17	17

and in the remaining 11 there was an increase:—

Bacup	38	51
Blackburn	11	13
Bolton Science and Art School	31	168
Burnley Carlton School	62	69
Bury	60	72
Heywood	23	32
Liverpool	28	68
Manchester Society	13	31
Middleton	17	22
Oldham Analytical Society	13	14
Preston	23	37

So the result of one year's indefatigable exertions of the local administrators, upon classes in existence in the previous year, is seen in a diminution of pupils in 18 schools out of a total of 33, and an increase in 11, and this in the county in which the scheme has every advocacy, and is fostered in every conceivable way.

Next consider the results of instruction in Lancashire. It must be borne in mind that pupils who have not sufficient knowledge to enable them to pass an examination for the 5th class, "for" (says the Directory) "the fifth-class standard is only such as will justify the Examiner in reporting that the instruction has been sound, and that the students have been benefited by it," may swell totals, but the results of their instruction, in the deliberate opinion of the Department, are *nil*.

Subjects taught.	No. under instruction.	Total No. that passed examination.	Total No. arranged in classes.				
			1	2	3	4	5
Geometrical drawing	668	144	33	31	18	13	49
Machine drawing	550	208	29	21	94	37	32
Building construction	345	125	15	22	40	20	28
Elementary mathematics	91	18	2	1	6	4	5
Theoretical mechanics	147	17	0	4	7	3	3
Applied mechanics	48	7	2	1	3	0	1
Acoustics, light and heat	285	60	3	9	26	8	14
Magnetism and electricity	81	19	0	6	6	4	3
Inorganic chemistry	744	152	1	7	34	47	53
Organic chemistry	97	8	0	3	3	3	2
Geology	104	31	2	5	12	8	4
Animal physiology	233	76	5	18	27	7	19
Zoology	6	4	0	1	3	0	0
Structural and economic botany	20	2	0	1	0	1	0
Mining	11	1	0	0	1	0	0
Metallurgy	20	12	0	0	3	0	9
Physical geography	173	54	3	8	8	19	16

These results should also be considered with reference to their distribution among the towns named in the "Comparative Statement."

Towns.	No. of candidates who have passed the several examinations:—1. Geometrical drawing. 2. Machine drawing. 3. Building construction. 4. Elementary mathematics. 5. Theoretical mechanics. 6. Applied mechanics 7. Acoustics, light and heat. 8. Magnetism and electricity. 9. Inorganic chemistry. 10. Organic chemistry. 11. Geology. 12. Animal physiology. 13. Zoology. 14. Structural and economic botany. 15. Mining. 16. Metallurgy. 17. Physical geography.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Accrington	...	...		...	..	...	2	6	12	..	3	...	...	...	...	...	...
Ashton-under-Lyne	1	10	..	..	...	...	...	..	..	..	...	...	...	...	...	...	...
Bacup	..	...	..	...	...	...	6	.	2	...	...	...	...	...	...	...	8
Blackburn (2 schools)	..		..		..	..	7	7	9	...	...	...	3	...	..	...	..
Bolton (4 schools)	19	40	31	...	3	2	1	4	18	...	...	7	...	..	...	..	9
Burnley (5 schools)	..			...	2	...	14	5	18	..	5	...	..	...	..	...	19
Bury	20	26	24	...	...	...		..	3	..	...	...	...	...	...		...
Chorley	8	...	..	.	...	..	...	..	..	...	...	...	.	...	...	...	...
Clitheroe	...		..	..	..	...		4	3	...	...	...	...		...	.	...
Darwen	...	...				...	7		6		.	...	...	...	..	...	...
Droylsden	7	14	8	..	...	..		...	4	5		...	..	...		.	..
Denton	...		...	..		...	..		..			...	..	...	...	...	...
Haslingden	..	...	...	...	..	...	4	...	..	...	...	..	...	...	..	..	3
Heywood	9	15	11	.	...	..	..	.	3	...	...	..	.	...	...	...	
Lancaster	...	...	.	3		...	...		4	..		8	..	...	...		
Liverpool (2 schools)	..	...		12	3	...	5	2	14	...	...	5		...		...	..
Manchester (6 schools)	18	29	21	2	1	2	1	...	21	.	...	52	2	1		12	1
Middleton		...	...	...	..	...		..		..		..	...	1		...	15
Nelson-in-Marsden	2	..	.	.		...	11	..	.	...	18	..	...	...	...	...	...
Newton Heath	7	6	..			...	...	..	4	3	...	...		...	.	...	...
Oldham (4 schools)	49	55	32	2	3	1	..	...	1	...	...	...		...	.		..
Padiham	...			...	...	...	2	.	...	..	...	...	...	...	...		...
Pendleton (2 schools)	1	6		..		...	1	.	..	...	...		..	.	...	.	...
Preston	..				4	...		..	3	..	2	3	..	...	...	.	..
Rhodes	.		.		...	...				.	...		...	...	...	...	..
St. Helens	...	.	...	.	...	..	..	...	4	...	..	...	.	...	..	...	
Salford	2	7	...	...	1	2	..	...	...	...	...	2	...	...	1	...	...

It matters not from what point of view the statistical returns of science teaching are regarded, the same unsatisfactory results present themselves. From a table of results, published in the last annual report of the Lancashire and Cheshire Union, I extract the following figures, showing the results of the science examinations in all the institutions included in the table, that were represented by candidates in 1864:—

Number of Institutions 13

Names.	No. of successful candidates.			
	1864.	1865.	1866.	1867.
Bacup Mechanics' Institution	17	20	9	17
Bollington Mechanics' Institution	18	0	0	0
Bolton Mechanics' Institution	44	80	51	52
Burnley Mechanics' Institution	46	88	17	13
Bury Athenæum	7	30	40	74
Crewe Mechanics' Institution	23	19	13	9
Haslingden Mechanics' Institution	46	8	19	9
Hulme Church Institution	4	8	0	0
Macclesfield	27	23	3	0
Manchester Mechanics' Institution	231	296	170	156
Rawtenstall	12	0	0	0
Salford Working Men's College	27	31	10	11
Stockport Mechanics' Institution	16	38	24	36

From these figures it will be seen that four institutions show no results in 1867; in one the results are the same; in five there is a considerable decrease; and in three only is there any increase. The results of science teaching commenced in 1864, and continued to 1867, being 518 successful students in 1864, against 377 in 1867.

I must not trouble you with further details. You will, however, allow me to make a few remarks respecting the "Comparative state of scientific instruction in Lancashire and Yorkshire." As the results of technical education may be approximately ascertained by the Examinations, and notwithstanding the number under instruction, only those are shown "to have benefited by it" who can at least pass the standard of the 5th class, the present state of instruction in Yorkshire may favourably compare with that in Lancashire. It must first be decided what are the subjects of instruction common to the two counties. I suppose I shall be allowed to assume that the following are essential:— Drawing, including design; mathematics and mechanics; light and heat; steam; chemistry; geology; mining and metallurgy.

From the above tables it will be seen that the subjects of animal physiology, consisting of instruction in human anatomy and physiology, and physical geography, form a considerable element in the totals of Lancashire results. I say not one adverse word respecting the importance of these subjects as parts of general education, but as they do not enter into the manufacturing requirements of Yorkshire, they must be eliminated from the comparison. Even in Lancashire, of the 52 successful Manchester candidates in the former subject, 37 are boys in the institution not over 14 years of age. It will also be noticed that geometrical and machine drawing figures largely in the Lancashire list. Here, however, more comprehensive data must be chosen for comparison, and the results of drawing as a whole, including design, must be considered, if we would arrive at a correct comparison of the efforts made for secondary education in the two counties. Let me invite attention to the following tables, compiled from the last report of the Department of Science and Art, in which it will be seen that the standard of education measured by results is far higher in Yorkshire than in Lancashire.

Instruction in drawing is recognised by the department under three heads:—

I. Schools of Art.
II. Night Classes.
III. Schools for the Children of the Working Classes.

I.—Schools of Art.

1. Table showing the schools of art in Lancashire and Yorkshire; number of students under instruction; number presented for examination in the 2nd grade; and number of artizans whose works were found satisfactory:—

Lancashire.

Town.	No. under instruction, 1866.	No. of students examined in 2nd grade.	No. passed as successful.	No. of artisans whose works were found satisfactory.	
				Elementary.	Advanced.
Burnley	95	23	4	5	1
Lancaster	264	68	20	3	2
Liverpool (N. district)	579	191	60	19	1
,, (S. district)	574	146	75	2	5
Manchester	358	66	26	4	29
Preston	152	47	16	3	2
Total	2,022	541	201	36	40

Yorkshire.

Town.	No. under instruction, 1866.	No. of students examined in 2nd grade.	No. passed as successful.	No. of artisans whose works were found satisfactory.	
				Elementary.	Advanced.
Bradford	106	88	18	4	6
Halifax	135	52	30	12	9
Hull	183	57	32	6	0
Leeds	479	192	93	67	3
Sheffield	317	54	25	74	13
York	118	37	14	12	4
Total	1,338	480	212	175	35

Comparative Results.

	No. under instruction, 1866.	No. of students examined in 2nd grade.	No. passed as successful.	No. of artisans whose works were found satisfactory.	
				Elementary.	Advanced.
Lancashire	2,022	541 or 26·7 per cent.	201 or 9·9 per cent.	36 or 1·7 per cent.	40 or 1·9 per cent.
Yorkshire	1,338	480 or 35·8 per cent.	212 or 15·8 per cent.	175 or 12·3 per cent.	35 or 2·6 per cent.

2. Table showing prizes awarded and payments for results:—

Lancashire.

Town.	No. of students who obtained 2nd grade prizes.	No. of students who obtained 3rd grade prizes.	National competition medals.			Queen's prizes.	Payments for results.
			Gold.	Silver.	Bronze.		£ s. d.
Burnley	1	3	...	...	...	...	14 5 0
Lancaster	5	3	...	...	1	...	19 10 0
Liverpool (N. district)	22	4	...	...	...	...	26 15 0
,, (S. district)	14	4	...	...	1	...	58 15 0
Manchester	10	5	...	2	5	1	55 5 0
Preston	3	3	...	...	1	...	13 3 4
Total	55	22	...	2	8	1	187 13 4

Yorkshire.

Town.	No. of students who obtained 2nd grade prizes.	No. of students who obtained 3rd grade prizes.	National competition medals.			Queen's prizes.	Payments for results.
			Gold.	Silver.	Bronze.		£ s. d.
Bradford	5	2	...	1	...	...	13 0 0
Halifax	10	8	...	...	1	...	40 5 0
Hull	6	2	...	...	...	1	24 10 0
Leeds	46	17	...	...	1	1	123 15 0
Sheffield	13	23	...	...	...	2	87 15 0
York	8	5	...	...	...	1	36 0 0
Total	88	57	...	1	2	5	325 10 0

Comparative Results.

	No. under instruction.	No. of students who obtained 2nd grade prizes.	No. of students who obtained 3rd grade prizes.	National competition medals.			Queen's prizes.	Payments for results.
				Gold.	Silver.	Bronze.		£ s. d.
Lancashire	2,022	55	22	...	2	8	1	187 13 4
Yorkshire	1,338	88	57	...	1	2	5	325 5 0

II.—Night Classes.

Lancashire.

Town.	No. under instruction.	No. examined in 2nd grade.	No. successful.	No. of 2nd grade prizes.	No. of artisans whose works were satisfactory.	No. of 3rd grade prizes.	Payments for results.
							£ s. d.
Accrington Mechanics' Institution	14	10	5	2	...	...	5 0 0
Middleton Mathematical School	27	16	8	3	..	...	6 0 0
Total	41	26	13	5	...	...	11 0 0

Yorkshire.

Town.	No. under instruction.	No. examined in 2nd grade.	No. successful.	No. of 2nd grade prizes.	No. of artisans whose works were satisfactory.	No. of 3rd grade prizes.	Payments for results.
							£ s. d.
Holbeck Mechanics' Institution	30	10	8	3	5	6	9 10 0
Hunslet Mechanics' Institution	26	18	8	4	6	2	10 0 0
Keighley Mechanics' Institution	45	34	18	7	14	6	19 10 0
Kirkstall Educational Institute	41	38	15	7	16	6	18 0 0
Total	142	100	49	21	41	20	57 0 0

Comparative Results.

	No. under instruction.	No. examined in 2nd grade.	No. successful.	No. of 2nd grade prizes.	No. of artisans whose works were satisfactory.	No of 3rd grade prizes.	Payments for results.
							£ s. d.
Lancashire (two classes)	41	26	13	5	...	...	11 0 0
Yorkshire (four classes)	142	100	49	21	41	20	57 0 0

III.—Schools for the Children of the Working Classes.

Comparative Results.

County.	No. of towns connected with the department.	No. of children taught drawing.	No. examined.	No. satisfactorily taught.	No. showing proficiency.	Payments for results.
						£ s. d.
Lancashire	11	8,045	4,679	1,568	562	216 17 0
Yorkshire	20	6,746	3,501	1,383	691	239 5 0

It may be said that the foregoing tables deal with drawing as an art and not as a science, and that geometrical and machine drawing come under the latter category. It may be so. In Yorkshire artisans attend the schools of art to be instructed in these subjects, and are successfully taught therein, but the Department, while it gives payments on results if the pupils are taught by a late pupil who has passed an examination in the second class, will not recognise the labours of its own art-masters, who are fully qualified to give the necessary instruction; who do give the instruction; whose pupils in many cases go in to the examination, but whose labours are not recognised; nor do the results enter into a comparative statement of science classes.

In mathematics and mechanics the results are too small for comparison; in fact, these subjects testify to the non-success of the scheme. The higher mathematics—science classes, including algebra, plane and spherical trigonometry, mensuration—had only five successful candidates in England, one in London, and four at Plymouth; and the science classes in applied mechanics, requiring a knowledge of the general principles of mechanism, could only produce in England thirty-eight successful candidates; and the same remarks apply to geology, mineralogy, mining, metallurgy, and steam. In these subjects, not only are Lancashire and Yorkshire behindhand, but the whole country is so likewise.

The results of geology in Lancashire are mainly gained at the institution at Nelson-in-Marsden, and there it is unconnected with the daily toil of the students, for in running through the list, I see no other description than that of weaver, warehouse boy, office boy, and the like. Of mineralogy there is no notice in the list, and there are only 28 successful candidates throughout the country.

Lancashire certainly has an advantage over Yorkshire in mining, for it has 11 candidates under instruction, one only having been so taught as "to profit by the instruction given." This must not be placed to the discredit of Lancashire, for only 9 candidates have been successful in the science classes of England and Wales; 26 candidates gained certificates, but 17 are entered as self-taught.

Of the 34 successful candidates in metallurgy, 12 candidates are to the credit of Lancashire and 3 to Yorkshire, but all the Lancashire candidates are boys 12, 13, and 14 years of age respectively, while the Yorkshire candidates are artisans.

Steam is unknown as a science class subject in either county, yet the government syllabus is most comprehensive; treating of the general properties of steam; the different kinds of steam engines; description of boilers; methods of measuring efficiency of steam; its practical working, and so forth. In Great Britain and Ireland only seven towns are represented, and most of the candidates were sent from Plymouth and Hull.

Acoustics, light and heat, grouped as one subject, and magnetism and electricity, are the only subjects in which a comparison between Lancashire and Yorkshire can be drawn favourable to the former; but I will leave manufacturers to strike the balance, after they have considered the results of the instruction in chemistry as follows:—

Organic Chemistry.

	No. of pupils under instruction.	Total No. that passed examination.	Total No. arranged in classes.				
			1	2	3	4	5
Lancashire	97	11 or 11·3 per cent.	0	3	3	3	2
Yorkshire	24	16 or 66·6 ,,	2	2	7	4	1

Inorganic Chemistry.

	No. of pupils under instruction.	Total No. that passed examination.	Total No. arranged in classes.				
			1	2	3	4	5
Lancashire	741	152 or 20·4 per cent.	1	7	34	47	53
Yorkshire	163	55 or 33·7 ,,	5	6	11	14	19

I now submit that the foregoing tables of results prove that the science classes of the Department of Science and Art are exercising but the smallest influence upon technical education, and that nationally the standard of the same is very low. I further submit that Yorkshire is not behind Lancashire in its educational results even at present, and that all the advocacy in Lancashire has failed to maintain classes that have been established, while the results, as tested by examination, are very small; moreover, that the scheme has not been without advocacy in Yorkshire. In addition to the labours of the late Mr. B. Blake, agent to the Yorkshire Union of Mechanics' Institutes, who, in season and out of season, pressed the scheme upon the managers of institutions, the organising master of science classes, Mr. Buckmaster, has year after year met the delegates of the associated institutes at the annual meetings, until in 1865, being present by special invitation, he stated that he could add nothing to what in previous years he had said on the subject.

Notwithstanding the foregoing adverse remarks respecting the results of the Science Classes Examination, I am not opposed, except as regards the tentative nature of the scheme, and the minor arrangement of details, to the system of the Department. On the other hand, I think it requires but very slight alterations to cause it to produce all that is desired for the technical education of the mass of our skilled workmen. The causes of failure are beyond its control. But I do most strongly object to totals being paraded, which delude those who cannot spare time for an examination of details, and foster the belief that a great work is being done in our science classes, whereas we, who are constantly in the midst of educational work, know that the fruit of science classes will be very small until the nation is permeated with primary education of a higher standard than at present exists.

I am, &c.,

Henry H. Sales, Visiting Officer for Yorkshire.

Industrial and Scientific Education. — The Working Classes of Nassau.—Sir,—Resuming the extracts from my report on the condition of the working classes in the late duchy, now Prussian province of Nassau, I hope it will not be supposed that I approve, and hold up for imitation, all that I relate. To begin with the compulsory system of education. Setting aside the question of right, and the consideration whether the upper classes of society pay that enlightened attention to education which would entitle them to prescribe strict rules for the lower ones, I doubt the expediency of attempting, at the present time, to introduce compulsion as regards attendance at school; the more so, as nearly the same end may be attained by compulsion as regards the providing of schools, and inducements as concerns the use of them. Then, again, I believe that to propose the adoption of the German educational period of 6 to 14 years of age would be to raise unnecessary difficulties, unless the proposal should be based on the half-time system. Be this as it may, the German programme of attainments given in my previous letter is rather too high for us. Moreover, I would substitute the more comprehensive range of natural science for that of natural history. There are a few great facts in each of the three kingdoms of nature so important, and at the same time so interesting and so easy when properly taught, that no child should be entirely ignorant of them, any more than of the fact that the earth turns round. But there are certain equally simple elementary data in other branches of natural science, which have a still more direct bearing on the requirements of daily life. What everyone wants, and what, among the working class in particular, may essentially promote health, physical comfort, and industrial success, is what may be called practical bionomy or the science of common life. It is made up as follows:—1st. A common sense selection of the simplest and most indispensable facts and principles of physics and chemistry, with merely a few outlines of natural history in general, but a good insight into human physiology in particular. 2nd. The applications of this preparatory knowledge to the ordinary concerns of life, as included in a full circumscription of domestic and sanitary economy.* It is evident that practical bionomy, thus constituted, is, as far as science is concerned, the best general foundation a lad can have for his future industrial career; but there are a few further portions of knowledge, mostly appertaining to chemistry, mechanics, and geometry, of which, according to the nature of his prospects, it may be exceedingly useful for him to be as well informed before he leaves school for his apprenticeship, as circumstances may allow. It is only by a thoughtful *ponderation* of the relative value of the things which children can possibly be taught in the limited time, and with the very limited resources devoted to primary education, and by preparing accordingly a scheme of studies, of an obviously practical character, clear and well defined, yet susceptible of adaptation to local circumstances, that the serious difficulties can be overcome which impede the development of science in our national schools; and it will be only by means of a centralised organisation, competent to deal with every detail, and to keep every wheel going, that we may hope to see popular education undergo, safely and successfully, that scientific regeneration which Liebig has rightly pronounced to be "a necessity of our age." The greatest tact and caution will be required in avoiding to interfere with religious susceptibilities, which are in this country more difficult to deal with than appears to have been the case in Nassau. "The population of Nassau consists of Protestants and Roman Catholics in the proportion of about three of the former to two of the latter. There are also a few German Catholics and Jews. Some districts contain only Protestants, others only Catholics. In many places they are mingled together in various proportions, always enjoying equal rights. In purely Evangelical parishes Evangelical teachers are appointed; in purely Roman Catholic places Roman Catholics; in places of a mixed population both (or if the place is small the preponderating number decides the question). 'A long experience,' says a respectable person, to whom I owe much information on this subject, 'has proved the practicability of a just poising of interests under circumstances apparently most difficult. If people see that you proceed with a conscientious endeavour to act with impartiality and justice, they are readily satisfied.' The same plan of friendly adjustment extends through the whole system. Thus, the local clergymen, appointed with the title of inspectors to superintend the spring examinations, and to exercise at all times a salutary control, are likewise selected from both persuasions. I am assured by a Catholic master, whose village school used to be visited by a Protestant inspector, that this difference of creed, instead of producing distrust on either side, seemed rather to elicit increased urbanity." The *Gewerbe Verein*, or Industrial Society of Nassau, has done much for supplementing the ordinary school education with evening and other classes; but these need not detain us, resembling as they do those of Wurtemburg, lately described to us by Mr. Davidson, and I pass on to the system of apprenticeship. "The would-be artisan must be able to exhibit proof of having concluded his attendance at school (which, as I have mentioned elsewhere, is obligatory from the sixth to the fourteenth year) by satisfactorily passing his final examination; he must also have passed his confirmation, which takes place about the same time; it is preceded for a considerable period by strict religious instruction, and is solemnized by both Protestants and Catholics in a very impressive manner." I am told that with Protestants the period of preparation is generally 10 or 11 months, during which the clergyman daily gives an hour's instruction, chiefly in their catechism, which is much more comprehensive than ours. I may here mention that the Bible is much less made use of in schools as a text-book for the training of the memory, and the development of the intellect, than with us. In fact, parents and teachers seldom put it, especially the Old Testament, in the hands of children. They seem to think that as, in a social point of view, Christians select and adopt only certain portions of the Jewish laws and customs, so likewise they are at liberty to select, in an educational point of view, those portions of narrative which they consider most likely to produce good fruits in the youthful mind. Accordingly, instead of making, as we do, the actual text of Scripture the groundwork of popular education, they prefer using a compendium of its important facts and moral lessons. "If a lad is quite a dunce, and especially if he cannot satisfactorily get through his catechism, he may be retained under tuition for another year; or, if his vicious propensities are found incorrigible by ordinary means, he may be sent off to a disciplinarian school. If all is tolerably right, the lad receives in due form his educational certificate, and he and his friends set about looking out for the right sort of shop, and a comfortable master; but, before a definitive agreement is come to, German prudence steps in very appropriately and prescribes two weeks' preliminary trial. If this turns out to mutual satisfaction, a contract is drawn up, of which the legalization is obtained with very little expense, or none at all if the parties are poor. For ordinary trades, such as those of the shoemaker, tailor, joiner, baker, &c., the usual term is three years, and the total sum to be paid to the master varies from thirty to sixty florins (£2 10s. to £5), or a term of four years is agreed upon, without payment, the work of the apprentice in the last year being expected to form an equivalent. With respect to more difficult trades, such as those of the watchmaker, mechanician,

* I am now preparing a synopsis of this natural range of useful knowledge for the use of teachers in elementary schools, and am prepared to devote £100 per annum, for three years, to special examinations and prizes in connection therewith.

lithographer, &c., the term is usually three or four years, with a payment of eighty to two hundred florins (£6 13s. 4d. to £16 13s. 4d.). Some few trades, requiring little or no technical training, are exceptional with regard to payments; thus apprentices engaged in operations of building, whitewashing, &c., not only have nothing to pay, but receive at once a daily remuneration of a few pence. In no case does an apprenticeship last longer than four years. As far as I have been able to ascertain, serious disagreements between masters and apprentices are less frequent in Germany than with us. One legitimate cause of dissatisfaction on the part of the apprentice, which frequently occurs in England, is the incompetency of the master to teach all he engaged to teach. This is in some measure obviated in Germany by the examination which must be undergone before an artisan can settle anywhere as master; but in all cases redress is facilitated by the practice of paying the stipulated sum by instalments, so that one-third or one-half of the amount stands over to the conclusion of the term. If an apprentice has just cause for complaint, he is released by the local authorities from further obligations towards his master, and his friends from further payment. At the expiration of his term the apprentice must furnish proof of the extent of his acquirements, by executing some appropriate piece of handiwork, in the presence of the official judges of the trade, forming a kind of jury, which, from its usefulness, deserves some attention. Every three years the masters in each trade, residing in a district, or in a group of districts, if the trade is a scarce one, assemble to elect, or re-elect three representatives for the purpose of examining the certificates, and of testing and recording the abilities of industrial candidates. Such is the Board of Examiners, which we now find sitting in judgment on the merits of the young artisan anxious to emerge from his apprenticeship, and which we shall meet with again in a further stage of his career. If the examiners are not satisfied with the young man's performance, he must find means of improving himself within half-a-year, against another trial; if, on the contrary, they are well-pleased, he obtains his certificate as *gesell*, or journeyman, and sets out for his travels. Those to whom German literature is familiar, will remember that the *wanderschaft*, or travelling apprenticeship of young artisans, is included in the world of poetical ideas and associations peculiar to the Germany of the olden time. It is true that, about the year 1819, the guild system was handled in a manner which nearly amounted to its abolition in the Duchy of Nassau, and that the *wanderschaft* ceased to be obligatory; moreover, railroads and police have done much in these prosaical days to deprive this custom of its colouring of romance; but, nevertheless, it still retains enough of the character of the industrial period in which it had its origin, midst potent guilds and jolly companionships, to render a special inquiry both entertaining and instructive. For our present purpose a brief summary of its leading features will suffice. When the *gesell* arrives at a town, he goes forthwith to the specially appointed inn of his trade, where the inn-father, from whom he is entitled to receive paternal attentions and advice, shows him a register, in the form of a slate or black board, on which is inscribed the name of any master wanting a hand. If the register is a blank, and the *gesell* has no cash in purse from previous savings, he may claim his *viaticum*, or travelling money, which is either paid from the treasury of the town, or from a subscription-purse of the trade, or made up by small donations which he gets at the several workshops of his calling, where he applies in succession for that purpose; in so doing, he generally makes good his claim to brotherly assistance by some token which he bears, or by mysteriously symbolical signs and passwords, analogous to those used in freemasonry. At Frankfort, where trade affairs are reckoned to be on a more liberal, or more antiquated footing than elswhere, an itinerant servant of the proud company of hair-cutters receives, from a special purse, as much as thirty-six kreutzers (one shilling); but this may be counted exceptional, and in the generality of cases the total amount which a common journeyman obtains by legitimate means is no more than a few pence: at all events the sum is definitive; except in case of illness, no further sum can be claimed, and it will be well if the next morning's dawn sees our wanderer trudging contentedly onward, his knapsack on his back, with a boot sticking out at each end of it, and his faithful pipe dangling at the side of his mouth, whilst he sings some classical ditty of the brotherhood. Often, however, his prospects are far from encouraging, and his heart grows heavy as he slowly puffs his last pipeful. The very apprenticeship through which he has acquired the knowledge of his trade, binds him to its narrow and exclusive regulations. He can only exercise it by placing himself at the disposal of a licensed master; the law forbids him, under penalty, to undertake anything on his own account; and I am assured that this enactment is rigorously enforced. There was a time when the industrial vocabulary construed the word *fechten* as a justifiable kind of begging, which did not disgrace a needy journeyman, but now it is inscribed in the black-book of the police; and if a poor fellow, compelled by sheer necessity, extends an unwilling hand towards a stranger, and a *gendarme* espies him in the act, he is not only punished with arrest, but this fact is noted down in his pass-book, and subjects him, wherever he goes, to be watched with a suspicious eye, and to increased severity in case of a repetition of the offence. In relation to its moral tendency, this thick-and-thin life of labour and adventure has little to recommend it. In a technical point of view it is undoubtedly productive of good results. If endowed with an observing turn of mind, the *gesell* may acquire in his travels not only practical experience in all the branches of his calling, but a valuable knowledge of the various methods and contrivances used in various countries; and it is indeed his chief consolation in the hardships he has to undergo, that those acquirements may one day enable him to ascend into a higher industrial region, where he will be no longer a dependent, and need no longer remain a bachelor."—I am, &c., T. Twining.

Twickenham, 30th Dec., 1867.

MEETINGS FOR THE ENSUING WEEK.

Mon......British Architects, 8.
Entomological, 7.
Medical, 8.
Victoria Inst., 8.

Tues ...Pathological, 8. Annual Meeting.
Ethnological, 8. 1. Mr. Albert S. Bickmore, "Some Notes on the Ainos." 2. Mr. John Crawfurd, "On the History and Migration of Plants yielding Textile Materials."
Syro-Egyptian, 7½.
Royal Inst., 3. Professor Tyndall, "On Heat and Cold." (Juvenile Lectures.)

Wed ...Geological, 8. 1. Mr. W. W. Stoddart, "On the Lower Lias of Bristol." 2. Mr. C. O. Groom Napier, "On the Lower Lias at Cotham, Bedminster, and Bristol." 3. Mr. W. Boyd Dawkins, "On the Dentition of *Rhinoceros Etruscus*."
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
R. Society of Literature, 4½.
Archæological Assoc., 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.

Fri.......Astronomical, 8.

Sat ......R. Botanic, 3¾.

Patents.

From Commissioners of Patents' Journal, December 27.

GRANTS OF PROVISIONAL PROTECTION.

Ammonia, &c., extraction of—3566—A. M. Clark.
Arithmetic, &c., imparting instruction in—3546—J. Williams.
Bedsteads and mattrasses—3594—R. D. Dwyer.
Bedsteads, &c.—3610—J. Atkins.
Bench planes and moulding tools—3552—W. E. Newton.
Boilers—3483—R. B. Jones and W. Powell.
Boilers—3514—W. J. Fraser.
Boilers, preventing and removing incrustation in—3586—W. Ross and A. Long.
Boots and shoes, cleaning—3606—G. H. Ellis.
Bricks and tiles—3534—P. Bawden.
Buildings, warming—3457—W. A. Herring.
Buildings, warming—3487—J. Partington.
Caissons—3526—J. R. Baillie.
Canal boats, &c., propelling—3604—H. H. Murdoch.
Candles—3536—H. Field.
Carriage wheels, &c.—3524—J. Goodman.
Carpets, manufacturing—3394—A. Turner and W. E. Newton.
Cask headings, &c., shaping—3497—W. Clapperton.
Castors for containing pepper, &c.—3414—G. Heiron.
Chains, iron and steel—3515—A. Camme and F. Delpech.
Churns—3560—R. Tinkler.
Coffee-pots, &c., bags for—3462—J. Mabson.
Cotton, &c., sizing—3481—C. Brazil.
Doffing-knife apparatus, lubricating—3448—J. Newton.
Door bolts and indicators—3550—J. G. Settle.
Engines, steam—3512—G. Holcroft and W. N. Dack.
Engines, &c., steam—3576—G. D. Kittoe.
Fabrics, finishing—3504—R. G. Lowndes.
Fabrics, finishing woven—3612—A. Cochran.
Fabrics, preparing for dyeing—3384—J. Baylis.
Fibrous materials, spinning and doubling—3455—J. T. Webster and W. Oxley.
Fibrous materials, treating—3510—J. W. Burton.
Fibrous substances, preparing for spinning—3489—W. Clissold.
Fibrous substances, twisting—3582—N. Haley and J. Hodgson.
Filters—3503—C. Kerby.
Fire-arms and cartridges—3539—W. Richards.
Fire-arms, breech-loading—3324—J. H. Johnson.
Fire-arms, breech-loading—3409—R. Clay, jun.
Fire-arms, breech-loading—3616—J. Kerr.
Fire-bricks, &c.—3501—H. Bessemer.
Fountains—3568—E. Rimmel.
Frames, spinning and twisting—3533—J. Collingham & T. E. Smith.
Fuel, artificial—3544—J. H. Johnson.
Furnaces—3459—D. Smith.
Furnaces—3467—M. Tildesley and J. Bird.
Furnaces—3592—H. Green.
Games of skill, apparatus for playing—3213—T. Taylor.
Gas retort ovens and furnaces—3554—H. Atkinson.
Grasses, &c., spreading—3475—W. N. Nicholson.
Guns, &c.—3562—G. Clark.
Hats and bonnets—3513—H. Giles.
Haymaking machines, &c.—3538—R. Boby.
Hops, &c., training—3509—J. Grout and E. Mathews.
Iron and steel, manufacturing—3614—W. H. Richardson.
Knife-cleaners—3485—O. Barrett and H. Leggott.
Lamps—3532—W. G. Hanning, G. B. Knott, and L. C. F. Clerc.
Lamps to be used under water—3527—J. Ward.
Mannre—3518—A. T. Carr.
Metal, manufacturing malleable—3463—S. Perkins and W. Smellie.
Metal sheets, corrugating—3511—J. Woolfield.
Mohair, &c., manufacturing—3540—J. Robinson.
Money, &c., transmitting—3464—J. G. Scott.
Motive-power apparatus—3087—H. W. Grylls, H. Neville, & J. Holt.
Motive-power engines—3508—W. B. Leachman.
Moulds, &c., coating the interior surfaces of—3473—J. Durrans.
Mustard, &c., appliances for serving—3519—J. M. Napier.
Needles, making up packets for sale—3584—A. Shrimpton.
Needles, &c., fixing on reels or receivers—3436—W. Pidding.
Ordnance—3507—W. Palliser.
Ordnance, breech-loading—3453—E. Walker.
Ornaments, &c.—3479—R. Jones and J. Abrahall.
Orthopœdic apparatus—3493—A. M. Clark.
Paper, &c., treating—3535—E. R. Sintzenich.
Pipes, socket and flange spigot—3491—C. M. Barker.
Powders, explosive and fulminating—3469—P. G. L. G. Designolle and J. Casthelaz.
Presses for stamping—3516—A. M. Clark.
Printing machines—3570—W. Conisbee.
Pumps, steam—3531—E. Death.
Railway cuttings, &c., measuring the quantities of earth-work in—3506—W. H. Barlow.
Railway engine wheels, &c., securing the tyres of—3525—J. O. Butler.
Roads, constructing—3596—J. Murray.
Rocks, &c., boring—3386—T. B. Jordan and J. Darlington.
Ropes, &c., washing and sizing—3588—S. Marsters.
Saws—3522—T. A. Weston.
Scenic illusions, treating—3541—J. H. Pepper and T. W. Tobin.
Screens for preventing the spreading of fire—3523—G. A. Young.
Ships' blocks, &c., pulleys for—3521—G. H. Nick.
Skates—3564—T. C. Parson, jun.
Skirts, manufacturing fabrics for—3618—W. B. Pullar.
Stables, &c., fittings for—2698—J. Musgrave.
Straw elevators, apparatus for driving—3477—F. Roper.
Sugar-breaking machinery—3461—J. Green.
Sugar syrup, treating—3574—J. Dawson.
Tin, reducing—3517—A. M. Clark.
Umbrellas and parasols—3505—C. Conner.
Valves, slide—3528—R. Roberts and P. Williams.
Vegetable juices, preserving—3499—L. Rose.
Vehicles, registering number of passengers entering—2573—W. Baird.
Washing machines—3558—W. and F. Bates.
Water, raising—3590—W. A. Gilbee.
Water-tuyeres—3529—R. W. Brownhill.
Windows, &c., sliding the sash frames of—3620—B. Monson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Cotton ties—3645—W. Walker.
Lamps—3602—M. H. Collins.
Liquids, measuring—3624—L. L. Tower.
Ventilators—3626—J. T. Kershaw.

From Commissioners of Patents' Journal, December 24.

PATENTS SEALED.

1870. J. Gabbott.	1906. A. Stewart.
1871. W. Bullough.	1910. C. Petit.
1884. W. Marshall.	1918. F. T. Pollard.
1886. C. O. Heyl.	1951. E. M. Brown.
1892. C. Brown.	1959. F. Brady.
1896. J. Holroyd and W. Fieldhouse.	1972. H. C. Carver.
1897. C. O. Heyl.	1974. W. C. Church.
1898. P. Zaroubine.	2007. W. Avery.
1899. P. Smith.	2030. A. H. Brandon.
1902. A. Hodge.	2119. J. Saxby.
1904. S., R., and W. Trulock.	2194. D. Hodge and R. C. Witty.
1905. W. H. Richardson.	2231. J. Birch.
	2475. A. H. Brandon.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3119. F. A. Chevallier.	3176. J. Hargreaves.
3171. J. Ramsbottom & T. Blackburn.	3174. W. Reid.
3150. J. Butchart, H. Stroud, and S. A. Morrison.	3175. J. H. Johnson.
3195. R. A. Brooman.	3191. J. Paterson.
	3236. T. R. Harding.
	3250. T. Bouch.

From Commissioners of Patents' Journal, December 31.

PATENTS SEALED.

1915. J. G. N. Alleyne.	2032. J. B. Fraser.
1916. J. Chaudron.	2044. E. H. Bernier.
1917. F. T. Hubert and H. D. G. Truscott.	2105. W. Barningham and J. Thompson.
1919. P. Ironside.	2130. J. Hooper.
1921. W. Duce.	2137. W. E. Newton.
1924. G. A. F. Fowke.	2155. A. M. Clarke.
1925. T. and J. Wood.	2160. W. E. Newton.
1927. J. Sturgeon.	2161. A. Wilson.
1930. G. Gordon.	2174. J. Smith and W. Schofield.
1934. F. R. Aikman.	2179. W. E. Newton.
1935. J. McKibbin.	2208. B. Dobson and J. Cocker.
1937. W. Galloway and G. Plant.	2217. J. Saxby.
1938. D. P. Morison.	2296. R. Heathfield.
1945. W. Thompson.	2301. E. Newby.
1954. J. Verreyt.	2346. F. H. Wenham.
1960. J. Bolton.	2429. W. E. Newton.
1976. W. R. Gorst.	2452. J. H. Johnson.
1986. J. C. Major.	2457. J. Macintosh & W. Boggett
1992. I. M. McGeorge & A. Paul.	2530. T. Cook.
1997. A. Mather.	2581. J. B. Meldrum.
2006. G. Gabillon.	2622. F. H. Varley.
2013. W. R. Lake.	2740. G. R. Solomon, jun.
2024. G. Davies.	2927. E. T. Hughes.
2027. W. E. Newton.	2962. T. Webb.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

3177. R. Wilson.	3227. W. H. Preece and A. Bedborough.
3207. E. Morewood.	3233. M. A. Muir & J. McIlwham.
3214. H. Hicklin and C. Pardoe.	3222. J. R. Breckon & R. Dixon.
3228. R. H. Leese.	3248. H. A. Bonneville.
3219. J. Dodge.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

3172. W. Hill and H. Barber.	3. M. Henry.
3182. W. E. Newton.	

Journal of the Society of Arts.

FRIDAY, JANUARY 10, 1868.

Announcements by the Council.

ARTISANS' REPORTS ON THE PARIS EXHIBITION.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'clock :—

JANUARY 15.—"On the Details of a Plan for the Distribution of Food at the Homes of the People." By WILLIAM RIDDLE, Esq., C.E.

JANUARY 22.—"On the Reports of the Artisans selected to visit the Paris Universal Exhibition of 1867." By WILLIAM HAWES, Esq., Chairman of the Council.

JANUARY 29.—"On the Climate and Industrial Prospects of the Colony of Natal." By Dr. MANN, Superintendent of Education, and Special Commissioner for the Colony.

FEBRUARY 5.—"On Trade Museums." By. J. FORBES WATSON, Esq., M.D., Reporter on the Products of India.

FEBRUARY 12.—"On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it." By WENTWORTH LASCELLES SCOTT, Esq., F.C.S.

CANTOR LECTURES.

The second course for the present session will be "On Food," and will be delivered by Dr. Letheby, M.A., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health, and Food Analyst for the City of London, as follows :—

MONDAY, JANUARY 20TH.—LECTURE I.

Varieties of Food—their Chemical Composition, and Nutritive Value.

MONDAY, JANUARY 27TH.—LECTURE II.

Comparative Digestibility of Foods. Functions of different Foods. Construction of Dietaries.

MONDAY, FEBRUARY 3RD.—LECTURE III.

Preservation, Preparation, and Culinary Treatment of Foods.

MONDAY, FEBRUARY 10.—LECTURE IV.

Adulterations of Food. Conclusion.

The lectures will commence each evening at 8 o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets are forwarded with this number of the *Journal*.

TECHNICAL EDUCATION.

The Council feeling the great importance of this subject, have resolved to hold a Conference at the Society's house, on the 23rd and 24th inst., the particulars of which are explained in the following circular :—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C., 9th December, 1867.

TECHNICAL EDUCATION.

SIR,—I am directed by the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, to invite your (Chamber of Commerce or other body) to appoint its President or other representative, to attend a Conference which is to be held here, on Thursday and Friday, the 23rd and 24th of January next, to consider and suggest what measures may be taken to promote the industrial and scientific education of the various classes of the community.

The Conference will commence its sittings on Thursday, the 23rd of January, 1868. The Chairman of Council will take the chair at 12 o'clock precisely.

At as early a period as possible, the Council will issue to each gentleman who accepts their invitation to the Conference a programme of the probable course of its proceedings; and, to enable the Council to do this in a satisfactory manner, I am to request you to inform me, with the least possible delay, whether a representative from your [ ] will be able to attend the Conference; whether your [ ] has any special resolutions to suggest, or any particular points to which it desires to direct attention; what general measures for the promotion of education it may conceive to be requisite; and what institutions of a specific character are needed in your own neighbourhood to give the greatest practicable facilities for the acquisition of knowledge applicable to your local industries.

The object of the Conference is to ascertain, not merely what the Society of Arts, Manufactures, and Commerce, but what the nation at large can do to promote technical education among the workmen, the foremen, the overlookers, and the employers in Arts, Manufactures, and Commerce; and it is hoped that an expression of opinion by this Conference may tend in some degree to diminish the difficulties with which the solution of this vital question of national education is at present confessedly surrounded.

I am, your obedient servant,
P. LE NEVE FOSTER, Secretary.

The foregoing circular has been forwarded to :—

- The Mayors of the Towns which are the principal seats of manufacture in the United Kingdom.
- The Presidents of the Chambers of Commerce and Agriculture.
- The Presidents of all Societies and City Companies which have co-operated with the Society in respect of Education or Art-workmanship.
- The Presidents of Institutions in Union with the Society of Arts.
- Her Majesty's Inspectors of Schools, Factories, Mines, and Collieries.
- Professors at University, King's and other Colleges.
- The Examiners of the London University.
- The English Jurors at the Paris Exhibition of 1867.
- The Society's Judges in Art-Workmanship.
- The Society's Examiners in Education.
- The Society's Visiting Officers.
- The writers of letters to the Schools' Inquiry Commission.

And many other gentlemen connected with education.

Members of the Society taking a special interest in this subject are invited to attend.

Prizes to Art Workmen.

The works sent in competition for the Prizes offered this Session will be placed in the Society's Room, for the inspection of Members and their friends, on and after Monday next.

The following is a catalogue of the works received:—

FIRST DIVISION.

Works sent in in Accordance with the Prescribed Designs.

1. Carving in Stone.—After a frieze for a chimney-piece by *Donatello*. Price £15. By Alexander J. Earp, 2, Ebenezer-cottage, Kennington-park, S.
2. Ditto. Price £10. By H. Coles, 16, Alma-terrace, Fentiman-road, Lambeth, S.
3. Carving in Marble.—After the same design, by John B. Fisher, 61, Arundel-street, Sheffield.
4. Carving in Stone.—After a chair-back in the South Kensington Museum. Price £10. By W. H. Barrett, 14, Alma-terrace, Fentiman-road, Lambeth, S.
5. Ditto, by "Troy."
6. Carving in Oak.—Panel, by C. H. Line, 41, Prince of Wales-crescent, Kentish-town, N.W.
7. Ditto, panel enlarged to suit for pilaster of chimney-piece. Price £12. By "W. H. B."
8. Ditto, by Thomas E. Mayle, 33, James-street, Stockwell, S.
9. Repoussé Work in Metal.—After the Martelli mirror case in the South Kensington Museum. Price £20. By A. Dufour, 36, Cleveland-street, Fitzroy-square, W.
10. Ditto, after a panel, in low relief, of the "Virgin and Child," in the South Kensington Museum. Price £25. By G. Page, 39, Northampton-road, Clerkenwell, E.C.
11. Ditto. Price £15. By S. S. S.
12. Ditto. Price £14 14s. By "Bona Fide."
13. Ditto, after a tazza in silver. Price £6. By Alfred Page, 29, Myddelton-street, E.C.
14. Hammered Work in Brass.—After a knocker in wrought iron in the South Kensington Museum. By E. Millward, 35, Little Clarendon-street, Clarendon-square, N.W.
15. Ditto, by "M. C. S."
16. Ditto, in iron. Price £3. By W. Sendall, High-street, Wisbech.
17. Chasing in Bronze.—After a relievo in marble, "Virgin and Child." Price £15. By "H. H."
18. Ditto. Price £20. By T. Nichols, 4, Everilda-street, Hemingford-road, N.
19. Ditto. Price £16 16s. By H. C. Hatfield, sen., 46, Bolsover-street, Euston-road, W.
20. Ditto, ornament after a missal cover. Price £18 18s. By H. J. Hatfield, jun., 46, Bolsover-street, Euston-road, W.
21. Ditto, in silver, after the same design, by A. E. Millward, 8, New Compton-street, Soho, W.C.
22. Engraving on Metal.—After an arabesque by Lucas Van Leyden, by G. W. Hindley, apprentice at Messrs. Gerrard and Co., 29, Panton-street, Haymarket, S.W.
23. Ditto on ivory, after the same design, by "G. B."
24. Painting on Porcelain.—After a drawing by *Raphael*. Price £4. By Edwin Saunders, 8, Martha-street, Cambridge-heath, Hackney, N.E.
25. Ditto. Price £5. By Walter J. W. Nunn, 10, Grafton-street, Globe-lane, Mile-end, E.
26. Ditto. Price £2 10s. By "J. E."
27. Ditto. Price £3 3s. By W. Slater, Field-place, Stoke.
28. Ditto, by Thomas Stanway, 74, Lower Russell-street, Hanley, Staffordshire Potteries.
29. Ditto, by Joseph B. Evans, South-street, Mount-pleasant, Fenton, Stoke-on-Trent.
30. Ditto. Price £5 5s. By W. P. Rhodes, Liverpool-road, Newcastle-under-Lyne.
31. Ditto. Price £3 3s. By John Willshaw, 27, Bow-street, Newcastle-under-Lyne.
32. Ditto, Ornament, by Alexander Fisher, 5, Clyde-street, Stoke-on-Trent.
33. Ditto. Price £6. By W. H. Slater, James-street, London-road, Stoke-on-Trent.
34. Decorative Painting.—After an ornament by *Aldegrever*, by "C. P."
35. Ditto. Price £5 5s. By John Slater, Field-place, Stoke-on-Trent.
36. Ditto. Price £5. By W. J. Hutchins, Gold-tops, Newport, Monmouthshire.
37. Ditto, after a picture-frame in the South Kensington Museum, by "C. P."
38. Engraving on Glass.—Executed on a claret jug, after an arabesque by Lucas Van Leyden, by P. Oppitz, 76, Stamford-street, Blackfriars, S. Price £50. Exhibited by Messrs. W. T. Copeland and Sons, 160, New Bond-street, W.
39. Wall Mosaics.—After a female head in *Raphael's* cartoon of the "Beautiful Gate," by Samuel Cooper, 2, Waterford-terrace north, Fulham, S.W.
40. Die-sinking.—After a Wedgwood medallion in the South Kensington Museum, by W. A. Walker, 5, Tysoe-street, Clerkenwell, W.C. (unfinished).
41. Glass Blowing.—After an original in the South Kensington Museum, by Joseph Leicester, 34, Tenison-street, York-road, Lambeth, S.
42. Bookbinding.—"De imitatione Christi," bound in calf, after a specimen in the South Kensington Museum. Price £3 10s. By Louis Genth, 90, High Holborn, W.C.
43. Ditto, Mosaic, bound in morocco. Price £3 10s. By Louis Genth, 90, High Holborn, W.C.
44. Illumination.—After a specimen in the South Kensington Museum, by "T. H. R."
45. Ditto. Price £5. By Miss Mary R. David, 4, Anderson-street, Chelsea, S.W.
46. Ditto, by "C. P."

Subjects sent without Prescribed Design.

47. Cap, carved in Caen stone. By W. Aumonier, 173, Marylebone-road, N.W.
48. Ditto, by "Erna."
49. Repoussé work in Metal, after Wyon's medal for the North London Exhibition of 1866. Price £10. By James Gwillim, 19, Sidney-street, Mile-end, E.
50. Ditto, after Wyon's medal of St. George. Price £10 10s. By F. S. Briault, 5, Southampton-street, Pentonville, N.
51. Chasing in Metal.—Emblem of bread and wine. Price £4. Modelled and chased by C. Jacquard, 1, St. George's-road, New Kent-road, S.E.
52. Hammered work in Metal.—Mirror frame. Price £5 5s. By Thomas Bush, 36, Hall-street, City-road, E.C.
53. Ditto, a Ewer. Price £5 5s. By the above.
54. Ditto, series of specimens. By T. Winstanley, 22, New Compton-street, W.C.
55. Modelling in Plaster.—Evangelical emblems. By J. Meiklejohn, 58, Sussex-street, Pimlico, S.W.

56. Ditto, panel of spring flowers. Price £10. Designed and modelled by E. Dujardin, 46, Camberwell-grove, S.
57. MODELLING IN CLAY.—Sketches from *Punch* and *Fun*. Price £4. By J. W. Bentley, 22, Sherwood-street, Golden-square, W.
58. Do. A Tazza, intended for pottery to be decorated as Palissy Ware. Copy of work produced by Henry Brownsword, Salem-street, Etruria, Staffordshire Potteries, for Messrs. Wedgwood and Sons.
59. ILLUMINATION.—Price £3 3s. By Miss H. Jupp, 3, Bellevue-terrace, Clevedon, Somerset.
60. PAINTING ON PORCELAIN.—Specimen of Heraldic Painting. By Edward Mayer, Lyndhurst-street, Burslem, Staffordshire.
61. Ditto. Dessert Service, Majolica style. Price 100 guineas. Designed and painted by Miss L. Lelia Hawkins, Belvedere-road, Upper Norwood, S. Twelve plates, subject: the Signs of the Zodiac; centre-piece, Summer; two dishes, Spring and Winter; four dishes (The Muses), Memory, Music, Astronomy, and Eloquence rose-water flagon and bowl, Clouds and Rain.
62. ENGRAVING ON GLASS.—Jug and two Goblets Price £30. Antique shape. Heraldic designs, surrounded with arabesque borders. Designed and arranged by Mr. Jones, in the employ of Messrs. Copeland and Sons, and engraved by Paul Oppitz, 76, Stamford-street, Blackfriars, S. Exhibited by Messrs. W. T. Copeland and Sons, 160, New Bond-street, W.

SECOND DIVISION.

WOOD CARVING WITHOUT PRESCRIBED DESIGN.

(*a.*) *Human figure in the round, in alto or in bas-relief. Animals or natural foliage may be used as accessories.* 1st. prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

63. An Allegorical Clock. Price, without works, £38. By "Tempus Fugit."
64. "Neptune;" carving in walnut-wood. Price £25. By Charles Liddle, 5, Goding-street, Vauxhall, S.
65. Female Figure, in carved panel of walnut-wood. Price £10. By Samuel Moutrie, 219, Stanhope-street, Hampstead-road, N.W.
66. "The Seasons;" Four Medallions, in peartree-wood. Price £8 8s. the set. Designed and carved by W. Aumonier, 173, Marylebone-road, W.
67. "Daphne." By H. W. McCarthy, 106, Brook-street, Kennington-road, Lambeth, S.
68. "Summer;" Female Head. Price £15 15s. (when finished). By Mark Rogers, 111, Tachbrook-street, Pimlico, S.W.
69. Boy's Head, carved in a Bracket. By E. Glancy, 113, Manor-street, Chelsea, S.W.
70. Girl's Head, carved in peartree. Price £4. By H. Godard, 13, Upper Marylebone-street, N.W.
71. Medallion and Flowers. Designed and carved by E. Dujardin, 46, Camberwell-grove, S.
72. "The Nativity of Cain." Price, when finished, £18. Designed and modelled by S. Shadaway, carved by J. S. Shadaway, jun., 31, Walton-street, Brompton, S.W.
73. Human head. Specimen of carving in different stages, for the use of amateurs. By W. H. Holmes, 101, Dean-street, W.
74. Child's head. By William Davison, 20, Marlborough-road, Chelsea, S.W.

(*b.*) *Animal or still-life. Fruit, flowers, or natural foliage may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

75. A Dead Lark. Price £8. By "Erna."

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament, in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

76. Oval Frame in lime wood. Price £3 15s. By W. M. Holmes, 101, Dean-street, W.
77. Mahogany Frame. Price £7 7s. By G. Box, 15, William-street, Regent's-park, N.W.
78. Scoop for a Tea-caddy, carved in box wood. Price £2. By J. Manhood, 11, Effingham-street, Pimlico, S.W.
79. Box. Carved by Philip Davison, 8, Randall-street, Hydge-grove, Battersea, S.W.
80. Jewel Casket. By G. Rumford, 19, Eccleston-street East, Pimlico, S.W.
81. Portrait Frame. Price £8. By G. H. Bull, 16, Millman-mews, Millman-street, Foundling, W.C.
82. Oak Bracket. Price £8. By the above.
83. Panel of Flowers Carved in Satin-wood. By Edward Glancy, 113, Manor-street, Chelsea, S.W.
84. Fruit and Flowers, after the style of Gibbons. Price £7 7s. Carved in the solid by R. A. Brangan, 54, Foley-street, Portland-place, W. Gilt by R. Farrell.
85. Panels, representing "Spring, Summer, and Autumn" ("Winter" not ready for exhibition). Price £42 the set of four, or can be sold separate at £10 10s. each. Designed and carved by R. A. Brangan, 54, Foley-street, Portland-place, W.
86. Panel in Oak, intended for centre frieze Ornament. Flemish renaissance. Price £3. Designed and carved by "E. J. G."
87. Oak Clock Cases (unfinished). Price £6 6s. Designed and carved by "E. J. G."
88. Panel for Cabinet Door. By G. H. Barnsdale, 2, Queen-street, Peterborough.
89. Part of a Frieze; subject from "Midsummer Night's Dream." By J. M. Leach, 23, Effingham-street, Pimlico, S.W.
90. Clock-case, carved in oak; Elizabethan style. Price £20. By "W. H. B."
91. Gothic Panel in oak, for pulpit or reading-desk. Price £15. Designed and carved by H. G. Price, 36, London-street, Fitzroy-square, W.
92. Ornamental Panel in mahogany, carved for casting in metal. Price £10. By the above.
93. Two Panels in oak; natural foliage. Price £9 the pair. By the above.
94. Panel in Walnut-wood for a round-end sideboard. By J. Sparrow, 76, Vauxhall-bridge-road, S.

Proceedings of the Society.

FOOD COMMITTEE.

The Committee met on Saturday, December 14th. Present—Mr. E. Wilson (in the chair), Sir R. Montgomery, Captain Grant, Messrs. W. H. Michael, J. Ludford White, G. F. Wilson, F.R.S., Rev. J. E. Hall, and James Greenwood.

MR. RICHARD JAMES WHITAKER LEITH attended before the Committee, and gave information with respect to the late Hungerford-market.

In reply to interrogatories by Mr. Michael, MR. LEITH stated that he had been connected with the late Hunger-

ford-market. It was originally established by the share capital of a joint-stock company. The capital consisted of 2,022 shares of £100 each, making a total of £202,200. Then there was a mortgage of £40,000, and a second mortgage of £11,000; and, besides that, there was a debenture capital of £34,400, making a total of £300,000 capital. The whole of that capital was expended in the construction of the market and its approaches. It consisted of Hungerford-street, which was built by the company; then there were the upper area, and a great hall; also the lower quadrangle where the fish market was held, a colonnade beyond that, and two large taverns facing the river; together with a large wharf for a hay and straw market. He would explain that the original plan was to have the fish-market in the lower area, but as passengers going by the steamers objected to going through the fish-market, the trade of the fish-market was removed to the upper area. Afterwards the company tried to get some of the trade from Covent-garden there. Some of the growers brought their produce there, but they returned to Covent-garden after a short time, and did not send any more vegetable produce to Hungerford. The object of the market was to have a large fruit and vegetable market like Covent-garden, and in the next place a large fish-market.

Q.—Was it the intention to have a wholesale business or retail business only at this market?—It was retail in the first instance, but it was the wish of some of the shareholders to endeavour to remove the fish-market from Billingsgate to Hungerford.

Q.—What steps did they take for that purpose?—A meeting of the shareholders was held, and they were asked to concur generally in the project. Some objected; others proposed a separate adventure to get the market from Billingsgate.

Q.—Was any money subscribed towards that project?—About £30,000, the whole of which was expended in a few months, without effecting the object. The money was spent in hiring fishing smacks, and bringing up fish landed at Barking and other places.

Q.—Did they get a separate supply of fish in that way?—Not so much as they expected.

Q.—What circumstances led to the failure of the wholesale market?—The produce was not equal to the capital expended.

Q.—How was the project looked upon by the wholesale dealers in fish?—As antagonistic to their interests at Billingsgate, and they did not wish to be removed.

Q.—Did the wholesale dealers oppose the removal of the market from Billingsgate?—Yes, all they possibly could. The large salmon dealers in particular opposed it most strenuously.

Q.—Do you mean the persons who supplied the wholesale market, or those who purchased there?—It was in this way. I believe the dealers in Billingsgate contract with parties in Scotland for the supply of salmon, and the fish was sent direct to Billingsgate, so that they resisted the Hungerford project.

Q.—Did they object in fact to the establishment of a second wholesale fish market?—There was this objection: they could not get all the fish they wanted at the West-end, and the dealers would have to attend two markets of a morning, which could never go on.

Q.—They objected to having a second Billingsgate, though it would be nearer the West-end?—I cannot say that; but if they could not get what they wanted at Hungerford, they would be obliged to go to Billingsgate.

Q.—They objected to having their attention divided between two markets?—Yes.

Q.—Was that the general feeling of persons who wanted a supply of fish?—That I cannot say: I give you what was considered to be the objection to it. It stands to reason, if they had to go to two places instead of one for their articles, they would hardly get their stock home in time for their business.

Q.—Was there any attempt made that you are aware of to get a supply of fish in any other way than by means of the fishing smacks?—Not that I am aware of.

Q.—How much of the £30,000 was lost?—The whole of it.

Q.—Did any fish come to this market through the South Western or the Great Western Railways?—I cannot say how it came. I believe the fish generally came up by vans at that period. This was in 1833.

Q.—How long did the experiment continue?—Only a few months.

Q.—Subsequently you attempted the same thing with regard to Covent-garden produce?—Yes.

Q.—How did that fail?—When the growers went to the market, instead of encouraging them, they let them take their produce away.

Q.—What was it led to that? Was there an objection on the part of persons who wanted supplies to purchase in your market?—The difficulty was to get them to go there in the first instance.

Q.—After that you found it impossible to make it a wholesale market?—They would not go there again.

Q.—What was the result of the undertaking, in a financial point of view?—It was a failure; because from being a great market, the centre portion was converted into a great hall, which was in turns appropriated to various purposes, and the shops were occupied as bazaars and other trades; but that also failed. The most successful occupation of the great hall was that by Gatti, as a refreshment saloon, which was largely frequented, and it was devoted to that purpose up to the time the market was removed. As a market, it may be said to have been a failure altogether. The class of articles, excepting fish, was mostly inferior, and people went to Covent-garden in preference.

Q.—I believe the shares were originally £100?—Yes.

Q.—What was the dividend paid to the shareholders?—The dividend was only 2 per cent. at the time the railway company purchased the property. The shares were then about £40.

Q.—I believe the railway company bought them at about double that price?—Yes: there was a loss of £20 on the shares.

Q.—Had you much trouble in letting the shops in the Arcade?—Yes, a great deal latterly; there was such an admixture of trades, including cheap jewellery shops, &c., that the Arcade became a nuisance.

Q.—Did you consider the market, as far as the public was concerned, a failure?—With the exception of retail fish and butchers' meat.

Q.—Do you think if you had the conduct of a market of a similar character to this you could adopt means to make a wholesale market successful?—The best experience is the old Fleet-market, in Farringdon-street, which was a very good market, and a large trade was done there; the public frequented it very much. It was, as you know, removed for a very short distance. A beautiful market-place was provided regardless of expense, but it was a failure. It was then endeavoured to establish Portman-market, but that was also a failure. The West-end people would not take the trouble to go to market; and the nobility and gentry objected to the system of poundage which was carried on by servants when they were entrusted with the purchase of provisions.

Q.—From your experience, have circumstances materially altered since that time in any way with respect to the probability of a market of this kind being successful now? Do you think, if it was endeavoured to establish a wholesale fish market at the West-end, circumstances are so altered in the present day, as to give great probability of success?—I think not, unless you got the Billingsgate interest to approve of, and assist in it. I think it would be a failure altogether. It must be recollected that within the last few years Billingsgate has been much improved and enlarged. It is very different now to what it was thirty years ago.

Q.—Are you aware of the fact as to the supply of fish

at Billingsgate being equal to the demand at the present time or not?—As far as I know, I should say for the most part it is. The market always seems to be overflowing, and the reduction in the price of fish is very considerable. The great wholesale trade begins between 3 and 4 o'clock in the morning, and after that the smaller dealers and costermongers get their supplies, and that continues from about 9 o'clock till 12. Sometimes late supplies of fish come into the market.

Q.—You are not able to say whether the complaint of the large fishmongers is well grounded—that the supply of fish is not equal to the demand generally?—I should almost be inclined to doubt what they say in this respect; and it may be remarked that the show of fish at the large dealers daily is no indication of the scarcity of supply in the market. Sometimes when the supply is most plentiful there will be but a small show of fish in the shops of the large dealers.

Q.—Are you aware of any special circumstances which led to the failure of Farringdon-market?—No; further than a general objection on the part of the public who frequent such markets to being put out of their way by the removal of the market to another place. The old Fleet-market was formerly held near the obelisk erected to Alderman Waithman.

Q.—Then the mere fact of removing the market from the open street to a commodious place, for carrying on the trade, led to the failure of the market?—I should say that was the case. There would be little or no rent to pay for the stalls in the street; but in an elegant market-place, high rents would, no doubt, be paid. I cannot say what tolls were charged in Farringdon-market; but on this, and on other matters of interest, with regard to Farringdon-market, I would refer the Committee to one of the blue books, from which a great deal of information as to the scale of charges, and everything else relating to it may be obtained.

The Chairman—How long did the Hungerford-market experiment continue, from first to last?—With respect to the wholesale trade in fish, it was under twelve months I should say; but the experiment of the market as a whole was continued from 1833 till 1865, when the property was purchased by the railway company. Prior to that there was an old Hungerford-market.

Mr. James Greenwood, a member of the committee, stated that he had made some further investigations with respect to local markets in the metropolis, the result of which he would be happy to lay before the committee. His recent observations, he said, tended to confirm the opinion he had previously expressed as to the utter insufficiency and partial failure of many of the existing local markets; but it appeared to him better and more practicable to remodel and improve those which exist than to attempt to establish markets in new localities.

Clare-market.—This is a market proper; because, although it has extended beyond its first design, there is an actual market-place supported on pillars, and containing several avenues. The adjoining bye-streets have taken up the market, and are occupied by a great number of costermongers' barrows on Saturday nights, and they do a considerable trade; but with regard to the market proper I found one side of it was entirely shut up for all trading purposes, and had been converted into lodging-houses. Clare-market extends from Blackmoor-street along the back of Drury-lane to Duke-street, Lincoln's-inn-Fields. The market-place itself is the most dismal, tumble-down place that can be conceived. There are some butchers' shops, and those of two classes; and considerable business is done in wet fish, particularly by a Jew dealer, who has extensive corner premises, and employs six or eight shopmen. The butchers are of a mixed sort; you may purchase a leg of mutton at 8d. per lb., and you may obtain the same joint as low as 6d. per lb. It is a drunken neighbourhood, as well as a dirty, there being no fewer than fifteen public-houses within a square of 120 yards. It is not at all a lively market, such as might be expected to exist in such a neighbourhood. There is no apparent reason why it should not be made a more important market; the surrounding neighbourhood is one of the poorest in London which, however strange it may appear, is generally found to be an advantage to a market than otherwise. All the busiest and most flourishing of London markets and market-places are situate in the midst of an extremely poor population. Leather-lane; the New-cut, at Lambeth; Brick-lane, in Spitalfields; may be quoted as examples of this. I cannot account for the meagre and dismal aspect of Clare-market. It may arise from uncertainty of tenure on the part of the shopkeepers. I should think this not unlikely, judging from the ruinous condition of the place.

Newport-market.—From Clare I went to Newport Market. That is more decidedly a market proper than Clare; arranged with considerable care, and the shops properly furnished with all the trade appurtenances. It is more of a butchers' market, and is rather extensive; but I found in the street called Market-street, which evidently was designed as one of the chief streets in the market, many of the shops were occupied by trades quite foreign to the market's original purpose, such as marine store dealers, and chandlery stores, and cobbler's stalls. The best shops in Market-street were for the most part closed, and in the main avenue of the market, which is the butchers' avenue, I found shops devoted to other trades than that of the butcher, such as chandlers', milk, and potato shops, &c., all of which, in my opinion, goes to show that if a larger butchering trade could be done there, these shops would be appropriated to their proper use. Market-street is part of the market proper. There is a large range of buildings at the end of Newport-street; it is an excellent site for a large local market. Large premises there are partly shut up, and a portion of them converted into the Newport Boys' Refuge. In Newport-street, which approaches the market, but forms no part of it, there is a large and cheerful business done in all manner of animal and vegetable food. There are plenty of costermongers' barrows, which are not allowed to be taken into the market proper.

Farringdon-market.—This is the largest, and, in its design, the most ambitious market in London. It has an immense area for the convenience of market carts, and ranged along three sides of its square are shops for retail as well as wholesale dealing. Skirting this centre market place is an extensive and commodious avenue, consisting of a double row of roomy shops, and lit from above by a noble vaulted skylight, extending its whole length. I believe that originally these shops were intended for the butcher trade. I did not count them, but I should guess that these shops number from fifty to seventy. As to the central part of the market, there is visible evidence, in the shape of a few carts from the country market-gardens, and of water-cress vendors, and costermongers, and petty dealers coming to buy, that a certain amount of business is transacted; but as regards the surrounding shops mentioned, it is impossible to imagine a more dismal failure. Those on the eastern side are in partial use as fruit and potato stores, but all the remainder are closed, and have been closed so long that the woodwork of the shutters is rotting, and the shutter-bars red with rust. It seems to be nobody's business to look after the property, which is rendered more forlorn-looking from the circumstance of a rag and waste-paper dealer being located in one of the deserted avenues, and flaunting his goods freely about the place, and scattering damp rags about the ways and on the pavement to dry. There is a noble-looking clock in the market, but its glass and gilt face have been smashed by the boys, which makes it of a piece with its time-past looking neighbours. Without doubt, Farringdon-market is a disgrace to those who pretend to the management of it.

Oxford-market.—This is in reality no market at all. It has been designed in a commodious and rather handsome manner, but the trade is entirely retail. The

butchers are for the most part high-priced. Many of the shops originally intended for butchers are devoted to other businesses of a miscellaneous character. You could hardly have a better site than this for a market, but at present it is hardly entitled to be called a market; it is just a square of retail butchers and fruiterers. If it had been a success as a market, I apprehend the shops would be occupied for the businesses for which they were intended.

Q.—In what respects does the trade of Newport-market differ from that of Oxford-market?

A.—Meat and provisions generally are cheaper in the former than in the latter.

Q.—Do you consider that is because it is in a lower class of neighbourhood?

A.—There are generally a larger stock of meat and a larger number of purchasers at Newport than at Oxford-market. My own conception of a public market is where people come from their own immediate districts for the purchase of their provisions, expecting pecuniary advantages that will reward them for their trouble.

Q.—It is the question of preference of purchase in the market and preference for the costermonger class of dealers?

A.—The preference of the poorer class is decidedly to those localities where the costermongers most congregate; that in itself makes a market. The barrows give a cheap tone to the place. In addition to the markets I have spoken of, I paid a visit to Strutton-ground; that is a poverty market nearer to Westminster. I found the costermongers' barrows quite abolished in that neighbourhood, and the place was in consequence very dull. It is quite evident that the shopkeepers there are not averse to the presence of the costermongers, inasmuch as where opportunity offered, they allowed stalls to be pitched on spaces in front of their shops, or by the side of them. There is a place not far from this, called St. Erwin's-hill, out of the Broadway, Westminster, where costermongers congregate in large numbers, the neighbourhood looking dirty in the extreme; but the costermongers take to that rather than go away altogether, and people go over their soles in mud to buy vegetables and other articles there. I had some conversation with a man who owns and used to let out 17 barrows; and he told me he only let out three at the present time. He had no idea what had become of the people who used to hire them, but he supposed, to use his own expression, they had "gone on the make," which I interpreted, perhaps erroneously, that they were getting a living by dishonest practices. In a market such as Clare, I should say some of the butchers slaughter their own meat—more particularly sheep. Those who have not licensed slaughter-houses send their animals to be killed at a neighbour's who has. These butchers, for the most part, buy in the live as well as the dead meat market. Some butchers who have licensed slaughterhouses kill from 25 to 30 bullocks per week for their neighbours, and they are paid 3s. 6d. per head for killing and dressing, the offal of course being taken by the owner of the carcase. I may mention, while on this subject, that the curiosities of food in London are very remarkable; for instance, there is a person in Bermondsey who has large premises, and who supplies the women who are seen selling them about the streets, with short sheeps' trotters at 3½d. per dozen, and those with the shank bones on at 7d. per dozen. These the retailers sell in the streets at a halfpenny and a penny each. There is also another curious trade carried on in the Bermondsey skin market. There is what is called the "bits and ears" trade. There are a number of boys who have the privilege of going over the ox-hides heaped up for sale and trimming off pieces of flesh and ears that are left on the skull. These are piled in small heaps, and sold for 3d. or 4d. a lot. Besides these, a very large trade is done in dripping, which is used by the poor to a large extent as a substitute for butter. It is a very large article of consumption in the poor districts, where a good deal of fish is fried, as it is more savoury than butter. In one instance I ascertained that a man buys butchers' fat at 3s. per stone, and with the addition of rice and potatoes he makes some kind of compound which will set and harden, and to give it colour and a gravy-like appearance fried bullock's liver is added to it. This compound is sold wholesale as dripping, and you might buy as much as half a ton of it at a time, if you wanted it, of one manufacturer. Another article of large consumption amongst the poor is that known as "spiced beef," which is prepared in round tins holding about 7lbs. each. This is sold at about 4d. per lb. For the manufacture of this article bullocks' heads are bought in large quantities in the market, and the flesh is used for this purpose, after having been boiled tender, and then the "spicing," &c., is added. If the inspectors went to the manufactories I have referred to, I think they would find something abominable, worthy of their attention. There is at Strutton-ground, Great Peter's-street, Westminster, a large "broken victuals" shop, where they do a good trade, the meat being sold at 4d. per lb., and bread at 1d. per lb. The whole of the meat was cooked and very well looking, and no doubt it would be a very great benefit to the poor of such neighbourhoods if shops of this kind were more numerous, as a means of disposing of the surplus victuals of clubs and hotels. The different descriptions of victuals I saw did not at all appear to be such as would be obtained from private houses.

The CHAIRMAN wished to point out what appeared to be a discrepancy between Mr. Greenwood's statement to-day and when he last attended. He was then asked whether he thought, in the case of Whitecross-street, and other markets of that character, the trade was on a sufficiently satisfactory footing to enable the working classes, including the wives of the more respectable of that class, to go there and purchase articles of provision at a reasonable rate without much personal inconvenience, and his reply was that in a rough way it was an efficient system of distribution of food to the lower classes, while from Mr. Greenwood's remarks to-day it was to be inferred that there was great necessity for the improvement of these markets.

Mr. GREENWOOD, in explanation, said his observations applied to markets proper, rather than to street markets, in which the costermonger element was the chief attraction to the public. In Newport-street, for instance, there was a busy and cheerful trade going on amongst that class, while the market proper was a dull affair, a great part of the space being occupied by people in businesses other than those contemplated when the market building was erected.

Captain GRANT remarked that in the one case rent was paid, and in the other there was an exemption from all charges.

Mr. GREENWOOD said the collection together of a large number of costermongers' barrows and stalls very speedily constituted a market. Strutton-ground, to which he had already alluded, used to be as lively a place on Saturday nights as Whitecross-street; now it was almost destitute of that kind of trade, and the public were obliged to go to the regular shops for the provisions chiefly dealt in by the costermongers.

The CHAIRMAN inquired whether, while the costermonger element diffused an air of liveliness and cheerfulness in a neighbourhood, it had not at the same time the effect of vulgarising the traffic, so as to render the visits of a decent workingman's wife to such a spot disagreeable. Did Mr. Greenwood think the costermongers, as a class, were pleasant people for a respectable woman to deal with?

Mr. GREENWOOD replied that upon the whole it might be a disagreeable mode of dealing to a great many people, but to such people the regular markets or the established tradesmen were open.

The CHAIRMAN inquired whether arrangements could not be made by which the more respectable portion of the working classes could be served equally cheap as by

the costermongers, without being subject to the unpleasant associations of that class of dealing. The question was whether, under the costermonger system, the interests of those people whom they were bound to regard were consulted.

Mr. Greenwood—To gain the advantage of the costermonger element without the vulgarity attending it? He thought not. He thought it quite hopeless to think of establishing a respectable (so called) class of costermongers.

It was remarked by various members of the Committee that the market-places in provincial towns, which were, without exception, extremely well conducted places of business, were frequented by the most respectable classes of society in the early portion of the day, and formed the principal sources of supply to such towns; and in the evening the poorer classes resorted thither for their supplies, which were obtained at lower prices than in the earlier part of the day. This, it was stated, was particularly the case at Birmingham and Oxford, which might be regarded as model markets.

The Committee having thanked Mr. Greenwood for his further information, added a request that he would, at his convenience, continue his interesting researches into the subject. The Committee then adjourned.

Mr. A. Wood, Deputy Chairman of the Great Western Railway, attended, and gave evidence in reference to the establishment of new meat markets.

The Committee had before them a tin of preserved meat from Australia, sent by Mr. Harbottle. The meat is preserved raw, by a special process, the particulars of which have not been communicated to the Committee. The meat was stated to have been killed on the 9th of August last, and packed on the 12th. It arrived in this country on the 12th of December. On being opened a rush of gas took place, but the meat was perfectly sound, and of good colour. The meat having been cooked, was tasted by the Committee. There was a strong metallic flavour, which rendered it unpalatable.

The Committee met on Wednesday, 18th December. Present:—Mr. Benjamin Shaw, in the chair, Capt. Grant, Messrs. W. H. Michael, J. T. Ware, Harry Chester, G. F. Wilson, F.R.S., E. W. Hollond, Ed. Wilson, and J. Ludford White.

Mr. Robert Tooth attended to give information with respect to the manufacture of Liebig's Extract of meat as prepared at his establishments at Sydney, Australia.

Mr. Tooth, in reply to interrogatories by the Committee, stated that he had been for some time engaged in the manufacture of *extractum carnis* in Australia, which is now being largely imported into this country. The process of manufacture was essentially the same as that of the extract made by the South American Company.

The Chairman remarked that the object of the Committee was to promote by every available means the quantity and quality of meat food in this country, and the Committee would be glad to hear whether there was a probability of this article being brought in to aid that object. From the chemical evidence already before the Committee the impression left on their minds was that it would not serve at all as a permanent article of diet in this country, especially amongst the poorer classes, for whom the increased supply of meat was most required.

Mr. Tooth observed that, with the addition of bread or vegetables, all the properties considered to be essential in food, which were lost in the preparation of the extract, were restored. He had not tried the experiment of feeding persons exclusively upon this food for any length of time, either with or without the addition of bread and vegetables, but he had credible information that Dr. Brereton, of Sydney, had lived exclusively upon the extract and vegetables for several months without experiencing any physical deterioration. In that case it was eaten with potatoes, peas, beans, and cabbage. A 1lb. canister of the extract represented the nutritive value of 32lbs. of beef without bone or fat, and the half-pound canisters 16lbs. of the lean of meat. The one element of meat which was lost in the preparation was albumen. He did not claim any marked difference in the composition of the article as compared with the South American Company's. The solution made with this extract he believed was clearer than that made by the Company, showing greater care in the manufacture of it. In the case of the medical man who used this diet for several months, he had reason to believe that he was perfectly satisfied with the state of his health during the period of the experiment. He was not aware whether he lost flesh or gained in weight during the time, but he considered himself to be in as good state of health after the experiment as he was before trying it. The extract now before the committee was made entirely from beef; it was occasionally made from mutton, which was of more delicate flavour, and the best quality of extract is that which is obtained from animals well matured. All the parts of the carcase are employed in producing the preparation, with the exception of the fatty portions and the bones. The sale of the article was decidedly increasing in this country, and he thought when the expenses of the first introduction into this market were met, the price would be reduced. The bones of the animals used in the preparation are stored, and when the stock is sufficient to freight a ship, they will be sent to England. He always killed his own meat, and he had at the present time somewhere about 25,000 head of cattle in Queensland. The northern part of Australia was the best place for cheap meat. Where there is a population, meat is, of course, dearer, owing to the larger demand which exists for it. He had not turned his attention to the preservation of either beef or mutton in its natural state, but a friend of his in Sydney had spent a large sum of money upon an apparatus for freezing meat. A shipment to this country is soon expected. He (Mr. Tooth) was in Australia at the time the experiment was first tried, and he thought it was likely to be attended with good results. The supply of meat in Australia may be said to be unlimited, from the vast extent of grazing district. If the demand for meat in this country could be met by any means, people out there would take greater care of their stock than they do at present. Beef and mutton were not used promiscuously in the preparation of the extract, but one description only of meat was always used at a time. But the more delicately flavoured is that made from mutton, which is more costly than that made rom beef. The sheep are small, and they are more expensive to manipulate than oxen, it being almost as expensive to "bone" a small animal as a large one.

Mr. Chester asked Mr. Tooth what his opinion was as to the quality of Australian mutton being such as would be suitable for consumption in this country, and such as would be approved of here for use in first-class families?

Mr. Tooth—He quite thought so. He had seen a letter in the newspapers complaining of the quality of Australian mutton. That was, in his opinion, quite a mistake, as the mutton in Australia was very good, and he was certain it would be liked in this country.

Mr. Chester remarked that he had been informed by people who had lived in Australia that the mutton was so bad that they would scarcely touch it.

Mr. Tooth could not agree with that; the people in the towns ate quite as much mutton as beef. For his own part, he would say the mutton was quite as good as the beef. In bad seasons for grazing, of course the quality, both of beef and mutton, was not so good. There are no cross-breeds of sheep; it is all Merino mutton, and it was considered to be of most delicious flavour.

Mr. Chester remarked that in London the idea of eating Merino mutton was most unpleasant.

Mr. Tooth said the best quality of Merino mutton in Australia was very much like the Welsh mutton. He had prepared extract of mutton, but at present only in small quantity; he, however, intended to increase it, and to devote one part of the year to beef, and another to mutton.

The Chairman asked what market Mr. Tooth anticipated for this article? Whether as an article of regular diet, or principally for sick and invalid persons.

Mr. Tooth replied it was useful besides for many culinary purposes—such as making soups and gravies; for sick persons he thought it was a valuable diet. He knew of many instances in which medical men considered lives had been saved by the use of this extract. He had been told so by several doctors in Sydney. It affords nutriment to the system of delicate persons without overtaxing the digestive organs. He looked upon the *extractum carnis* as most valuable. It was strictly animal food, and this substance could only be got by obtaining it from the animal itself. Meat food was deficient in this country, but in Australia it was abundant, and could be manufactured in this form, and brought here at a cost smaller than that at which it could be produced here. It was true it was deficient in some of the substances necessary to constitute it a diet supplying all the elements required by the human system, but it must be mixed with bread and vegetables, so as to restore those elements of which it was deprived in the manufacture, in order to preserve it good. He had not tried experiments for adding any albuminous or other nitrogenous substances to the extract. If he was met by a chemist with the objection that though the extract contained seme valuable elements of food, it had not all that was required to render it perfectly nutritious, he would meet it in this way: some persons live upon vegetable food, and we know that was not sufficient to give persons in this country the necessary powers which people require to keep up the amount of labour that was demanded of them. They required a certain amount of animal food to give them the requisite physical strength to enable them to endure hard manual labour, or sustained mental exertion. Vegetable substances alone would not do that; an admixture of animal matter was necessary to the proper sustentation of the system, and this he apprehended was supplied in the extract, it being purely an animal substance.

Mr. E. Wilson—Do you consider this extract, with the addition of bread or vegetables, would constitute a perfectly nutritious meal for a person in good health?—Yes, I do.

Mr. Michael—You have not, as I understand, tried any experiments for the introduction of any of the nitrogenous elements which the meat is deprived of in the process of the manufacture of this extract?—No, I have not.

Mr. Michael reported as follows, in reference to the tin of preserved meat from Australia sent by Mr. Harbottle:—

"The tin canister of meat sent to me for examination was in a perfect state of preservation. The inner surface of the tin case was blackened and oxidized, and where the meat was in contact with the case it was also blackened and adherent. The meat had been probably exposed to the action of some gas containing a large quantity of oxygen (query, nitric oxide), the whole texture being of a vivid red colour, but firm and unaltered. When cooked on a gridiron it was somewhat paler in colour than beef in an ordinary state, but firm, good, and thoroughly nutritious. This also applies equally to the meat when fried. There was a distinct metallic taste, like iodide of potassium, which lasted in the mouth for about an hour. Some persons who ate the meat, with full knowledge of its mode of preparation, were unable to detect this, and pronounced it excellent. Soaked for 18 hours in water, and then cooked, it had lost much of this taste, and was very good eating, but not so good as when cooked without the intervention of water. Adopting Liebig's mode, it made excellent 'beef tea,' in which, however, the same taste could be detected. Time did not allow examination to determine the mode of preservation adopted, but the reaction on litmus was not more acid than that resulting from ordinary fresh meat. Soaked in water for 36 hours, at a temperature ranging from 45° to 50°, the putrefactive process had commenced, but I am not aware of the length of time which had elapsed since the tin case was first opened."

The Committee resumed its sittings of the Christmas Vacation on Wednesday, the 8th January, 1868. Present,—Mr. Benjamin Shaw (in the chair), Captain Grant, Rev. J. E. Hall; Messrs. J. J. Ware, S. Gurney, M.P., E. W. Hollond, E. C. Tufnell, J. Ludford White, and W. H. Michael.

The Committee had under consideration the question of adulteration of food; and the further discussion was adjourned till Wednesday next.

Proceedings of Institutions.

Birkbeck Literary and Scientific Institution, Southampton Buildings.—The 176th Quarterly Report of this Institution was recently presented to the members. The year just ended shows that the income has exceeded the expenditure by £30. The lectures and entertainments, which have been given by the Rev. J. M. Bellew, Mr. and Mrs. Howard Paul, Messrs. Edmund Yates, George Dawson, George Buckland, &c., &c., have been well attended, and have given great satisfaction. The classes, in which instruction is given in all branches of education, are in a very satisfactory condition. A large number of the members have distinguished themselves at various public examinations, many carrying off valuable prizes. The distribution of prizes by the Earl and Countess Russell, in October last, was very successful; the demand for tickets was so large that the issue had to be suspended some days prior to the ceremony. The library, which contains nearly 6,000 volumes, and the reading-room, which is supplied with all the principal newspapers, periodicals, and magazines, are well used and appreciated. The number of persons who have joined either the institution or its classes, has nearly reached the large total of 1,100. This is the highest number within the memory of the present management. Altogether, the institution is in a highly satisfactory condition.

TECHNICAL INSTRUCTION AT LEEDS.

At the distribution of prizes at the Mechanics' Institute at Leeds, of the 30th December last, Mr. Baines, M.P., made several observations on the subject of technical instruction. As coming from so high an authority on education, and from one who has hitherto so consistently and valiantly repudiated state interference in education, Mr. Baines's opinions are remarkable, and deserving of careful attention. After some observations on the general advantages of a knowledge of science and art, he proceeded as follows:—He was sorry to say that we did not now stand by any means so high in England, generally speaking, as we ought to do, and as we must do if we were to maintain our commercial and manufacturing superiority. It was essential to the very livelihood of our working classes, as well as to the profits of our capitalists, that we should improve our position in science and in art. The Paris Exhibition had been the means of drawing attention to the position in which

England stood compared with foreign nations, both in regard to art and science and in regard to their application to industry. He was sorry to say that the accounts which had been received showed that we were losing ground in comparison with our foreign competitors. There was first the letter from Dr. Lyon Playfair, drawing attention to the matter; and then there were letters from the jurors in the various branches of industry in the Exhibition, addressed to the Schools Inquiry Commission. Then there were accounts from some of their own townsmen—from Mr. Thomas Nussey and Mr. Leach, who went over to examine on behalf of the Chamber of Commerce; and their own teacher (Mr. Smith), whose ability to judge on such matters no one could doubt, had also given the results of his experience. Then there was Mr. James Kitson, jun., whose high scientific and judicious character, and his position as the head of one of the great ironmaking works in Leeds, made it impossible to doubt his testimony. The other day Mr. Mundella, of Nottingham, gave to the Associated Chambers of Commerce a comparison between the state of things in Saxony and in Nottingham, and, he supposed, in Yorkshire, and it would have made them blush to have heard it. And that day he had received a report from Mr. Samuelson on technical education on the Continent and in this country; and he could assure them there were statements made concerning Leeds calling for their serious consideration. They were in some branches of industry very eminent, but there were other branches which seemed to be so neglected as to be kept running in one groove, as if they were incapable of improvement or extension. Especially was it so in a staple branch of industry—the great woollen manufacture; and he declared he did not understand how it was that in a town where there was so much of the spirit of improvement, where there was so much money, where there was so much intelligence, they should allow the Belgians, French, and Prussians to pass them, and beat them hollow in their own staple manufacture. Mr. Samuelson stated that the Belgians were now sending into this country woollen yarns to the value of £2,000,000 yearly. What ought to be done in Leeds? Mr. Samuelson also made an unfavourable contrast between Leeds and Bradford, remarking that the Bradford people were very much more wide-awake, that they got on much faster, that they were much more ahead in science, and in the cleanliness and perfection of their machinery and all their manufactures. And Mr. Samuelson drew attention particularly to a contrast between Leeds and the canton of Zurich, in Switzerland, where there were a great number of schools and colleges for technical and general education. "I invite," he said, "the member for Leeds to look to this, for the population in this canton is about the same as the population of Leeds—that is to say 234,000." He was afraid they would not cut a very good figure by the comparison; yet these things were facts which they must look to. In France, in Belgium, in the different countries of Germany, in Prussia and Saxony, and even in Austria, as well as in Switzerland, a very great superiority was shown in the means and results of technical instruction. These countries were before us in the art of design, and in the scientific education given to those classes especially who conducted the great manufacturing establishments. Well, then, what were we to do? We were making some progress. We had not sat absolutely still during the last few years. He found from a blue book he had with him that the number of pupils attending provincial art schools in 1860 was 11,121, and that in 1866 the number had risen to 15,597. If they added the teachers, the number at present would come to about 17,200. The schoolmasters, however, and the pupil teachers, owing to the withdrawal of the payment of which Mr. Smith had so often told them, and which he thought most injudicious, and this seemed to be proved to be so by the figures he was going to mention—owing to this fact the number of schoolmasters and pupil teachers in art in the provinces had diminished in this way—that whilst in 1860 they numbered 2,495, in 1866 they only numbered 1,049. That was a most serious and alarming diminution. The teachers of the schools of art had also lost a great number of children who were formerly taught drawing in the national, grammar, parish, and other schools; but though they had lost them in this way, the children were not altogether deprived of this kind of instruction, because in schools of art and public schools where instruction in drawing was taught and recognised, and in some small degree paid for by the Department of Science and Art, the number of pupils so taught in 1860 was 89,491, and in 1866 it was 104,068. In 1860 the Department at South Kensington instituted science classes, and in that year there were nine schools and 500 scholars. In 1863 there were 75 schools and 3,111 scholars; in 1866 153 schools and 6,835 scholars; and in 1867 207 schools and 10,180 scholars. So that we really were making some progress—enough to keep us from despairing;—nay, not despairing; it was absurd to use such a word in England. They need never despair. What was being done in Leeds? They were instructing a very considerable number of young men and women—instructing them well. In science they were not doing much; but he was glad to mention Mr. Ward, who, he believed, was doing his duty well. He should like, however, if he had twice or thrice as many students under his care. Their number had, however, increased from 36 in 1865 to 38 in 1866, and the number was 45 at present. Still in a town like Leeds—full as it was of dyehouses and chemical works, with many potteries and glass works, and where there were so many occupations requiring chemical science and knowledge—there ought to be two hundred science students instead of fifty. What was to be done in the matter? There were some suggestions he would venture to make, and first of all, he thought they should endeavour to perfect as far as possible all the present appliances for instruction in art and science in Leeds and in other towns. He thought that their Institution, which had now existed for more than forty years, and had always in some measure taught art and science, was now in a fair way to make progress in them. He could not help thinking, also, that there should be a few technical schools such as existed in very great perfection indeed upon the Continent, in which there should be professors in art, and in the various branches of science, and connected with which there should be museums, models, laboratories, and apparatus as means of carrying on instruction. Mr. Smith would, of course, plead for examples, his complaint being that he was not properly supplied in this way, and he would plead also for a gallery of art. There should likewise be a few schools or colleges of a superior kind in the centres of our great manufacturing industries—one, for instance, in the centre of Yorkshire, one in the centre of Lancashire, one in the centre of Nottingham, one in the centre of Warwick (at Birmingham), one in Glasgow, a great cotton manufacturing town, and another in Belfast, a great linen manufacturing town. He thought there should be six or eight such schools abundantly supplied with professors and with all the means for obtaining high artistic and scientific instruction; and that these schools should be for the training of the middle-classes, for those who were to be masters, or managers, or foremen. And he could not help hoping that by-and-bye there would be in the other schools throughout the country exhibitions, as they were called, or sums of money to be given to the most proficient students, that they might be sent to the higher schools and colleges. He thought this would be a kind of graduation in technical instruction which would be found most desirable. There was another thing he would plead for, and that was, the perfecting of the institution at South Kensington, believing that if the School of Mines, as it was called, in Jermyn-street, and the College of Chemistry, in Oxford-street, were amalgamated with it, the institution might be made into a technical university in London, where there should be professors of the highest

name and fame that could be got from any quarter of the world to teach art and science. If all this were brought about, he thought we should be in a way to make very satisfactory progress—to redeem the character we may have lost in regard to our industry—and to raise the commercial footing of Britain to a higher position than it had ever yet occupied. In conclusion, the hon. member wished every success to the School of Art and the Mechanics' Institute, and trusted that when the new building—a noble building he could not help calling it —was opened, and the debt paid, the people of Leeds would find themselves in a position in which they would be able to make such strides that no great industrial community in the kingdom could get ahead of them.

LAMBETH LIBRARY AND SION COLLEGE.

The following correspondence has appeared in the *Times*:—

SIR,—You allowed me last autumn to put in a plea for the maintenance of the fine old ecclesiastical library at Lambeth on its present site; and, with your permission, I now renew it with some suggestions calculated, I hope, to render the preservation of the library and its improvement all the more practicable.

Do you or any of your readers happen to know an old City library and charitable foundation of the dullest and grimmest sort hidden in London-wall, called Sion College? It was first endowed in 1623, by one Thomas White, Vicar of St. Dunstan's-in-the-West, for twenty poor persons, and a library was added to it afterwards, which is now said to consist of more than 50,000 books, chiefly theological. Defoe says that "here expectants might lodge till they were provided with houses in the several parishes in which they serve cure. The twenty poor persons still get their annuities, but the readers of the library are so few that the librarian cannot tell the number, and how long ago any "expectant" lodged there is beyond the memory of man. The only lively thing in Sion College at present is the annual dinner on the election of a president. You can hardly find the names of any of the City clergymen as readers now-a-days. The whole thing is "as dead as a door nail." But it represents a value at least of £60,000, besides an annual public grant of £363, which it receives in compensation for losing its privilege of obtaining from publishers a gratuitous copy of every printed book, when that scandalous imposition on literature was remodelled. To our shame it still remains, although in a mitigated shape.

I suggest for consideration that Sion College Corporation do sell their land and old buildings, and offer to the Archbishop of Canterbury to transport their books to Lambeth, and undertake to manage both their own and his library, which is threatened with expulsion. With a contribution from the Archbishop and the Ecclesiastical Commissioners an ample income would be found and a noble theological library be formed for the use of the whole body of the clergy.

Railways, bridges, the Thames embankment, all render access to the site easy. It is within five minutes of the Houses of Parliament.

Perhaps the Dean and Chapter of Westminster would exhume their own library and add it. I am told that Convocation also wishes for a good library. If such a theological library had been founded, the wicked sale of Archbishop Tenison's library would never have been proposed or effected.

I venture to throw out these suggestions in the hope that the Royal Society of Literature, or the Society of Arts, will help to discuss the subject, and induce all the respective parties interested to amalgamate their forces, and thus establish a theological library worthy of the subject.

I am, Sir, your obedient servant,

Jan. 4. HENRY COLE.

SIR,—I must request the favour of your inserting in your columns a few lines in answer to a letter published in your impression of yesterday, as, if I left that letter unnoticed, it might be supposed the librarian of Sion College is as incapable of giving a satisfactory answer to a question your correspondent never put to him as Mr. Cole assumes him to be.

Mr. Cole argues that Sion College "is as dead as a door-nail," because—and he seems to imply that he has the authority of the librarian for the statement—because "the names of scarce any of the City clergy appear as readers there now-a-days." When he wrote thus, Mr. Cole can hardly have been aware that the convenience of the clergy is much better provided for than it would be if they were forced to come to Sion College whenever they wished to benefit by its library. Mr. Cole cannot have known that for several years past the privilege has been conceded to all clergy connected with the College, and that the same privilege has recently been extended to all the clergy within the metropolitan limits, of taking books away for use at home. Mr. Cole can never have heard that at least half the Fellows (about 150 in number) and a very considerable and increasing number of clergy from all parts of the metropolis, thankfully avail themselves of this privilege, and show their appreciation of it by paying an annual subscription to defray the working expenses of the library. Mr. Cole must also have been ignorant that besides all these, who borrow books for use at home, many of the clergy within the College limits do, as a matter of fact, read in London-wall, though no record is kept of their visits, as they have a right to use the library whenever open, as freely as if it were their own.

I gladly avail myself of this opportunity to let it be publicly known that while many of the Fellows of Sion College, myself among the number, are by no means convinced that the present site of our buildings is the best possible, we are yet thoroughly determined to oppose any repetition of the mistake of a former generation by embarking in a grand architectural scheme before we have counted and provided for the cost.

It may be true that our present buildings are possibly worth £60,000, and if anyone can inform us where to obtain a more central site and build upon it a spacious library and hall and convenient almshouse for 20 inmates, and at the same time enable us to pay off the mortgage which cripples us, all for this sum, we beg he will communicate with us, as, out of many sites which have been under the consideration of successive Courts of Governors, not one has ever yet offered itself to which they could with common prudence recommend the Fellows to move.

Nor do I think I shall provoke a disclaimer from any of my brethren if I say that the Fellows of Sion College will give a very calm and impartial consideration to any well-considered scheme which would tend to make their corporation of greater public utility, with no other reservation than a decent regard for the intention of their founder and of their own chartered rights.

One word more. Mr. Cole alludes to the sale of Tenison's Library. Upon the occasion of that sale the then Court of Governors devoted a considerable proportion of the ordinary income for the year to the purchase of such of the Archbishop's books as were not already in their library, and the money so provided was largely supplemented by a private subscription among the Fellows, aided by donations from our visitor and one or two laymen.

I am, Sir, your obedient servant,

WM. H. MILMAN,

Fellow and Librarian of Sion College.

Sion College, Jan. 7.

SIR,—The valuable suggestion contained in Mr. Cole's letter on this subject, which appears in the *Times* of to-day, deserves consideration. It is not novel, and has been under discussion by the Court of Governors who manage the affairs of Sion College, but no action has been taken upon it. It would not become me, as pre-

sident, to express an opinion on a matter which is under consideration, but I may state that the Governors are most anxious to make Sion College more generally useful. It is their ambition "to found a noble theological library for the use of the whole body of the clergy," and they would invite the laity also to join them.

Various schemes have been submitted to the Court, and the subject occupies their serious consideration. I trust that shortly a decision may be arrived at. Meanwhile, allow me to assure you that, though we are condemned to occupy a site in London-wall "of the dullest and grimmest sort," but which some of our brethren would characterise as a peaceful retreat from the bustle of life, and decidedly adapted to theological study, we are not defunct; and if the Court had been honoured with the company of Mr. Cole at the last three evening meetings of the College, he would have seen that "the whole thing is not as dead as a door-nail," but that "there is life in the old hound yet."

We court publicity, and if the Royal Society of Literature and the Society of Arts will help to discuss the subject, and will render us any assistance in establishing a theological library worthy of London, we shall be grateful.

I am, Sir, your faithful servant,

William Rogers,
President of Sion College.

Bishopsgate, Jan. 6.

HAVRE INTERNATIONAL MARITIME EXHIBITION.

An exhibition under the above title will be held at Havre, under the patronage of His Majesty the Emperor and His Highness the Prince Imperial, and will be open from the 1st of June, 1868, to the 31st of October. The exhibition is organized under the auspices of the Municipal Administration of Havre and of a general Consultative Commission, of which M. le Sénateur-Préfet de la Seine-Inférieure is Honorary President. The programme of the exhibition includes forty-three classes, divided into the five following groups:—Navigation, goods, fishing, aquiculture, complemental classes.

1. *Navigation.*—1st class, sailing vessels (models and plans). 2nd, steam vessels, ditto. 3rd, wood-built vessels and composite (wood and iron). 4th, iron-built vessels. 5th, boats of all descriptions. 6th, masting. 7th, rigging. 8th, sails. 9th, materials for fitting out ships. 10th, preservation of ships. 11th, furniture for vessels, steamers, yachts, &c. 12th, ship stores. 13th, sailors' outfit and chest. 14th, instruments for navigation, steerage, lighthouses, and signals. 15th, hygiene, ships' medicine chests, and surgery. 16th, apparatus for loading, stowing, unloading, and transhipping. 17th, life-boats, and other contrivances to save life and property; swimming apparatus; various objects for the use of bathers. 18th, paddle propellers. 19th, screw propellers. 20th, engines, impellers. 21st, steam boilers and generators, fuel. 22nd, various parts of machinery belonging to marine engines and accessories. 23rd, various works relating to ports; repairing ships.

2. *Goods.*—24th class, textiles: cotton, flax, hemp, &c., wools, horsehair. 25th, colonial goods for consumption; home produce (similar). 26th, corn, alimentary flours, fruits, and seeds. 27th, dyeing and chymical produce. 28th, greasy and oily substances. 29th, woods wrought or unwrought. 30th, all kinds of metals. 31st, different sorts of goods and produce of industry for importation or exportation. 32nd, instruments and apparatus applied by trade to establish the quality or discover the adulteration of goods. 33rd, packing: produce used for manufacturing objects necessary to pack up goods.

3. *Fishing.*—34th class, whale fishing, &c. 35th, cod fishing, &c. 36th, coast fishing. 37th, river fishing and pond fishing. 38th, speciality of tackle and instruments used in fishing; bait, salt, preparation of fish; models of establishments for preparing fish; fishermen and sailors' outfit and clothing.

4. *Aquiculture.*—39th class, fresh and salt water aquaria.

5. *Complemental Classes.*—40th class, art annex, special naval art, art properly so called. 41st, writings and books, maps and plans. 42nd, competition and experiments. 43rd, nautical sports; representations, the plan and action of which will be taken from historical events or fabulous and legendary subjects.

A Maritime and International Congress will take place during the time of the exhibition.

The exhibition will be held in closed galleries, which were begun in the month of July, 1867, on the grounds situated by the sea-shore, opposite the roadstead on the Boulevard Impérial and the Boulevard François I. These grounds are granted by Government. It contains, besides the galleries, an enclosure in the open air; a floating annex will receive special exhibitions. The whole surface of the exhibition is about five hectares, or 12 acres and two roods English measure, not including the annex above mentioned. Objects admitted will be exhibited under the name of the inventor, builder, manufacturer, or author, &c., and generally of the producer or the manufacturer. They may also be exhibited under the name of the shipowner, merchant, holder, collector, tradesman, or the consignee.

Exhibitors will have the privilege of selling in the enclosure of the exhibition, commodities manufactured on the spot. They will have also in special galleries, for this purpose, the right of letting customers taste their produce and retailing goods similar to those exhibited. Non-exhibitors will not have this right.

The rewards adjudged to exhibitors, on the decision of the International Jury, will consist of pecuniary gifts and objects of art, gold and silver medals and honourable mentions; there will be several great prizes amongst the rewards. The jury will begin their operations as soon as the exhibition opens. The rewards will be delivered at a grand assembly of the general commission on Sunday, 26th of August, 1868. The catalogue of the exhibition, entitled "Catalogue Officiel de l'Exposition Maritime Internationale," and the under title, "Manuel de la Marine et du Commerce Maritime," has been ceded to M. Marc Deffaux et Pache, Rue de Rivoli, No. 164, Paris. They will have no right to sell the book at more than two francs, nor to require from exhibitors or the public more than two francs for each line of notice or advertisement.

A moderate charge is made to exhibitors on account of the expenses incurred by the erection of the building, and for watching, insuring, and keeping the same in order. The tariff of the exhibition is fixed as follows:—

	£	s.	d.
Closed galleries, 3 ft. 3 in. square	1	0	0
" 1 ft. 7½ in. square ..	0	12	0
" 9½ in. square	0	8	0
On inside wall, 3 ft. 3 in. square	0	8	0
In open air, 3 ft. 3 in. square	0	4	0
With the right to erect sheds or set up kiosques	0	8	0

Pictures and purely art productions will be admitted free of charge.

Foreign goods to be directed to MM. Mohr, Nicole, and Co., general agents to the Maritime International Exhibition of Havre. Foreign goods will be received for temporary admission, and consequently will not have to pay any custom-house dues.

Goods and produce will be received upon the premises of the exhibition from the 1st of March until the 1st of May, 1868. The railway companies in France, on production of the certificate of admission, will allow a deduction of 50 per cent. on objects and produce destined for the exhibition. The companies for transport by sea will also, for the most part, reduce their prices on freight.

Demands for space will be received up to the 15th of

February only, and application for forms should be made to Mons. Alf. D. de Lavigerie, Special Commissioner for England, 40, Great Titchfield-street, Oxford-street, W., who will give any further particulars.

CONSTRUCTION OF THEATRES AND HOUSES.

Only two days after the destruction of Her Majesty's Theatre, one of the suburban theatres of Paris, Belleville, was completely destroyed in about three hours. When we consider the great size of Her Majesty's Theatre, and the fact that in the case of Belleville the water was frozen, the shortness of the time in which the former was consumed as compared with the latter is startling, yet the construction of the Belleville Theatre was far from perfect, for the floor of the pit gave way and four firemen and a soldier injured, two of them very seriously.

Few facts are more remarkable than the small amount of damage done by fire in Paris, yet the number of persons in each house, and consequently the number of fires, is very much larger than in London; and, although the number of firemen is three or four times larger in the former than in the latter city, the engines are mere garden toys compared with those of the London brigade, to say nothing of the steam fire-engines. The comparative immunity from fire may be accounted for, in part, by the very crowding of the houses which would seem to be a source of danger; each family only occupies one floor, and consequently there is little chance of a fire smouldering for hours without being discovered, but the grand difference in favour of modern French houses, as compared with those of London, arises from their superior construction.

In the first place timber is almost entirely banished; the beams, girders, and flooring-joists are all of iron, and the spaces between them filled in with brick arches and mortar; this arrangement not only renders the floors nearly fire-proof, but it excludes noise, and affords little shelter for vermin. Then again the floors themselves are composed of thick oak parquet, instead of inflammable deal boards; while those of the kitchens, pantries, and offices are mostly of tile. The staircases, it is true, present some danger, but nothing compared to that which surrounds the flimsy constructions in London houses.

In theatres and other large buildings the staircases and passages are of pre-eminent importance, and I believe that much attention has been given to these parts in the various recently-constructed theatres of Paris; in some of the old theatres, as, for instance, the Palais Royal, the staircases are of iron.

It is only when public attention is excited by such accidents as the destruction of Her Majesty's Theatre, that attention is to be obtained for questions of this kind, and these are the moments when it is important to point to what has been done in the way of improvement elsewhere; within a very few years there have been several important theatres built in Paris, the Châtelet Theatre, Lyrique, and Gaité, amongst the number, while the New Opera house offers, at the present moment, an admirable occasion of studying the newest modes of construction and the precautions adopted by French architects and builders. When we consider what an awful calamity might have happened had Her Majesty's Theatre been crowded with spectators, the importance, nay, the moral duty, of collecting all the available results of study and experience need notbe further insisted on.

Fine Arts.

Prizes offered by the Belgian Academy of Sciences, Arts, and Literature.—The following is the list of subjects offered for prizes of a thousand francs each in the section of the fine arts for the year 1868:—First: An historical account of medal engraving in Belgium from the sixteenth century to the year 1794, embracing all the country at present belonging to Belgium, and including the biography of the artists as well as a criticism on their works. Second: An inquiry respecting the period at which the architecture in the Low Countries was affected by Italian influence, with indications of the persons to which such influence is attributable, and citations of works in illustration of the same.

Manufactures.

Manufacture of Fiddle and Harp Strings in Italy.—The manufacture of strings for musical instruments has been carried on from time immemorial in some of the small villages in the Abruzzi, and at the present time the Neapolitan provinces maintain their superiority in the production of this article. They require the greatest care and dexterity on the part of the workman. The treble strings are particularly difficult to make, and are made at Naples, probably because the Neapolitan sheep, from their small small size and leaneness, afford the best raw material. They are made from the small intestines, which must be very carefully scraped; the intestines are then steeped in alkaline leys, clarified with a little alum, for four or five days, until the guts are well bleached and swollen. They are next drawn through an open brass thimble, and pressed against it with the nail, in order to smooth and equal their surface; after which they are washed, spun or twisted, and sulphured during two hours. They are finally polished by friction, and dried. Sometimes they are sulphured twice or thrice before being dried, and are polished between horsehair cords. The strings manufactured in Italy are noted for their strength, transparency, brilliancy, and clearness of tone. This manufacture was introduced into France by a Neapolitan nobleman, in 1766, who established a manufactory at Lyons. This industry is carried on in various other towns in Italy, namely Gubbio, Foligno, Bologna, Venice, Vicenza, Padua, Verona, and Bassano.

Commerce.

Russian Commerce.—In the *Journal* of the 27th December last an account of the general growth of Russian commerce was given, from the governmental lithographed sheet of M. Bogdanoff. The following, from the same source, shows the relative progress of the import and export trade between that country and the other states of Europe and America. Imports from:—

	1865. Roubles.	1866. Roubles.
England	48,744,019	59,393,518
Prussia	50,610,578	69,723,416
France	9,764,318	10,227,860
Hanseatic towns	6,929,884	8,143,596
Austria	5,870,392	8,458,296
Italy	6,362,626	5,453,671
Turkey	5,128,598	4,875,416
Holland	4,349,370	10,508,687
Belgium	1,049,463	2,927,788
Sweden & Norway	2,211,057	2,364,767
Spain	2,039,460	1,568,866
United States	1,225,637	2,247,200
Moldo-Wallachia	1,868,073	725,303
Greece	1,713,241	1,182,311

Exports to:—

	1865. Roubles.	1866. Roubles.
England	98,159,101	101,851,975
Prussia	27,632,920	28,896,960
France	15,588,007	16,793,887
Turkey	7,263,565	9,196,171

	1865. Roubles.		1866. Roubles.
Austria	7,148,049	..	6,033,050
Italy............	5,734,684	..	5,891,200
Holland	5,026,913	..	5,553,273
Hanseatic towns..	2,884,661	..	3,698,123
Moldo-Wallachia.	2,908,971	..	2,662,770
Sweden & Norway	2,498,658	..	3,871,161
United States....	1,295,926	..	1,433,078
Denmark........	1,054,748	..	1,300,684
Portugal	793,062	..	376,142

It will be seen by the above figures that, with very few exceptions, the progress of the commerce of Russia is highly satisfactory. The return does not include the trade with Asiatic states.

Obituary.

Antoine François Claudet, the eminent photographer, died rather suddenly on Friday, the 27th of December, of heart disease. A few months since M. Claudet sprained his foot, and the shock appeared to affect his whole system; and at the age of seventy an accident which might have been a trifle at twenty, was not so easily got over. M. Claudet was born in Lyons, on the 12th of August, 1797, so that he had already lived out the allotted span of three score years and ten. He was a gentleman of fine taste, of high culture, and of pleasant manner; and his name will long be remembered in connexion with the art which he all but made his own. M. Claudet originally came to England for the purpose of establishing, in connection with the Messrs. Chance, of Birmingham, the manufacture and sale of glass shades. The manufacture of glass shades which, under the name of "Cylindres de Verre," had long been carried on in France, was first undertaken, at M. Claudet's instance, by Messrs. Chance, who, in the true spirit of enlightened enterprise, notwithstanding the vexatious pressure of the excise laws (since repealed), embarked largely in the manufacture, getting workmen from France for making both shades and the sheet-glass which had then been for some time made from cylinders. It was found, however, that some method of cutting the bottoms of the shades and cylinders must be adopted, surer and less expensive than the hand method. M. Claudet invented an ingenious and simple machine for this purpose. For this he received the medal of the Society of Arts in 1850. Shortly after the discovery of the daguerreotype, M. Claudet commenced the practice of that art in this country, and subsequently communicated to the French Academy of Sciences a paper on the discovery of a new process for accelerating the production of the daguerreotypic image by the addition of bromide and chloride of iodine to the iodide of silver; thus permitting a portrait to be obtained in fifteen or twenty seconds. This discovery was, with the fixing of the image by chloride of gold, the completion of Daguerre's invention. In 1849 M. Claudet communicated a paper to the Académie des Sciences upon the use of a new instrument called the focimeter, the object of which was to secure the good focus of photographic portraiture. In 1848 he communicated a paper upon a new apparatus called the "Photographometer," the object of which was to measure the intensity of the photogenic rays and to compare the sensitiveness of various compounds. This paper was also read before the British Association at Birmingham, 1849. At the Exhibition of 1851, M. Claudet received the Council medal from the President of the jury for his numerous discoveries in Photography. In 1853 M. Claudet was elected member of the Royal Society, for his various scientific labours and discoveries in connexion with photography. His certificate of admission was signed by Sir John Herschel, Sir David Brewster, Prof. T. Graham, Prof. Wheatstone, Prof. Faraday, Mr. Babbage, and other eminent members of the society. In the same year he had the honour of taking the portrait of Her Majesty and several other members of the royal family, and was appointed Photographer in ordinary to Her Majesty. In 1855 M. Claudet obtained a first-class medal at the French International Exhibition for his eminence in the profession. In 1858 he communicated a paper to the Royal Society upon the "Stereomonoscope," an instrument founded upon the principle of the *inherent* property of the ground glass of the camera to produce in relief the image of the camera-obscura In 1862 M. Claudet was named member of the jury at the London International Exhibition, and obtained the medal of the jury. M. Claudet was a Chevalier of the Order of the Legion of Honour, and he had tokens presented to him by the late Emperor of Russia and King Louis Philippe. He was elected a member of the Society of Arts in 1842.

Publications Issued.

A Treatise on Frictional Electricity in theory and practice. By Sir William Snow Harris, F.R.S. *(Virtue and Co.)*, 8vo., pp. 291.—This work has been edited by Charles Tomlinson, F.R.S., and, indeed, completed by him, Sir W. Harris having died before he had finished the great work he had undertaken. The whole of the first part, up to page 200, had the benefit of his final revision. The second has been put together from the papers left behind by Sir William; and the editor has had the assistance of Lady Harris, and her son, Mr. Harris.

Notes.

Oyster Culture.—In a paper addressed to the Société d'Acclimatation, on the state of ostreoculture in the commune of Marennes (Charente-Inferieure), and especially on the artificial oyster beds of the Rock of Der, M. Delidon considers the current as the natural vehicle by which the spat of the oyster is carried to the places where it finds suitable materials to fix itself upon; but should no obstacles be put in the way of the current, an immense quantity of the spat will be taken out to the open sea and utterly lost; and it is to avoid this that collectors are formed. The ancient Romans used to make them of timber, and this material is used at the present time with perfect success, with the slight drawback that timber is not very durable. Stones, sea-shells, and tiles therefore answer much better, but even these are not unattended by annoyance, for as the oyster only travels once in its life, that is, whilst in the state of spat, it becomes necessary, after a certain time, in order not to be at the expense of multiplying the collectors, to detach the young oyster from the stone or tile, and transfer it to the definitive oyster bed. Now in this preliminary operation at least twenty-five per cent. of the young oysters are destroyed, on account of the thinness of their shells, which break in the attempt to separate them from the tile or stone. This serious loss is partly owing, according to M. Delidon, to the clumsy shape of the knife with which the operation is performed, but in a great measure also to the circumstance that the oyster is fixed to the naked tile or stone, whereas if the latter were coated with some substance that would resist the action of the water, but could be removed without much difficulty by mechanical means, all this loss might be obviated. M. Delidon recommends for this purpose a composition he has tried successfully for the space of two years, consisting of plaster of Paris made up into a paste with oil.

Nice and Genoa Railway.—The section of railway from Nice to the Italian frontier, belonging to the Paris, Lyons, and Mediterranean Company, is now completed.

Correspondence.

Industrial and Scientific Education.—The Working Classes of Nassau.—Sir,—Having followed the German artisan through his primary education, his apprenticeship, and his journeymanship, I will conclude the description of his educational career as given in my "Letters on Nassau," by an extract concerning mastership:—"Before the journeyman can become a master, and fix his abode as such in the place of his choice, a few important steps remain to be taken. If a native of another German state, he must obtain the freedom of the one of which he wishes to become a denizen; if merely of another parish, he must still get admission to parochial rights, which are sometimes expensive; in every case, he is required to accomplish single-handed, for strict inspection by the Board of Examiners, some model piece of workmanship, sufficient to show, not merely a moderate amount of skill, as when he was a candidate for a journeymanship, but his thorough knowledge of the *arcana majora* of his calling. If he can follow up the display orally, with theoretical evidence, he is entitled to be admitted forthwith to the honourable company of the masters of the trade." I need scarcely say that the examinations which the artisan has to pass, in order to become first a journeyman and afterwards a master, are, of all the features of German technical training which I have described, that which deserves on our part the most earnest study. I particularly drew attention to it in a letter to our worthy chairman, Mr. Hawes, which was inserted in the Society's *Journal*, January 13th, 1865, and I quoted an answer to my special inquiries received from a friend in Prussia well acquainted with the manufacturing and commercial industry of that country, and strongly evidencing the importance attached there to this means of affording a stimulus to the artisan, and a guarantee to the employing public. Whilst, however, I would strongly advocate the principle of special examinations for all ordinary manual trades, I should not wish to import into this country the whole of the German system. Firstly, I do not consider that with us compulsory examinations would be acceptable, nor, indeed, that they would be necessary. Journeymen would soon find out that they could better get employment, and masters in trade that they could better get customers, on the one hand, and apprentices on the other, by possessing certificates and diplomas, provided the mode of obtaining these were such as to secure general approbation and implicit confidence. Secondly, I do not think that the constitution of the Boards of Examiners, described in my last letter, would exactly suit this country. The amount of discretionary power entrusted to the local members of a given trade, would, unless subjected to proper supervision by a central administration, tend to favour the influence of individual or corporate interests, to the prejudice of national ones. Nor could we hope to establish in this manner, still less to maintain at all times throughout the country, that uniformity of standard for each class of industrial certificates and diplomas, which could alone entitle them to full confidence, and secure their full practical value. I am the more inclined to lay some stress on this consideration, because the multiplied examinations for general purposes, now overlapping each other in this country, display an uncertainty of standard, and altogether a want of systematic and singleminded organisation, which might have very inconvenient results in the case of technical examinations. What, indeed, I most fear, is the impulsive and disjointed manner in which matters of this kind are treated. For nearly twenty years I have seen the best friends of our industrial prosperity, those who knew and appreciated the exertions of foreign nations, striving in vain to draw public attention to the rapid progress made in the race of technical improvement by our continental rivals. They have been all the while pulling hard, whilst we have been pulling easy. The natural result has at length become too manifest to be gainsaid. Within six months public opinion has veered round; everyone now calls out for science whether or not he understands what science actually is; everyone declares that to provide technical instruction is "the thing to do," and proclaims his patriotic readiness to lend a hand. The consequence will be that we shall soon have technical institutions springing up in all directions; some not worth the ground they occupy, or located just where they are not wanted; others susceptible of being provisionally very useful for the sake of experiment, but which will afterwards only be in the way. Then, again, technical scions will be incongruously grafted on to existing educational stocks of the wrong sort for receiving them. Of course, everyone will try to convince himself and others that the thing which suits his own purpose best, is just what the nation stands in particular need of. Amid this confusion, a most favourable juncture for establishing our technical industry on a regular educational basis, worthy of our legitimate ambition, might soon be lost, unless the government, encouraged by the approaching conference, were to adopt prompt measures for securing public confidence, and for taking the lead of the movement.—I am, &c., T. Twining.

Twickenham, 6th Jan., 1868.

Recent International Monetary Conferences.—Sir,—The Vice-President of the Board of Trade, in the recent brief session of Parliament, answered a question put to him by Mr. Ewart respecting these conferences. He gave, however, small encouragement to the expectation entertained in certain quarters that the public might have timely opportunity of profiting by the reports from the delegates appointed by our Government. It appears, from the report of what was said at the conference of July last, that the various nations have been requested to signify by the 15th proximo if they will consent to place their monetary systems upon the plan of unification contemplated by that conference. A further conference will then probably be arranged. We are usually told, in England, that public opinion must take the lead in this matter. If it is to be consulted at all, the issue of at least a preliminary report before now might have been expected. In its absence, information from foreign countries moving more actively in the matter is doubly welcome. The first instalment of it which reaches us is a very elaborate, although somewhat discursive, report addressed to the American Department of State by Mr. S. B. Ruggles, delegate from the United States. Mr. Ruggles recapitulates the general features of the plan agreed to by the conference. (1.) A single standard of gold exclusively. (2.) Coins of equal weight and diameter. (3.) Coins of equal quality, nine-tenths fine. (4.) The weight of the present five-franc gold piece, 1612·90 milligrammes, to be the unit, with its multiples. (5.) The coins of each nation to continue to bear the names and emblems preferred by each, but to be legal tenders, public and private, in all. A marked prominence is given in the report to the opinions upon this scheme held by the Hon. John Sherman, Chairman of the Finance Committee of the Senate. This gentleman paid a visit to England last year, accompanied by Mr. Kasson, a distinguished member of the House of Representatives. We have an agreeable recollection of their conversation on the principles of international coinage and how they might practically promote the good of this country and of America. Mr. Sherman has given expression to his matured views in a letter addressed to Mr. Ruggles. This was communicated to the Committee on Weights, Measures, and Money which met in Paris in May, 1867. He there remarks:—"The treaty of Dec. 23, 1865, between France, Italy, Belgium, and Switzerland, and the probable acquiescence in that treaty by Prussia, has laid the foundation for such a standard (*i.e.*, a uniform standard of value and exchange). If Great Britain will reduce the value of her sovereign

twopence, and the United States will reduce the value of her dollar something over three cents, we then have a coinage in the franc, dollar, and sovereign easily computed, and which will readily pass in all countries, the dollar as five francs and the sovereign as twenty-five francs. This will put an end to the loss and intricacies of exchange and discount. Our gold dollar is certainly as good a unit of value as the franc, and so the English think of their pound sterling. These coins are now exchangeable only at a considerable loss, and this exchange is a profit only to brokers and bankers. Surely each commercial nation should be willing to yield a little to secure a gold coin of equal value, weight, and diameter, from whatever mint it may have issued." Mr. Sherman's opinion on the probability of the Congress of the United States agreeing at an early period to reduce the weight and value of the dollar to correspond with the present weight and value of the gold five-franc piece in France, is that it can readily be fixed by congress, and he sees no difficulty in the process. He adds, "In England, many persons of influence, and different chambers of commerce, are earnestly in favour of the proposed change in their coinage. The change is so slight with them, that an enlightened self-interest will soon induce them to make it, especially if we make the greater change in our coinage. We shall have some difficulty in adjusting existing contracts with the new dollar; but as contracts are now based upon the fluctuating value of paper money, even the reduced dollar in coin will be of more purchasable* value than our currency. We can easily adjust the reduction with the public creditors in the payment or conversion of their securities, while private creditors might be authorised to recover upon the old standard. All these are matters of detail to which I hope the commission will direct their attention." We believe that neither Mr. Sherman nor Mr. Kasson would deem it at all necessary to establish a scheme of compensation, if so small a difference as that involved in making the coinage of Great Britain international were in question. But the doctrine of limits in questions connected with currency, as indeed with those which depend upon social and political economy, comes very directly into play when we consider whether a disparity-table, or tariff of allowance, is at all needful in the case of the suggested alteration of the British gold coinage to the extent of about 0·825 per cent. only, to make it international.† A full discussion of this question would require further explanations. We now restrict ourselves to a reference to some points of evidence or example. Mr. Ruggles states that, in point of fact, no practical inconvenience was experienced from the Act of Congress in 1834, which reduced the weight of the gold dollar more than 5 per cent. He might, perhaps, have added with advantage, an allusion to the same having been the experience of Holland, which country, in more recent days, viz., in 1850, abolished her double standard, and coined a new florin as the basis of her exclusive silver standard, containing only 9·450 grammes of pure metal, instead of 9·613 grammes as theretofore. The intrinsic reduction in Holland thus amounted to about 1·7 per cent., or to more than double of what would be required from Great Britain if we were to join the convention of December, 1865. Here, then, we have an example of a nation, ranking amongst the most honourable in the world in matters financial, making this reform even for its own individual requirements, without having seen the necessity for a tariff.* But the alteration to be required in America is much more important than in Great Britain, being more than four times as great. Mr. Ruggles defines it as follows:—"The weight of the present gold dollar of the United States is 1671·50 milligrams. The value of the excess over the five-franc gold piece (58·60 milligrams) slightly exceeds $3\frac{1}{2}$ cents. To encourage the reduction of the United States' half-eagle, and of the British sovereign, to the value and weight of 25 francs, the Conference unanimously recommended the issue of a new coin, of that weight and value, by France, and the other gold-coining nations. The reduction in value of the half-eagle would slightly exceed $17\frac{1}{2}$ cents.; in the sovereign, 4 cents." Mr. Ruggles remarks to his Government that the aggregate population of the countries, European and American, which appeared by their delegates in the conference of July, 1867, is 320 millions; that the population of the dependencies of these nations in Asia is estimated at 190 millions. He remarks, that "there were no separate delegates from any portion of the West or the East Indies, not even from Australia, which had been separately and conspicuously represented in the International Statistical Congress at London in 1860, and which still plays a part so important in furnishing gold to British India, and other Oriental countries; and that it is indeed specially noticeable in the reported discussions of the conference, how little account was made of that populous quarter of the globe (India and the East generally) in estimating the world-wide advantages of a common money." This observation is very just. I have long entertained the same opinion, and have availed myself of every occasion in my power to enforce it. A French Government Commission met in April last, before the Monetary Conference, to study the question of the single and double monetary standards. This Commission expressed to me, through their secretary, the Marquis de Laizer, their gratification at being furnished with a brief memorandum (which has been added to their *procès verbal*), as to the great interest which India will by-and-bye take in international coinage, owing to its certain ultimate, although gradual, adoption of a gold standard. This question will doubtless be touched upon in a fuller and more able way by a late Master of the Mint, Colonel Smith, who has a report in hand, which may shortly appear, with fresh details on these points. Reverting to Mr. Ruggles's report, he remarks that the omission of direct representation of the Eastern world has become more worthy of remark, from the circumstance that information (and let us hope it is well authenticated) "reached Paris soon after the adjournment of the conference, that measures were in actual progress at Pekin for striking, for the use of the immense population of China, coins of the weight and value respectively of 20 francs, of 5 francs, and of 1 franc, bearing on their face the head of the Chinese Emperor, thereby assimilating the money of the Celestial Empire to that of Europe." The passages in which Mr. Ruggles refers to the interest taken in international coinage by other countries in America besides his own, are extremely interesting, and full of information. Space will only admit of the quotation of a few paragraphs. 1. As to Canada:—"The British colonies in Continental North America, recently consolidated by imperial authority in the 'dominion' of Canada, were represented in the conference only as a part of the British Empire by the delegates from the United Kingdom. That young but rising power, though remaining in form a colonial dependency,

* In the French version of this letter, the term purchasable is less ambiguously expressed, "d'un usage plus commode."

† Basing the calculation on the weights given in the "Annuaire du Bureau des Longitudes," I have estimated (in my privately-printed pamphlet on "Decimal Coinage in connection with the International Coinage of France and other Countries," London, March, 1866) that, so far as we are concerned, if the weight of pure gold in the sovereign were reduced from 7·318444 to 7·258061 grammes, *i.e.*, by about ·00825 of £1, say $8\frac{1}{4}$ mils, or thousandth parts, or a fraction under two-pence in the pound, an international coinage would be at once created.

* The Greeks, in their provisions for joining the Monetary Convention of December, 1865, have provided (by Article 20 of the Law of 10th April, 1867) that treasury and private debts shall be reckoned upon the basis of the new drachma, of which 89 parts, or leptas, equal one old drachma, so that 100 old drachmas = 80 new. And salaries, pensions, taxes, fines, fixed according to existing laws, are to be converted in the proportion of 100 old drachmas for 90 new, or a reduction of 10 per cent. The government of Greece has doubtless acted judiciously in this tarification, relating as it does to so large a difference of value between old and new currency.

now possesses, under the 91st section of the Act of the Imperial Parliament of the 29th March, 1867, the 'sovereign and exclusive legislative authority' to regulate its own currency and coin, already much assimilated to the decimal system of the United States. The deep interest in the success of the pending measure of unification manifested by M. Bouchette and other intelligent Canadian officials, who were at Paris to superintend the exhibition of the products of their country, affords grounds for believing that the general conclusions of the basis now proposed by the Conference will command the ready assent and co-operation of that active and interesting portion of the North American Continent." 2. As to the nations of Central and South America:—"This long array of states, of Spanish or Portuguese origin, and embracing in the aggregate a population of more than thirty millions of inhabitants, ought," Mr. Ruggles thinks, to be invited to the proposed plan of monetary unification, "in the hope that the whole of the Western hemisphere may be brought into line in this onward march of modern civilisation." He does not consider that there is any such diversity in the coinages of these nations and those of Europe or the United States, as to render the task of their unification seriously difficult. "The full and perfect measure of Hispano-American unification would be attained by increasing the weight of all the doubloons (of New Granada, Chili, Bolivia, Peru, Ecuador, &c.), to one hundred francs, which would render them at once equal to the double eagle, or twenty dollars, of the United States, or to four British sovereigns (when reduced as now proposed), and current without recoinage, brokerage, or other impediment, throughout the world. This enlarged doubloon, divided into halves and quarters, would supply for the people of Spanish America one convenient coin equivalent to fifty francs, or an eagle of the United States, or two British sovereigns; and another coin, equivalent to twenty-five francs, or a United States half eagle, or one British sovereign. Mexico has already a gold coin of twenty pesos, finely executed, and Peru has a gold piece of twenty soles, each of them being nearly equivalent to the double eagle. The mibreis of Brazil, now worth 10·85 dols., would probably be conformed to the plan proposed for Portugal, the parent country, by the Count d'Avila, her experienced and able delegate in the Conference, by the issue of a gold coin equivalent to twenty-five francs, with such subdivisions and multiples as convenience may require." We are inclined to hope that such paragraphs as these will prove refreshing to the spirits of those who may object to our country, or the Teutonic, as distinguished from the Latin races, adopting the principles of the Convention of December, 1865. Nothing can more clearly prove that the sovereign, or twenty-five-franc piece, has as great a part, or even a greater, to play in it, as the Napoleon or 20-franc piece. This was to a great extent illustrated by the diagram of international coinage included in my letter to you of the 27th December last (*vide Journal*, page 101). In an able article on German "Coinage Reform," which has just been contributed by Mr. A. Lammers, of Bremen, to the *Preussische Jahrbücher*, that author very truly states:—"Der sovereign ist in allen fünf Welttheilen bekannt, der Napoleon nur in Europa," and there is little doubt that many "notions," upon this text of the wider diffusion of the sovereign than the napoleon, will be worked out in the essays we may expect to see forthcoming next spring under the stimulus of the prize of 50 Fredericks d'or, or 283⅓ Prussian current thalers, which the Permanent Committee of the Commercial Assembly at Berlin have offered upon the question, "Welche Vorbereitungen und Uebergangsmassregeln sind anzurathen, und welche gesetzlichen Vorschriften sind in Bezug auf die Erfüllung bestehender Zahlungsverbindlichkeiken zu erlassen, wenn in einem Lande, wo auf Basis der Silberwährung solide Münzrustände bestehen, die Einführung der alleinigen Goldwährung beabsichtigt wird." I extract this announcement from the *Bremer Handelsblatt*, of 28th December ult., and it is signed by Messrs. Liebermann and Von Sybel, but I notice, in an article by M. Rigaud, in *La France* of 20th December, that the preparation of the programme and conditions of the prize have proceeded from the pen of M. Soetbeer, of Hamburg, a high authority on such subjects. M. Rigaud, in commenting on this prize offered for this best essay on the means for a country like Germany to adopt in the transition period from one standard (silver) to another (gold), aptly observes that in Germany the movement in favour of international coinage is more marked than in England, but the obstacles to it are greater. "Elle imprimait naguère sur ses thalers que la monnaie était la bénédiction du mineur national; et elle sait maintenant que l'or est le véritable métal de la monnaie internationale, suivant les votes de la conférence de Paris." Many passages in Mr. Ruggles's report give an effectual answer to those who see nothing in these monetary conferences but an attempt on the part of France to spread the system of franc-reckoning. Mr. Ruggles, on the contrary, as a zealous American citizen, sees in these conferences a chance, if not for the world-wide, at least for the continent-wide (North and South American at least) solidarity of the dollar. He gives, however, just and unqualified praise to what we may term the cosmopolitan spirit, as well as the eminent judgment and dignity with which the meetings of the conference were presided over, and "at which no proposition was made to abandon the use in any way of the word dollar, sovereign, thaler, florin, rouble, or any local denomination of money, or in any way to substitute the word franc for any or either of them." I propose in my next letter to enter more fully, from an English point of view, on those portions of Mr. Ruggles's report which refer particularly to the recommendations of the conference in respect of the sovereign. In the meanwhile, if the space at your command will admit of its insertion, I enclose, as an appendix to the present letter, a paper of my own, privately printed nearly two years ago, giving the details of a plan by which the British coinage, for denominations below the sovereign, might easily and effectually be decimalised as well as rendered at one and the same time international (*vide* appendix). If England were to resolve to entertain a proposal to join the convention of December, 1865, in the way Austria has done (and in writing this I have before me a copy of the preliminary convention between that country and France), it would not be at all necessary to proceed further than those parts of the convention which relate to gold coin, with the addition of the sovereign and half-sovereign. The silver token coins need not necessarily be included, although there would be no inconvenience, but the contrary, if these were also assimilated by the adoption, after a short period of notice, of a thoroughly practical method of decimalising the pound sterling into florins and mils, assimilating the new coins of account and of circulation, and preserving all the advantages of the present binary division, whilst the poor would have the further benefit of 1,000 new farthings or mils to the pound, instead of the present 960 farthings. Decimalisation is, obviously, the complement of internationalisation in coinage. A practical English statesman, who has held high office, is of opinion that the two are worth attempting together. They may, of course, be carried out separately, but I think that even if the international plan were first entertained as a question of the day, — pressed on our consideration by the nations most advanced in civilization—it is also expedient and prudent, as well as subservient to the educational improvement of this country, to prepare a decimal system for our adoption, if not consentaneously, at any rate a little later.—I am, &c., Frederick Hendriks.

Kensington, January 6, 1868.

Appendix.

On the Present Position of the Decimal System of Coinage in England, and the favourable opportunity which now

presents itself for carrying into effect a practical scheme for Decimalizing the Pound below the Florin, and at the same time making our Coinage really international.

The decimal coinage question has now been nearly half-a-century before Parliament and under public discussion. The interest at one time actively taken in it has now somewhat waned, but will not the less certainly revive. All who are interested in the international as well as domestic advantages to be gained by the projected decimalisation of our coins of circulation and of account, are naturally surprised that, after so much debate and criticism upon the alleged, but unproved, difficulties of carrying out a scheme which has only been partially been put into execution by the coinage of florins, and after the large collection of evidence from persons whom the Government invited to give their opinions for and against the suggested reform, Ministers should, one after the other, hesitate to take the required responsibility of carrying out a plan so highly approved by large majorities in Parliament; and that the repeated plea of want of full information should be urged for further adjournment of any positive action in it.

One of the Royal Commissioners on decimal coinage is reported as having stated to the House of Commons that he did not believe the working-classes would adopt the decimal system. This is probably an entire misapprehension, both of the intelligence generally, and arithmetical quickness specially, of our working-classes. If, however, the meaning be that the public should be entirely quiescent in the matter until the working-classes, as a body, initiate an agitation for the alteration of our coinage, they may indeed be destined to wait until the Greek Kalends! There is, notwithstanding, and fortunately too, for the movement, in its favour a large section of the working-classes of a higher grade—scientific, commercial, educational, professional—who would gladly adopt a complete system for decimalising the coinage, if it can be framed in such a way as not materially and violently to disturb the existing admitted conveniences, in some respects, of our present system.

With energy enough to distinguish us pre-eminently amongst nations as a people of action, our want of adaptability in matters of this kind is also somewhat notorious. A Minister of Finance in Belgium truly said that monetary questions remain for ever obscure to the million (*pour la foule*) in spite of the real social importance they possess. Foreign statesmen, on such grounds, consider it a duty to lead the way in any useful measure connected with standards and systems of currency and metallic circulation, rather than to leave the waiting public to take the responsibility of the initiative.

It is unfortunate that, by the death of the Prince Consort, we have in England sustained the loss of a personage who, by his high influence and sympathies for social improvement, would have materially aided this very question of decimal coinage in its gradual, but certain, approach to a complete system. In the last address made by the Prince to a large public assemblage—we refer to his inaugural address to the International Statistical Congress which met in London in July, 1860—he spoke with force and emphasis upon the difficulties and impediments arising from the different weights, measures, and currencies of Europe, and at the same time (most wisely, as it appeared to us) reccommended the retention of the pound as the largest (and therefore the most convenient) unit, and as offering with its tenth part, the florin, great advantages, particularly if further subdivided.

The recent monetary convention entered into by France, Italy, Belgium, Switzerland, Greece, and the Papal States, and to which Austria is about to add her adhesion, is very deserving of public attention in England, and opens a means which the first Ministry firmly established in Parliamentary majorities ought to avail itself of, to introduce a measure for decimalising the lower denominations of the coinage below the florin. And the opportunity would be an excellent one, for, at the same time (in the way already pointed out), rendering our coinage international in connection with the countries which have joined the convention, and the other countries which are certain, at no distant date, to give in their adhesion to it.

It is proposed, in this concluding section of our remarks, to give (1) a brief memorandum as to the various occasions when the question has been considered by Parliament and Ministers, &c., with the result; and then (2) to offer a sketch of a simple plan to avoid almost every difficulty which has been ever urged—with any reasonable foundation—against the entire and easy decimalization of the pound sterling below the florin.

(1). BRIEF MEMORANDUM OF THE PARLIAMENTARY AND PUBLIC HISTORY OF THE PROGRESS OF DECIMALIZATION OF THE POUND STERLING.*

1824.—Sir John Wrottesley moves, in the House of Commons, for enquiry as to the possibility of a decimal subdivision of the pound sterling into double shillings (*i.e.*, what were subsequently called florins) and into farthings of 1,000 (*i.e.*, into what are now proposed to be called mils) instead of 960 to the pound.

Result.—Motion opposed by the Government on the plea of inconvenience in carrying it out. Advantages of the plan nevertheless admitted. Motion withdrawn, on the Government giving a pledge (carried out in 1826) that the currency of Ireland should be assimilated with that of England.

1841.—The Astronomer Royal (Airy) and seven other eminent scientific men appointed Commissioners for a restoration of the standards of weights and measures destroyed at the fire which burnt down the Houses of Parliament. They report unreservedly in favour of a decimal subdivision of the pound sterling, and upon the facility of interposing between the pound and the shilling a new coin equivalent to two shillings, to be called by a distinctive name, and of considering the farthing, now passing as the $\frac{1}{960}$th part of a pound, as the $\frac{1}{1000}$th part of that unit, of establishing a coin of value equal to $\frac{1}{100}$th part of the pound, and of circulating besides these principal members of a decimal coinage other coins of values bearing a simple relation to them, including coins of the same value as the present shilling and sixpence.

Result.—Attention of the public much directed to the subject.

1843.—A second commission, consisting of the same commissioners as the commission of 1841, with a few additional scientific men appointed for the same purpose.

Result.—This commission proposed that the recommendations of the committee of 1841 should be carried out. The Government took no steps, and the matter remained in abeyance until 1847, when Sir John Bowring brought it again before the House of Commons.

1847.—Sir John Bowring, M.P., moves for an address to the Crown in favour of the coinage of silver pieces of one-tenth and one-hundredth of the pound.

Result.—The Government considered that the first step in the decimal system should be to establish a coin equal to one-tenth of a pound. This was the origin of the modern English florin, stamped "One-tenth of a Pound," the mintage of which was immediately sanctioned.

1853. March.—The commissioners appointed in 1843 wrote to Mr. Gladstone, Chancellor of the Exchequer, strongly urging the Government to issue copper coins related to the millennial subdivision of the pound sterling, and of the value of $\frac{1}{1000}$th, $\frac{2}{1000}$th, and $\frac{4}{1000}$th of a pound (differing little from the farthing, the half-penny, and the penny), might be extensively used by the public without present inconvenience, while the inscription of their values, as estimated in the decimal scale, would afford the means of shortly introducing that scale throughout the entire system.

Result.—Mr. Gladstone (in April, 1853) declines, on the part of the Government, to make any change with respect to the copper coinage, and declares that the altering the value of those particular coins, which are in point of fact the measures of value and the basis of the idea of value of the mass of the people, was a very serious matter indeed, and one which ought not to be undertaken on any mere abstract opinions and considerations without fully ascertaining that the ground under foot was secure, but that the Government would agree to the appointment of a select committee to inquire into the subject.

1853. April.—A select committee appointed to inquire into the practicability and advantages or otherwise of a decimal system of coinage.

Result.—The twenty-five witnesses examined were unanimous in recommending a decimal coinage, and, in fact, with one exception, supported the pound and mil scheme.

August, 1853.—Committee report to House of Commons. The pound sterling recommended as the unit of the new system of coinage, "Considering that the pound is the present standard, and therefore associated with all our ideas of money value, and that it is the basis on which all our exchange operations with the whole world rest, any alteration of it would lead to infinite complication and embarrassment in our commercial dealings; in addition to which its retention would afford the means of introducing the decimal system with the minimum of change." The Committee "having well weighed the comparative merits of the existing system of coinage and the decimal system, and the obstacles which must necessarily be met with in passing from one to the other, desire to repeat their decided opinion of the superior advantages of the decimal system, and to record their conviction that the obstacles referred to are not of a nature to create any doubt of the expediency of intro-

Result.—In consequence of the report of the Parliamentary Committee being unhesitatingly in favour of an almost immediate carrying out of the details of the decimal system to the coinage below the florin, the matter immediately attracted very great public attention, and many were the discussions which ensued; particularly as rival plans for discontinuing the pound as the future unit were zealously put forward by their advocates. The farthing, half-penny, penny, tenpence, twenty-pence, four shillings, eight shillings, crown, ten shillings, guinea, were all suggested as better bases than the pound sterling in a decimal system. The penny, half-penny, farthing, and ten-penny schemes, were the best supported of these opposition methods, but all four of these fail by disturbing the pound sterling to an impracticable extent, as they make the pound equal to £1 0s. 10d.

* In drawing up this *precis* we have availed ourselves to some extent, as far as dates are concerned, of the particulars given in the Parliamentary Report of the Decimal Commission of 1857. Our limits, of course, compel a very abridged statement.

ducing that system as soon as the requisite preparations shall have been made for the purpose by means of cautious but decisive action on the part of the Government."

June, 1854. — An association, called the Decimal Association, was formed, having for its chief object the establishment of the decimal system in coins of account and circulation based upon the pound and mil scheme. The chairman of this association, the late Sir Wm. Brown, M.P., had previously, in a letter dated Richmond-hill, near Liverpool, 13th December, 1853, addressed to Mr. Francis Shand, President of the Liverpool Chamber of Commerce, given an excellent epitome of the leading results of the scientific and practical evidence printed in the report of the Parliamentary Committee. We regret that our space is insufficient to admit of the letter being reprinted in full. Two or three paragraphs as to the ability of the poorer classes to comprehend the advantages of the system, are however so apposite that we are tempted to extract them. "The Duke of Leinster gave us information, that when the Irish currency was changed from 13d. Irish to 12d. English, it was soon understood by the poor, and no difficulty arose with them." "I am quite sure that the intelligence and aptitude of the labouring classes, readily to comprehend and understand any change in the value of our coin and its advantages, are not sufficiently appreciated." "Dr. Bowring* says that his Chinese servant, and a Chinese boy in his service, by the use of decimals, were rapid and accurate calculators. He never knew them to make a mistake; they were an over-match for him in the use of figures, and he never met a Chinaman who had not these advantages."

A most influential meeting was shortly afterwards held at Liverpool. The opinion of the leading merchants of that city was expressed in the resolution "that as the decimal system of money and accounts affords great facility, and is more clear, simple, and correct than that at present in use in this country, it is of great importance to the interests of trade and commerce that it should be adopted."

The Council of the Decimal Association, whose head quarters were in London, included Lord Stanley, Professor de Morgan, Mr. Crawford, M.P., the late Dean of Ely, and many other distinguished men. The Council were untiring in their exertions in distributing many thousands of pamphlets on the decimal question, and in stimulating the scientific societies of London to receive papers and encourage discussion on the advantages of the completion of the decimal coinage from the florin downward.

Result.—The labours of the Decimal Association were very successful in securing favour from the mercantile and scientific communities for the immediate introduction of the pound and mil scheme. But, although they waited, with very influential deputations, on the Chancellor of the Exchequer (Mr. Gladstone), and on the Premier (Lord Palmerston), they obtained but scanty sympathy from them, and but little more from the Board of Trade. The following extracts from Mr. Gladstone's remarks in reply to one of these deputations will show the disposition of ministers to adjourn the matter indefinitely. The right hon. gentleman remarked—"It is true that those people who have studied and paid attention to the question of a decimal coinage are unanimous in recommending it on account of the many advantages it possesses over all other systems. Now the people who have so studied the question are gentlemen who have been more or less actively engaged in commercial pursuits; but the public at large do not seem to be acquainted with it. It is, as you are aware, the enormous masses of the community who have immense business to transact that must guide the Government in the matter. They are attached to the present arrangement of the currency, as it admits of the different systems of divisors, and is the basis of all their notions of value."

"It has also many facilities of division which you must lose if you abandon it. It is impossible for you not to be struck with this—an advantage which takes its origin from the number of factors which a combination of the decimal with the duodecimals give rife to. With the Government it is impossible not to be so struck.† Again, it is so wound up with the habits of the people that it would not be advisable to have recourse to any change in it, unless we had clear evidence that it was one the people themselves required and understood. . . . I frankly own I am by no means convinced that you can get rid of the penny. . . I would only ask you, are the people prepared for the change? All I can say is, that I cannot take any decisive step until we are satisfied that the subject has been thoroughly sifted, and is well understood by the public."

* Now Sir John Bowring—this gentleman has most consistently and ably advocated the decimal system in his work on the subject, as well as in Parliament, and at many meetings of scientific bodies. His unwearied exertions deserve the gratitude of the public. The same may be said as to Professor de Morgan and the late Sir W. Brown, M.P.

† There is nothing very novel in this to strike any one. All the nations, except Great Britain, which in ancient days had vigesimal and duodecimal notation in their currency of account have since given it up. Cuthbert Tonstall, then Bishop elect of London, printed, in 1522, his learned and elegant treatise on Arithmetic, in which he remarked upon the widely-spread custom of keeping accounts in twenties and twelves as subdivisions of the nominal pound and shilling. We quote from page 272 of the Paris edition of 1529 of the Bishop's "Ars supputandi. "Nunc ætate nostra apud singulas penè nationes aurei pro regum aut principium arbitrio varium habent precium; sic libræ, sic solidi, ut nunc sunt vocabula; magnam pro regionibus diversitatem habent. Cæterum illud mirum vedetur; quomodo in tanta librarum et solidorum æstimationis differentia, pro suo cujusque regionis more, multæ tamen nationis consentiunt; ut vulgari lingua solidum vocent, quod denariolos duodecim vulgares complectitur, libram quod solidos viginti."

June, 1855.—The late Sir William Brown moved three resolutions in the House of Commons:—

1. "That in the opinion of this House, the initiation of the decimal system by the issue of the florin has been eminently successful and satisfactory.

2. "That a further extension of the system will be of public advantage.

3. "That an humble address be presented to Her Majesty, praying that she will be graciously pleased to complete the decimal scale, with the pound and florin, as suggested by two commissions and a committee of the House of Commons, by authorising the issue of silver coins to represent the value of the one-hundredth part of a pound, and copper coins to represent the one-thousandth part of a pound, to be called cents and mils respectively, or to bear such other names as to Her Majesty may seem advisable."

Result.—The first of the resolutions proposed by Mr. W. Brown, M.P., was carried in the House of Commons by a majority of 135 to 36. The second resolution was carried without a division. The third resolution was withdrawn. The Government still maintained the policy of more delay and more inquiry, and (as stated by the Decimal Coinage Commissioners in commenting on this debate) urged that it was inexpedient to make a change which would so deeply affect the interests of the poorer classes* without much more investigation than had yet been given to it, and gave an assurance that the subject should receive the most careful consideration possible.†

1856.—The Decimal Association immediately set themselves to work to improve the opportunity afforded by the obviously great success of the resolutions moved in the House of Commons by their Chairman. Further interviews took place with the Premier and the Chancellor of the Exchequer.

The City of London presented to the House of Commons a most influentially signed petition from its chief citizens and their employés, praying that the needful measures should be taken to prepare the way for the introduction of a decimal system of coinage and accounts. In this petition it was also averred that any other mode of decimalizing our currency than from the pound downward is altogether impracticable—that the pound constitutes an English national fixed idea of value and position, and is associated with every existing contract, and every comparison of past revenue, expenditure and price, and must be retained.

Petitions were also prepared, under the auspices of the Decimal Association, for presentation by

Result.—A Royal Commission, consisting of the late Lord Monteagle, Lord Overstone, and Mr. J. G. Hubbard, M.P., was appointed on the 1st November, 1856, for considering how far it may be practicable and advisable to introduce the principle of decimal division into the coinage of the United Kingdom.‡

These Commissioners thereupon applied themselves to the task of collecting fresh evidence from witnesses, and to the preparation of a series of questions addressed to Her Majesty's Ministers or Consular officers in foreign countries where a decimal coinage had been introduced, with the view of collecting information on the previous state of the coinage, the reasons which led to the introduction of the decimal coinage, the difficulties which had been found to attend the change, the extent to which the decimal coinage had been brought into practical use, and the result how far satisfactory or otherwise.

A preliminary report was made in April, 1857, by the three Commissioners, and a final report two years later, in April, 1859, by two

* It is truly amusing to note the cuckoo-cry (so oft repeated in this decimal question) of the difficulties which the poorer (!) classes will have to comprehend that the pound sterling will in future divide decimally into 1,000 mils or new farthings instead of the present 960 farthings, and that the 4-mil or new penny-piece will in future be as useful to them as the deeply-to-be-regretted, never-to-be-forgotten, present or old penny of 4 farthings. The fact is that Ministers have hitherto been always anxious to shift the burden and responsibility of carrying out the change on the shoulders of some future ministry. But Mr. Gladstone rather upset his argument (in the remarks by him we have above quoted) when he separated the unanimity of the commercial and studious people, who approved the decimal plan, from the "enormous masses of the community who have immense business to transact, and who are to be the Government guides in the matter." The poorer classes are of course the masses, but where is their immense business to suffer from the change?

† This kind of assurance has been the courteous but really unsympathetic reply of Ministers to all the deputations on the subject at which the writer has been present. Anything of the kind is sure to be looked upon in Ministerial halls as a crotchet, until it becomes a success.

‡ This reference to consider the practicability and advisability of introducing the principle of decimal division into the coinage, is, to our mind, quite inexplicable. If literally construed, it shows entire forgetfulness of the introduction of the principle, avowedly and distinctly, nine years before, when, with the approbation of the Crown and Parliament, the florin, or tenth of the pound, was authorised. The seven million florin pieces which had been coined from 1849 to 1856, were so many material protests to the inaccuracy of the terms of this commission.

schoolmasters and teachers, and by operatives, setting forth the educational advantages of the proposed change.	of the Commissioners, Lord Overstone and Mr. Hubbard, the Chairman of the Commission (the late Lord Monteagle) having resigned in the intervening period.

The final Report of the Royal Commissioners, dated 5th April, 1859, includes twelve resolutions, nearly all of a most discouraging character, and adapted to aid any present or future minister who may desire to postpone the further decimalization of the pound sterling, during at least the lifetime of the present generation.

During the nearly nine years which have passed since April, 1859, when the Report of the Commissioners was made, the "rest and be thankful tone" of its resolutions appears to have been sufficiently powerful to deaden any further active agitation for a decimalization of the pound from the florin downward. Of the twelve resolutions of the two Royal Commissioners there are only two which are really well-founded. The remaining ten are mistaken conclusions, drawn from imperfect premises. The two in which we concur are, No. 5, affirming that the pound and mil scheme is the only form in which there would be reasonable probability of sufficient support to introduce the decimal principle further into our coinage, and No. 7, which points out the superiority of the present system of coinage for the reckonings of the shop and market, in its more convenient divisibility of the factors 4, 12, and 20, as compared with 10, and the facility for a successive division by 2, that is, for repeated halving.

We have always been under the impression that the Committee which reported to the House of Commons, in August, 1853, and recommended the withdrawal of the half-crown, the three-penny and four-penny pieces, and the introduction of copper coins of one, two, and five mils, and of silver coins of ten and twenty mils, might have made a better choice as regards some of the new coins to be introduced.* Their proposition in favour of the retention of the shilling as 50 mils, and of the sixpence as 25 mils exactly, has been popularized into an indispensable part of the decimal scheme. This policy of conciliation by promising to retain all our present silver coins so far down as the sixpence inclusive, has indeed been a policy of weakness, as it has opened up a way of attack by the enemies of the whole scheme.

The cardinal principle that should be strictly adhered to in all coins of circulation, of a low enough denomination to be mixed up with the daily, nay momently, life of the whole community, as, for example, is the case with the shilling and its subdivisions, consists in such coins being arranged according to a scale that shall admit of the following conditions:—(1) Of change being given wholly in either of two denominations of the lower sort, so as not to require absolutely any mixing up of various sorts of lesser coins; and (2) of change being given by binary steps, *i.e.*, susceptible of successive division by 2, which is an advantage pre-eminently attaching to our existing system of coinage.

Such a principle would be entirely lost in the practical working of the present shilling and sixpence, in connection with the proposed coinage of the lower denominations of 10 and 20 mils in silver, and 1, 2, and 5 mils in copper. Change for say a shilling, or 50 mils, is required. If given in 2-mil pieces it requires 25 of them, a most inconveniently large number to count, and leading to loss of time in the innumerable small transactions of daily life. In fact, giving change for a shilling would always require, as at present, the giver of change to offer one coin of the next denomination (the sixpence) in silver, and the remainder in copper pieces of the smallest possible number. In perfect coinage this change consists in mixed average number (9) of penny and halfpenny pieces. Thus it is obvious that change for sixpence in copper† is involved in every normal change of shillings as well as sixpences. Here, with 1, 2, or 5-mil pieces, there will be a complete break down. Change in 1-mil pieces, or new farthings, is out of the question; in 2-mil pieces, or new halfpence, it would be impossible, as $2 \times 12 = 24$, or 1 mil wanting. In 5-mil pieces it is easy, as $5 \times 5 = 25$.

But whilst this one way of giving change is the only way which would be practicable, it is fraught with intolerable inconvenience. In the first place, the change can neither be halved nor quartered at all, although the same value; the sixpence now can be, by recourse to only one denomination of lesser coin for the halving, or one or two denominations for the quartering. In the second place, what is, if possible, a more embarrassing result, would arise. The 5-mil piece is the most inconvenient and impracticable copper coin that could possibly have been devised for change, as it would be impossible to halve or quarter it, or to split it up at all into any fractions except fifths, made up either by 5 small 1-mil pieces, or else by two 2-mil pieces and one 1-mil piece.

It has sometimes been suggested that 5-mil pieces of new coinage, and 4, 2, and 1-mil pieces (to which last three, the pence, halfpence, and farthings now current might be declared equal), would answer well as simultaneously circulating coins. This would indeed be confusion worse confounded, as it would much augment the complications and mistakes in giving change, besides introducing two coins nearly alike in value. A metallic currency should, in its various denominations, be always readily distinguishable, in the night as well as in the daytime, by the sense of touch. This alone would be a fatal objection to 4 and 5-mil pieces in the same circulation, and as to the necessity for the two on the score of convenience, we hold that also to be a mistake. For example, if at present a "penny farthing" ($1\frac{1}{4}$d.) is made up of 2 coins, what hardship would there be in the payment of 5 mils, also requiring two coins, a 4 and a 1-mil piece.

We may now ask, is no scheme possible, which, whilst it shall preserve intact the vast superiority of the pound and mil over every other plan that has yet been recommended, will, at the same time, secure the chief benefits of the binary division and subdivision of coins to which this country is accustomed? Our answer to this is, that we fully believe such a scheme possible, and that its prompt adoption is both expedient and politic.

In our explanations we shall have to travel a little over the same ground across which our remarks have led us, namely, to enlarge, by way of more adequate illustration, on what, since the publication of the report of the two Royal Commissioners, has gradually to a great extent indoctrinated itself into the public mind, as to the great advantage in the small transactions of every-day life, of having coins divisible like the shilling, sixpence, and penny, by 4, 3, and 2 successive halvings respectively, instead of having coin like the franc, half-franc, and two sous, divisible only by two halvings and one halving respectively.

Nothing can be truer than that, in the minute, ever-recurring wants of life, it is most important that we should have as many factors and divisors as possible of the small coins of circulation. On this groundwork the pound and mil scheme sets out with an immediate advantge to the poorer classes, in securing to them a one-thousandth instead of a one nine hundred and sixtieth division of the pound, a fiftieth instead of a forty-eighth division of the florin, and so on with the lower denominations of coin. So far well, but directly we come to dealings with 50 mils and 25 mils (the new names for the worth of the present shilling and sixpence), we have reason for surprise at their retention as coins of circulation, having been hitherto recommended by the advocates, in and out of Parliament, of the pound and mil scheme. It has already been explained, that to give change for a shilling or sixpence in mils, would occasion intolerable difficulties and loss of time. It is equally plain that halving and quartering of 50 and 25 mils is also impossible, so far as coins of circulation are concerned.

Why then retain the shilling or the sixpence as coins of circulation, when, as is well known, they would not be coins of account in the complete decimal system, the steps in which are exclusively reserved to the 1-1000th, 1-100th, and 1-10th of a pound sterling—in other words, to the mil, cent, and florin?

Our answer to such a question would most unhesitatingly be, that the shilling and the sixpence should be abolished as coins of circulation in the decimal system, because something better could be substituted for them, and that the only properly constituted coins of circulation that should in future be struck at the Mint are:—

		GOLD.		
Sovereign..................	equal	1,000 mils	...	(to be so marked)
Half-sovereign	,,	500 mils, or	$\frac{1}{2}$£	,,
		SILVER.		
Florin	equal	100 mils, or	$\frac{1}{10}$£	,,
40-mil piece	,,	40 ,,	$\frac{1}{25}$£	,,
20-mil piece	,,	20 ,,	$\frac{1}{50}$£	,,
10-mil piece (cent) ...	,,	10 ,,	$\frac{1}{100}$£	,,
		COPPER (Bronze).		
4-mil piece	equal	4 mils, or	$\frac{1}{250}$£	,,
2-mil piece	,,	2 ,,	$\frac{1}{500}$£	,,
1-mil piece	,,	1 ,,	$\frac{1}{1000}$£	,,

Of course it would take a few years for the new coinage to be struck at the Mint, and in the meanwhile there could be no objection, as a temporary measure, to the shilling and sixpence circulating.

The 40-mil silver piece would be exactly equal to 4-5ths of the present shilling, and, as it could be evenly divided, without fractions, by the factors 2, 4, 5, 8, and 10, it would be more convenient than the present shilling, which can be evenly divided without fractions by one factor less, viz.: 2, 3, 4, and 6, or, with fractions, by 8.

The 20-mil silver piece would be exactly equal to 4-5ths of the present sixpence, and, as it is evenly divisible, without fractions, by 2, 4, 5, and 10, it would be more convenient than the present sixpence, divisible evenly by 2 and 3 only, or, with fractions, by 4 and 8.

The 10-mil silver piece would be equal to $2\frac{1}{4}$d. and 3-5ths of a farthing, of present coinage, or a fraction under $2\frac{1}{2}$d. It would also be equal to exactly 1-10th of the present florin or two shilling piece, or 1-5th of the present shilling. The coinage of this piece, to be called a cent, as recommended by the Parliamentary Committee, &c., is of the utmost importance in completing the decimal system, as it would be both a coin of circulation and a coin of account. It is not, however, a coin capable of being converted conveniently into smaller change, except as five 2-mil pieces, and its division into two parts requires the use of the single mil coin with the 4-mil, just as the threepenny-piece, our smallest silver coin at present, requires the halfpenny as well as the penny. But this is not of much moment, as the smallest coin of circulation in silver is mostly used in dividing the larger silver coins, and so small a coin as ten mils is, like the threepenny-piece, vastly less used than the copper pieces by the poor.

We suggest the above described series of silver coins of circulation, as one which presents to the fullest possible extent, all the advantages of divisibility that distinguish the present system, with other peculiar conveniences. They come nearer to 10 pence, 5 pence, and $2\frac{1}{2}$d. of present coinage, which some will deem a more

* No crowns, half-crowns, or fourpenny pieces have been coined recently, the intention being to gradually let them disappear from the circulation. The crown is manifestly far too big for modern purses. The half-crown, however, has its friends and special uses, and, if the multiplication of the number of coins were not an objection, might very well have been continued with the florin in the new coinage. As the eighth of a pound it falls in conveniently not only with the duodecimal, but with the decimal scale also.

† We retain the conventional term copper for our new bronze coinage. This truism to our English readers is only a proper explanation to our foreign readers.

consistent effect in a decimal coinage, than is obtained by coins equal to 12, 6, and 3 pence, and there will be no difficulty in changing a perfect shilling or two sixpences into the new denominations of coin as they get into circulation from the Mint. Thus, several combinations of smaller silver coin will make a shilling; for example, five of the 10-mil pieces, or two of the 20-mil pieces, with one of the 10-mil pieces; or one of the 40-mil pieces and one of the 10-mil pieces. The change of a single sixpence is, however, more complicated, as copper equal to five mils must be added to the two 10-mil or the 20-mil pieces. But, it must be recollected, that the Gordian knot could here be most readily cut by the sixpenny pieces being the first called-in coin by the Mint, as the current sixpences are worn so thin as to be discreditable to our present silver currency, the greater part of which will soon require to be melted and recoined.

Having thus completed our explanations as to the silver money, there remains little to be said as to the decimal copper (bronze) coinage. The 4, 2, and 1-mil pieces, *i.e.*, the 1-250th, 1-500th, and 1-1000th of a pound, will compare most beneficially, as regards the poor, with one present penny, halfpenny, and farthing, the 1-240th, 1-480th and 1-960th of a pound. Their equal divisibility by two and by four, and the fact that the lesser value (by 4 per cent.) of the new proposed, as compared with the present copper coins, will often be a saving and a gain to the thrifty and the needy, ought to commend the scheme to the notice of philanthropists and statesman. As to difficulties about tolls and penny postages, and railway mileage, they can all be got over by fair adjustment and concessions. We will not libel the intelligence of the poor by asserting that they will have any difficulty in comprehending how to count in mils, or new farthings, instead of in shillings and pence. The impediments to the scheme being popular would entirely vanish if the friends of decimalization of our coinage, and, through that, of our weights and measures, could be induced to unite in supporting the scheme, of which an outline has now been imperfectly sketched. We entreat them to abandon at the outset the notion of coining a 5-mil piece. It has no more and no less consistency with the decimal system than the 4-mil piece, and we contend we have fully proved the surpassing advantages of the 4-mil piece, and its subdivisions of 2 mils and 1 mil.

We would earnestly hope that the decimalization of our coinage in Great Britain and all her colonies may, in the cause of education and of progress generally, be promptly carried out as a national measure, separately considered; it can at the same time be made an international measure, in concert with France and other countries, by joining the Convention of December, 1865, in the same way as Austria proposes doing. By this means the sovereign would become exactly equal to 25 francs, the half-sovereign to 12·50 francs, the florin to $3\frac{1}{8}$ francs, the 40 mil-piece to 1 franc, the 20-mil piece to 50 centimes or $\frac{1}{2}$ franc, the 10-mil piece to 25 centimes or $\frac{1}{4}$ franc, the 4-mil piece to 10 centimes or 2 sous, and the 2-mil piece to 5 centimes or 1 sou.

F. H.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, $8\frac{1}{2}$.
Social Science Association, 8. Mr. John Westlake, "On Naturalisation and Expatriation, or a change of Nationality."

Tues ...Medical and Chirurgical, $8\frac{1}{2}$.
Civil Engineers, 8. Inaugural Address of Mr. Chas. Hutton Gregory, president; and, time permitting, renewed Discussion upon the papers on "The Victoria Bridge," and on "New Railway at Battersea, &c."
Photographic, 8.
Anthropological, 4. Annual Meeting.

Wed ...Society of Arts, 8. Mr. Wm. Riddle, "On the Details of a Plan for the Distribution of Food at the Homes of the People."
Meteorological, 7.
London Inst., $6\frac{1}{2}$.

Thur ...Royal, $8\frac{1}{2}$.
Antiquaries, $8\frac{1}{2}$.
Linnæan, 8. 1. Dr. Hooker, "On Abnormal Cocoa-nuts." 2. Dr. Dickie, "On Mosses from the Shores of Davis' Straits." 3. Mr. Edward, "On *Conchia Edwardsii.*"
Zoological, 4.
Chemical, 8. Dr. Frankland, "On Water Analysis."
Numismatic, 7.
R. Society Club, 6.

Fri.......Royal Inst., 8. Professor Tyndall, "On Faraday as a Discoverer."
R. United Service Inst., 3. Captain Edward A. Sloane, "Utilisation of the Soldiers' unemployed Time, with a proposed scheme independent of Government Aid."

Patents.

From Commissioners of Patents' Journal, January 3.

Grants of Provisional Protection.

Belts, couplings for driving—3650—W. H. Chase, jun.
Blind cords, &c., instruments for joining—3215—U. P. Würflein.
Bread, &c., aërated—3573—W. Huskisson, jun.
Cannon, &c.—3642—C. W. Lancaster.
Capstans—3595—J. Patterson.
Cartridge cases—3636—E. and A. Ludlow.
Cloth, brattice—3561—J. H. Kidd.
Drains, machines for making—3583—T. V. Mackintosh.
Engines, rotary—3648—S. Salter.
Engines, &c., elastic packings for the pistons of—3495—E. Keirby.
Frames, &c., doubling—3634—W. Hurst and J. H. Wilson.
Furnaces—3565—O. Hollingworth.
Furnaces—3599—J. Hall.
Grain, cleaning, &c.—3632—J. Hadley.
Gunpowder magazines, &c.—2999—E. M. Palliser.
Hosiery machines, &c.—3567—E. and A. Tatham.
Lace—2706—J. Kirk and J. Kirk, jun.
Lamps, safety—3640—J. Rowe.
Looms—3547—W. McIlwraith and J. Bonner.
Looms—3549—A. Bullough.
Looms—3644—R. Crawshaw.
Malt for brewing, treating the solution of—3359—E. Belknap.
Metal breaker, self-acting—3555—F. Berry.
Meters, liquid—3587—E. M. Du Boys.
Moulding apparatus—3585—W. Simons and A. Carmichael.
Musical boxes—3603—O. A. Hébert.
Pipes, tinned leaden—3591—W. E. Newton.
Porcelain and pottery—3577—W. H. Kerr.
Portmanteaus, &c.—3638—I. Pick.
Potash and soda, bicarbonate of—3581—W. Huskisson, jun.
Ships' propellers—3589—F. L. and C. L. Hancock.
Shuttles and bobbins—3557—J. Sharples and J. Schofield.
Soda and potassa—3559—J. Hargreaves.
Stone, dressing—3571—J., J., and J. Booth.
Studs, solitaires, &c.—3569—L. A. W. Lund.
Surfaces, reducing the friction of revolving, &c.—3628—E. Lord.
Surgical appendages—3551—T. Pebardy.
Tapes, &c., retaining the outer ends of—3545—G. Marson.
Tobacco pipes—3646—H. F. Bengough.
Tubes, &c., for raising water, sinking—3572—J. E. A. Gwynne.
Umbrellas—3575—J. M. Shackleton.
Water from constant supply pipes, controlling the draught of—3563—E. H. Bentall.
Wearing apparel—3471—S. Goldstein.

Invention with Complete Specification Filed.

Hemp, &c., drawing and spinning—3712—J. Novikow.

Patents Sealed.

1956. P. F. Tranchat.	2062. W. Drury and C. Westrup.
1968. E. O. Greening and J. Atkinson.	2091. T. W. Riddell-Webster.
2015. W. S. Andrews.	2133. H. Lea.
2016. W. S. Andrews.	2273. F. Ryland.
	2747. B. Dobson & R. Halliwell.

From Commissioners of Patents' Journal, January 7.

Patents Sealed.

1993. J. Johnson, E. Shinn, and G. Ragg.	2034. J. H. Johnson.
2000. M. P. W. Boulton.	2035. J. H Johnson.
2001. N. Clayton and J. Shuttleworth.	2046. J. Hargreaves.
2018. J. E. Whiting.	2049. G. Sinclair.
2019. J. S. Hood.	2051. J. H. Johnson.
2020. D. and J. Collinge.	2054. D. M. Henderson.
2021. H. B. Fox and J. T. Hall.	2057. J. Laing.
2022. F. Holmes.	2058. E. B. Bigelow.
2023. J. N. Paxman and H. M. Davey.	2061. J. Walker.
2033. J. S. Henderson and J. Macintosh.	2066. H. Duke.
	2071. J. L. Norton.
	2184. T. Jones.
	3227. J. Coombe.

Patents on which the Stamp Duty of £50 has been paid.

3244. E. Pierce.	27. N. Thompson.
19. E. Kierby.	38. G. A. Buchholtz.
65. J. Welsh.	52. E. Tyer.
202. B. King.	34. J. Skelton.
24. D. Vericchio.	233. J. E. Massey.
26. G. Kent.	

Patents on which the Stamp Duty of £100 has been Paid.

53. W. Taylor.	122. H. Sagar.

Registered Designs.

4912—December 12—Ferrule for umbrellas and walking-sticks—Henry Richd. Cottam, Old-street, St. Pancras.
4913—December 13—A coat, to be called the "travellers' friend"—Lewis and Co., Rangleigh-street, Liverpool.
4914—December 14—Sulphur fumigator—W. Dall, M.D., 40, Queen-street, Glasgow.
4915—December 19—Belgravia wristband—Foster, Porter, and Co., 47, Wood-street, Cheapside.
4916—December 20—An improved fastener for the doors of railway carriage and other lamps—J. C. Warwick, 96, Suffolk-street, Birmingham.
4917—December 30—Blind pulley and cord holder—Thos. Pemberton and Sons, Birmingham.
4918—December 30—Cupboard turn—Thos. Pemberton and Sons, Birmingham.

Journal of the Society of Arts.

FRIDAY, JANUARY 17, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'clock:—

January 22.—"On the Reports of the Artisans selected to visit the Paris Universal Exhibition of 1867." By William Hawes, Esq., Chairman of the Council.

January 29.—"On the Climate and Industrial Prospects of the Colony of Natal." By Dr. Mann, Superintendent of Education, and Special Commissioner for the Colony.

February 5.—"On Trade Museums." By. J. Forbes Watson, Esq., M.D., Reporter on the Products of India.

February 12.—"On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it." By Wentworth Lascelles Scott, Esq., F.C.S.

Cantor Lectures.

The second course for the present session will be "On Food," and will be delivered by Dr. Letheby, M.A., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health, and Food Analyst for the City of London, as follows:—

Monday, January 20th.—Lecture I.

Varieties of Food—their Chemical Composition, and Nutritive Value.

Monday, January 27th.—Lecture II.

Comparative Digestibility of Foods. Functions of different Foods. Construction of Dietaries.

Monday, February 3rd.—Lecture III.

Preservation, Preparation, and Culinary Treatment of Foods.

Monday, February 10.—Lecture IV.

Adulterations of Food. Conclusion.

The lectures will commence each evening at 8 o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets were forwarded with the last number of the *Journal.*

Conference on Technical Education.

This Conference will be held in the Society's Great Room, on Thursday and Friday next, January 23rd and 24th. The chair will be taken each day at twelve o'clock, by Wm. Hawes, Esq., F.G.S., Chairman of the Council. The Council propose the following programme of the topics for discussion at the meeting. As they have reason to expect that the Conference will be numerously attended, and it is only to sit for two days, it is thought desirable that it should deal rather with general principles than with details, and that the latter should be taken up more deliberately by the committee which it is proposed should be established:—

1.—The necessity for improved national education for the working classes generally.

(*a*.)—Improved primary education, and the measures necessary for securing the same.

(*b*.)—Additional facilities in primary schools for affording the elder children the means of learning the elements of scientific knowledge.

2.—The necessity for the establishment of schools for technical and industrial education in relation to science and art, in which pupils, after leaving the primary schools, may obtain instruction suited to the special industries with which they may be connected, as workmen, foremen, or managers.

3.—The best measures for securing the foregoing object.

4.—How far technical education can be promoted by the aid of existing educational endowments.

5.—To request the Council to appoint a standing committee of members of the Society of Arts and others, to take whatever steps may be required to advance the objects approved by the conference, and to send deputations to the Government, to support such applications as may seem desirable.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport Financial Officer.

Proceedings of the Society.

Sixth Ordinary Meeting.

Wednesday, January 15th, 1868; Seymour Teulon, Esq., Treasurer of the Society, in the chair.

The following candidates were proposed for election as members of the Society:—

Bell, Arthur George, 4, York-st., Covent-garden, W.C.
Boyle, Edwin, 10, John-street, Adelphi, W.C.
Dalziel, Alexander, Cardiff.
Davies, Valentine, Furnace-house, Carmarthen.
De Lavigerie, Alfred D., 11, Sussex-street, Warwick-square, S.W.
Hollond, Edward, M.P., Dumbleton, Evesham, and Union Club, S.W.
Hooper, Frank, 24, Russell-street, Covent-garden, W.C.
Klein, Julius, Ph.D., 176, New North-road, and 3, Wilton-square, N.
Limbert, Edward Harvey, 5, Hercules-terrace, Upper Holloway, N.

Marr, James, 19, Bessborough-gardens, S.
Mort, William, 155, Fenchurch-street, E.C.
Pilling, Jonas, Manchester and Liverpool District Bank, Salford.
Reveley, H. J., Bryn-y-gwin, Dolgelly, North Wales.
Richardson, J., 13, Savile-street, Hull.
Round, Edwin, Tudor Works, Sheffield.
Rudkin, Thomas, 17, Newgate-street, E.C.
Smith, John, 22, Russell-street, Covent-garden, W.C.
Tappen, G. C. W., Horley-villa, Horley, Surrey.
Venables, Benjamin, 253, Camden-road, N.W.
White, J. Ludford, 111, St. George's-road, S.W.

The following candidates were balloted for, and duly elected members of the Society :—

Cox, Frederick, 100, Newgate-street, E.C.
Crewe-Read, Commander Offley Malcolm, R.N., Llandinam, Montgomeryshire.
David, Charles W., Cardiff.
Garrett, Richard, Carleton-hall, Saxmundham.
Haysmar, David, Portway-house, Weston, Bath.
Headlam, Alfred, Wavertree, Tunbridge Wells, Kent.
Humble, Michael, Gwersyllt, Wrexham.
Jay, Captain William Chickhall, 33, Cavendish-sq., W.
Levett, Robert, Packington-hall, Lichfield.
Llewellen, Thomas, M. Newport, Monmouthshire.
Lloyd, John, Huntington-court, Hereford.
Payne, W., 6, Salisbury-court, E.C.
Prideaux, Charles Grevile, Q.C., Brick-ct., Temple, E.C.
Scarborough, Thomas H., 5, Bloomsbury-square, W.C.
Smith, David, Siddal, Halifax, Yorkshire.
Wilson, Charles Thomas, Brynnewydd, Swansea.

The Paper read was—

DETAILS OF A PROJECT FOR THE PREPARATION AND DISTRIBUTION OF HOT FOOD, BY DELIVERY SERVICE AT THE HOMES OF THE PEOPLE, IN CITIES AND TOWNS.

By Wm. Riddle, Esq., Civil Engineer.

Your Food Committee were good enough to invite me to make a statement to them, in consequence of certain correspondence with an esteemed member of your Council, Mr. Harry Chester, to whom I am under obligation for bringing the subject of this paper before your society, and who, I regret to say, informs me he is too unwell to be here to-night.

My statement appeared in your *Journal* of the 15th of November last year. It contains the outline only of my project. I now propose to treat this matter more in detail, and to develop my plan completely.

1. The best way I can think of to put the plan outlined in the statement I have mentioned to a practical trial is, I will at once say—for I can only look at the matter in a practical shape—to raise, somehow, a capital of £7,000 ; to hire a plot of ground, by preference (so far as I am concerned) at Holloway, and put on it a building of iron and glass, 160 feet long by 40 feet deep, in 16 squares of 20 by 20 feet each, and about 18 feet high, with louvre ventilators. Our building should be of interchangeable parts, a plain, cheap, rectangular probably ridge-and-furrow-roofed structure, like a section of our old Crystal Palace of 1851, 160 feet by 40. Here is a plan of it.

Each letter indicates a square, 20 feet by 20 feet. This building will cost £1,500 to £1,800, I am told by one who has built such structures, and I think he is about right. This building is to be fenced off inside just as we may require it. We shall want a six or eight h.p. engine and boiler. This may be bricked up. We shall want drainage for our waste water, &c. I put £200 extra on this head. Our building is to be raised from the ground at least a foot, and ventilated beneath for dryness. It will be on concrete, brick, and sleepers, or creosoted beams, in such a way that no part will be a permanent structure. Like a four-post bedstead, it may be taken down and sold for horticultural or other purposes. Please mark that I would have a permanent structure, if necessary, of brick and mortar, but I greatly object to such, and think the iron and glass infinitely better. We want light, portability, adaptability, dryness, freedom from dust, from rats and mice, from decay; advantages so important and obvious, that glass and iron should be used far more than they are.

2. The district I propose first to work is Islington and its neighbourhood. It is respectable, and neither too high nor too low in condition.

3. Of the diagram plan before you, A B C indicate—A, the butcher's shop where killed meat is received; B, the vegetable shop, or store, where vegetables are received; and C, the dry store, where flour, raisins, sugar, &c., &c., are received and stored. From these three stores will proceed our raw materials in bulk.

4. In compartment D (see plan) puddings will be mixed in steam engine-driven pug-mills, many cwts. daily, done in convenient batches and put into closed tins for sale, in which same tins they will be steamed or cooked in iron rooms or chambers (being done some hundreds at a time) in our cooking apparatus. This steaming will be done in the next part of our building, E F G, where our cooking apparatus, representing probably in its general bulk cubical dimensions equal to about five cubes of 10 feet each, will be placed.

5. In our butcher's shop, or store, aforementioned, there will be racks for (say) 100 enamelled iron dishes, capable of holding 100 joints of meat of about 18lbs. each, more or less, but each dish holding about an equal quantity. The racks will be of wood or plain galvanized iron rods. The butcher will daily arrange joints on these dishes, and will remove superfluous bone, and, wherever it can be conveniently done, will cut out the bones of the joints, for on this will depend a good deal of the expedition in carving. In the butchers' department will be pickling vats, for pickling beef and pork with salt, saltpetre, and, if desirable (as I sometimes think), with the addition of sugar.

6. In the vegetable store, cabbages will be cut and washed, and water will be laid on to vats or troughs on purpose. This work may be done by women. Potatoes will come to us ready washed probably, by the merchant, in the ordinary course.

7. Carts will periodically bring killed meat, and daily bring vegetables, to us from our meat and vegetable agents or contractors, so we shall have everything "fresh and fresh." These contractors will operate only according to requisitions made by certified printed forms filled in daily in the manager's department of our building. These forms, like banker's cheques (in principle),

I	K	L	M	N	O	P	Q
A	B	C	D	E	F	G	H

will be sent to Covent-garden or other sources of supply. We may (and probably shall, under guarantee of quality) make contracts for meat and vegetables to be sent by railway from the country, far off, in answer to numbers of quantity telegraphed, or to letters sent daily or otherwise.

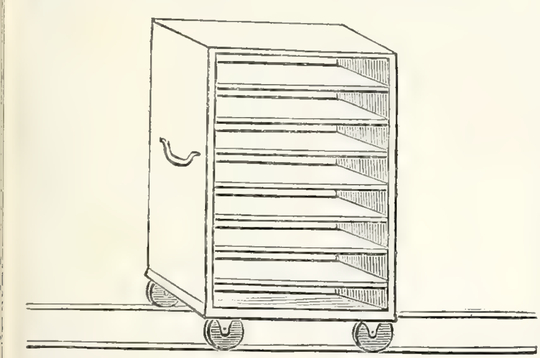
8. Our dry-store department will receive flour from flour mills by contract; groceries from the cheapest wholesale markets, from shippers or first-class merchants, without loss by commission; raisins, currants, rice, sugar, direct from Travers and Son, or other responsible traders.

9. I propose, at the outset of this project, to begin with a very simple bill of fare, because on that at first will greatly depend simplicity of operations, or, in other words, the profitableness of our undertaking. This is important to bear in mind. We want to give a plain good hot dinner to those who now often get but a cold and indifferent one; a plain, sensible, indisputable, English dinner. This is all I would attempt at first. Now, what may that usually consist of? We might commence with one sort of meat, one sort of pudding, two sorts of vegetable (green vegetable and potatoes) daily, say roast beef, or roast mutton, or boiled beef, or boiled mutton, or boiled pork; plum pudding, or rice pudding, or currant pudding, or lemon pudding, or roll jam or molasses pudding; potatoes mashed, and greens, or cabbages, or turnips mashed, or carrots mashed, or peas pudding, *i.e.*, one joint, one pudding, and two vegetables daily. Potatoes mashed for special reasons. (If plain boiled they will not improve in the canisters, and will require a much larger size of canister than we can well spare.)

10. I think the foregoing would do at first, changing over the above scale day by day.

(I may here make the remark, by way of parenthesis, that there is room for a pork-pie equal to what the so-called "Melton Mowbray" sometimes, but not always, is, at a fairly low price. I say a low price, because it can be done at a low price, and yet of quality quite first class. If we could get land conveniently near our building, we might utilize our waste cabbage cuttings and potato parings, probably, to keep pigs. We may come to require an outlet for a certain amount of returned stores, or surplusage, &c., for with the best organisation, on an issue of perhaps some tons of cooked food daily, there will be a margin of what would otherwise constitute waste, suitable, perhaps, for pigs and not for horses.)

11. I purpose to have a tramway flush with the floor, 1ft. 10in. wide or so, running from end to end of our building, with turntables of the simplest kind. On these trams we should send our hundred dishes of meat to be baked, on suitable trucks. (See woodcut.)



We also send, on such trams, our greens or cabbages, in large oblong rectangular baskets lined with tin, like those, as to the basket-work, seen on railway platforms. Our potatoes in nets are thus sent out of store. All things are first weighed to the printed filled-up forms sent in to the stores the previous night from the counting-house. On tramways the food of various kinds, and the puddings in tin from the pudding-kitchen, are sent to the cook-house. Our general transfer processes are conducted throughout our establishment in such a way, that one department will not be encroached on by another.

12. The trams are not to run through the several stores, but alongside them, outside a barrier. The tramway system is an excellent one. Wherever it can be used it keeps things in order, prevents litter, prevents encroachments beyond boundaries, prevents bruising and concussions, prevents noise, diminishes labour, and renders a factory or establishment what it ought to be, *i. e.*, all parts of a machine approximating (if I may so speak) to the automatic.

13. One department will be fenced off from another with iron and glass, excepting sliding or other doors, or delivery windows for vouchers, &c.

14. I have referred to compartments A and B and C, also to D where puddings are made. In this compartment or department D, we have mixing-machines, as the pug-mills I have referred to, or Stevens's bread-making machine, so modified as to be suitable for our mixing for puddings, or some other sort of machine for the purpose. There are several good ones.

15. We have water laid on to these mixing-machine troughs or mills, and also means of letting water off from them for cleaning them.

16. In this pudding-making department we have a cam-worked or other engine-worked suet-chopper acting on a wood block, the suet blades working through clearing-plates, like the blades of a cupping instrument. We have, in short, any other apparatus of the sort brought to bear admirably on a small scale, of late years, in first-class kitchens and establishments, for preparing materials. We shall take those principles already verified and used for materials in little, and use them for materials in bulk.

17. Our hot food will be sent out in three sizes of plain canister or tin, and only in this way. Our pudding department will contain racks for tins, and carriages like the truck or tram-carriage I showed in the drawing. On wall-racks and on the tram-carriages our tins, cases, or canisters will be ranged. These tins or metal cases will be not unlike the ordinary tin canister now much used for the sale of coffee by retail; they will be in 1 lb., 2 lb., and 4 lb. sizes, and no others. They will be all alike, for all our foods, in shape and make, and will be unusually strong and plain cylinders, with lids, and will be hard soldered. These sizes of 1, 2, and 4 combine well; for instance—

1 lb. and 2 lb.	of meat	make	3 lb.
1 lb. and 4 lb.	,,	,,	5 lb.
2 lb. and 4 lb.	,,	,,	6 lb.
1 lb., 2 lb., and 4 lb.		,,	7 lb.
4 lb. and 4 lb.	,,	,,	8 lb.

This renders the ordering by consumers a simple matter. Since writing the foregoing, an Oxford University man has told me that this plan of tin cases is like the way the University men received their food from hotels when he was an Oxford man, many years ago and it answered capitally.

18. The puddings, as made, will be filled into the tins, and the lids put on. The tins will be placed on the shelves of the tram-carriage, which last, by a small turn-table, forming part of the tramway outside the barrier, may be moved into the pudding department when wanted, and loaded with the closed tins of pudding, say 100 or so at once, as fast as they are made. When one carriage is thus loaded, it is passed through the barrier on to the turn-table; the turn-table turns of itself by pulling the carriage round by its end handles, and then the carriage is passed down to the cook-house to the pudding-steaming chambers.

19. D E F, squares in the plan (preceding page),

represent a space of 60 feet by 20, or 3 squares of 20 feet. In this are our roaster, boiler, and steamer—a block of brick flues, and iron plates, with oven, and boiling, and steaming chambers. It is about 50 feet long, and 12 or 14 wide, and of proportionate height, and fitted up, say by Benham and Sons, who have had ample experience for the certain production of excellent results with the small amount of fuel, of 1 lb. per diem for 5 adults, for all their meals and hot water. I have (as I said in my statement in your *Journal* of the 15th November) seen the excellent roasting performed by Benham's apparatus for more than a thousand of the Guards at one time. The results seemed to leave nothing to be desired. The roasting seemed to me first-rate, and by no means the coddled production of the common journeyman baker's oven, or of the common range oven. But there are other sorts of apparatus than Benham's, so well known to you that I need not name them. We shall combine the principles of each of the best for our large apparatus. In New York, I am told, the coal used is anthracite, or smokeless coal, and that it presents peculiar advantages for cooking is obvious. We cannot use the very excellent American cooking apparatus in England, for the want of smokeless coal, or rather for the usage which interferes with its adoption. At Holloway, by the use of anthracite, we may be quite sure of not plaguing the neighbourhood with smoke. The North London Railway, for three or four months, have been using anthracite with great satisfaction. The gain in heat is said to be 25 per cent. Anthracite is used at the City Flour Mills.

20. I have thus tried to explain to you our building arrangements, until you can imagine the joints arriving at the cook-house on the shelf-built tramway-truck, or trucks, or carriages; also the puddings; also the potatoes, in nets; and other vegetables in tin-lined basket-carriages.

21. The puddings may be steamed, if desirable, by relays. Plum puddings would not spoil thus. Some sorts would not bear it so well. Plum puddings require some six or eight hours, and in all the 24 hours there would probably be a batch or two under steam, in the same closed tins the consumer will receive them in; the outsides clean and bright-scoured from time to time by revolving leathers and rotten-stone, applied in a novel manner. The tins are separated by gratings in the steaming chamber.

22. The potatoes are steamed in their nets. The cabbages or greens are put into cisterns of boiling water, which cisterns have false, loose, perforated bottoms. When cooked the water is drawn off by a tap; a board with some hundredweights, or lever pressure, by a board or plate, is then brought to bear on them, and so the water is pressed out, and then, by tackle from the roof, the false bottom is raised out of the cistern or cisterns, and the greens or cabbages in bulk, previously pressed flat, and drained, as I said, are cut into small squares by sharp sword-blades; and thus in small block-like portions they are transferred to the canisters alongside, and sent away to the cart-loading room by the tramways. I have improved on the foregoing arrangement.

23. The potatoes I recommend to be mashed, because *au naturel* they may spoil, and will be too bulky for my tins (*"le jeu ne vaut pas la chandelle."*). Potatoes well mashed are generally preferred, and will keep in excellent condition, I think, much longer, and occupy less space; they will fit our tins only in this way. If we sacrifice one advantage we gain another. For mashing potatoes, 18 or 20 young girls, neat and clean, sit at three tables; each table is 10 or 12 feet long. On the under side of each table is a square wooden trench, about 8 inches deep and 14 inches wide. The nets of potatoes are placed in front on the other side of the narrow tables to that at which the girls sit, and matters are so arranged that they can peel the potatoes, and let them fall when peeled into a projecting part of the trench in front, and the peel, or skin, as it accumulates, is pushed into another parallel smaller trench behind the table, underneath the nets. As the trenches fill, a hoe is used to draw the peeled potatoes the entire length of the 10 or 12-foot trenches of the three tables, into tin-lined baskets. The peel or skins are also drawn out of their separate trenches by hoes, but at the contrary end of the tables, into waste-baskets. Each girl works by piece-work; and the skins are weighed, that no more than a certain weight of waste shall be permitted,—a per-centage on the whole weight of potatoes sent out of the store. The potatoes are transferred in the tin-lined baskets to a mashing apparatus, with a beater moved up and down by cams worked by the engine, on a revolving table or platform. On this, milk and sweet butter are incorporated, and an attendant moves the potato mash about under the masher with a tinned or plated spade or shovel, and when ready, the tins on tram-carriages alongside, or on racks, are filled, just before the delivery carts are sent out to the public consumer. The tins filled are, of course, the regulation 1lb., 2lb., and 4lb. sizes. Since writing this, I have been told by a tavern-keeper that plain boiled potatoes would not spoil in our tins, judging by his own practice.

24. Alongside our 50-foot cooking apparatus, or projecting further on into other space in our building if more convenient, (and if so we must add one or two more squares 20 $\times$ 20 to the building, see plan), is a table 60 feet long, of wood, very solidly made. It is three feet six inches wide and two inches thick, of the best deal, well seasoned. At every five feet a tin vessel, two and a-half feet oval and four inches deep, is let into the table, flush with its surface. Thus we shall have 12 of these tin vessels flush with the table-top or surface. The tin vessels are all connected underneath by a gun barrel or gas-pipe barrel, of iron tubing one inch in diameter, for the conveyance of steam to the tin vessels; the steam so used moves on freely into a condensing cistern somewhere beyond, to heat water for use. The tin vessels form the hot plates on which the enamelled iron dishes are to stand at the time of carving. There will be 10 or 12 joints being carved at once, and equi-distant along the table. When the carving is done, "condense water" is let out of these tins by brass taps or self-acting valves.

25. Between every joint or dish of meat on the table there will be two sorts of special, fixed apparatus. One is for weighing and filling the tins on the left of the carver, and the other is for sealing the meat canisters with a metal seal when filled. The sealer sits on the other side of the table to where the carver stands.

26. I may briefly say, as regards the weighing, that the meat is, as fast as carved, placed by an assistant (expressly not the carver) in a shallow, white enamelled iron dish, on the weighing machine; and the same assistant adds a measure of gravy. As soon as the scale vibrates, the dish, which has a fulcrum forward under it, is tilted, and the spout-like or somewhat funnel-like formation of the front part of the white enamelled iron dish of the weighing apparatus enables the contents to be tilted, funnel-fashion, into the tin canister placed to receive it. All tins of one weight are carved for first. The scale-dish never leaves its place save to move enough on its axis for filling the tin. The tin is then by a treadle moved under the table into position on the other side of the table for putting the lid on, and sealing, by the operator, a boy or girl, at the other or sealing apparatus. The whole operation takes place very rapidly.

27. The secured canisters go on to the tram carriages, which, when loaded with 50 or 100, are sent along the tramway to the cart-loading room. These meat-tram carriages, or all the food tram-carriages, may be walled-in with tin-plate doors, kept bright; and these doors, of which there will be many, will keep the food hot the very short time it will be on the trams, for all the carvers will be filling one tram carriage only at a time, and then it will depart and another will be shunted into position.

28. The mashing of potatoes, and the processes with other vegetables, take place in the same part of the

building as the carving (and simultaneously), but on the opposite side of the 20-foot wide area of operations.

29. In the last square, 20 feet by 20, of our building—marked H in the plan, or further on still, for I think we shall want two more squares—I should say the last square on the right hand of the front half of our block of building (160 × 40), the carts are loaded, two at a time. Observe that they are shut in by sliding doors during the loading, to keep the temperature well up. The horses are all ready in the shafts, one strong horse to each cart. Before loading, steam is let freely into the cart by a plaited hemp or suitable hose from our boiler, by a stand-pipe. This steam condenses in the cart body, and, parting with 1,000° of latent heat, speedily warms the cart inside, and drains off underneath of itself. Then the doors of the rear part of the cart are opened and the cart is loaded.

30. I have tried in this paper, so far, to lay down the following points:—

I. Building at Holloway by preference.

II. To work the Islington district or districts first.

III. To have our building as it were a part of a machine, and possessing stated merits peculiar to modern constructions, of a sort not yet sufficiently appreciated.

IV. To have our building in 16 squares of 20 by 20 feet, 8 to the front, and 8 forming the other, or rear half. Front half

A	B	C	D	E	F	G	H
1	2	3	4	5	6	7	8

A B C—Raw materials.... { 1. Meat. 2. Vegetables. 3. Groceries.

D—Pudding making and filling in.

E F G—Cook-house, carving-house, &c.

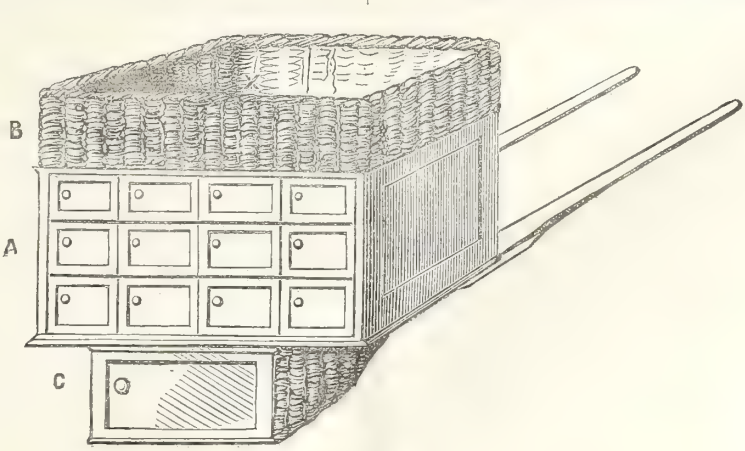
H—Loading cart room.

31. The above is but approximate. I want to give the impression which reading the American account of pig-killing and curing establishments in the United States, conveys to the more sluggish (I fear) old-world mind. We read that in America pigs are, so to speak, driven up an alley, are guillotined, and, by some process of legerdemain, in about a quarter of an hour come out bacon, or a good way towards bacon, by the cargo, at the other end of the factory. Raw material goes in at one end of our building, factory, call it what you will, and comes out encased and comforting nutriment at the other end; and this may be all done under the eye of those curious of the public, who like to pay, say 6d. a head, to come in behind a barrier, under certain regulations and in limited number, to report out of doors that all is conducted in a fair, cleanly, and wholesome manner—which is more, we know, than can be always vouched for below stairs in many great houses, where cook, with arms a-kimbo, defies a mistress to inspect her belongings, and under her despotism considerably more than the proverbial peck of dirt is eaten during the lives of some among us.

32. I must now speak of the delivery carts. I may as well state first that hot canisters of puddings or other food, are handled by the aid of the ordinary thick leather (housemaid's sort of) cleaning gloves, or even thicker if need be. Our carts will be of special construction. They will present the general appearance of the ordinary London Parcels Delivery cart. They will be of wood, lined with 2½ inches of felt, and within that with steam-tight galvanised iron plate, about 20 guage and 18 guage shelves. The plate seams had better be soldered. There will be 12 compartments running from back to front, and presenting the section shown in the next page.

The compartments are formed of galvanised iron-plate of the best quality, and perforated in walls and floors of the plates with colander-like holes (for drainage) before galvanizing. The back of the cart will consist of a frame of twelve apertures corresponding with the twelve compartments, and in which frame will be hinged twelve small closely-fitting doors. Each door will be a 2½-in. tin box full of felt, and will have a handle to open and shut the door with a spring catch. When one of the twelve doors is open there is seen a sort of fixed curtain, divided in the middle, a wadded pad, to prevent influx of cold air whilst putting the gloved hand through it to procure one of the twelve sorts of the canistered food (*i.e.*, three sizes of tin and four sorts of food, by multiplication, make the twelve), for every compartment will contain either a separate size or a separate food. The ordinary Parcels Delivery carts have a space beneath the main body of the cart; we shall have this, but separated quite from the food part of the cart. The top of our cart, or roof, will have on it a surrounding wall of basket-work, much as now seen on Nevill's bread carts, but only 18 inches deep. This, and the receptacle beneath, which may also be of wicker-work, varnished if need be, are for returned empty tins, and these will be secured from rattling by tinned wire-work, or basket-work divisions, and at the top by a heavy rug, if required, within the basket over all, to prevent a jingling noise.

A in the woodcut shows the body of cart with the 12 doors and handles of them behind. B indicates the basket



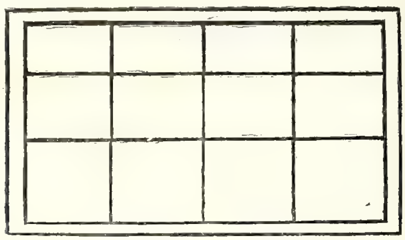
Back View of Cart.

top, the front (x) of which may let down at convenience. C indicates the lower receptacle and its door. The back door part of the cart may be japanned in any colour.

33. I reckon that each cart may take enough tins for 50 houses, say 150 tins or more. 600 dinners for families averaging six persons each, will represent the consump-

tion of 3,600 people, and 600 houses to call at. 12 carts, taking enough for 50 houses each, would deliver, between 11 and 1 o'clock, the carts leaving our building at 10.30 a.m.

I have mentioned the perforated plates in the carts. The bottom floor is double-plate with a space for draining, because before each cart leaves our building the very last thing, when all the food is in, and all the doors are closed, it will be inflated with steam (by a hose and stand-pipe, a fixture in the factory), allowed to blow off pretty freely. This will speedily bring up lost heat in the tins inside, and the carts will drain well with the motion over the roads. I don't think hot air would do for this; if so, a hot blast by a Lloyd's fan and twisted gun-barrel, in a small stove, would be a means of furnishing dry heat, which might be regulated by a thermometer behind a glazed slit in the wall of the cart. We know, moreover, that an ordinary dinner plate, or any solid object, appears to be instantly heated if plunged in hot water, or if subjected to steam at any pressure,—more rapidly than in an oven of high temperature. Each cart would require an injection-nozzle, or opening, for what I term the inflation, and this would be closed by a plug or screw.



Section of Cart.

34. Our carts will therefore leave our establishment with their body, or bulk, or contents brought up to 212°, and well jacketed in $2\frac{1}{2}$ inches of felt, baked sawdust, or other suitable non-conductor, with doors arranged to prevent influx of cold air, and the compartments curtained inside with felt, for winter or March winds.

35. Each cart has a driver and conductor, as in the case of the London Parcels Company, and the conductor must be an active, steady man, neat and respectable in appearance. I think he should wear a jacket of some dark-brown hempen fabric, capable of washing, and tight at the wrists. Such a material I have seen for the gaiters of shooting-boots and Volunteers' leggings, somewhere by Charing-cross,—strong, soft, warm, neat, and capable of being cleaned. There will be nothing in our arrangement of the tins which will soil either the inside of the carts, or the sleeves of the men; all that will be visible in this respect will be the exterior of canisters as bright as if they contained bonbons.

36. The carts take with them, filed counterparts of the tickets of the consumers on whom they are to call, arranged in order; the printed spaces filled up with the sizes and sorts to be delivered to each consumer.

37. A sort of limp portfolio will hang at the side or rear of each cart; limp leather lined with baize and partitioned inside, and yet capable of opening like a book. This has four spaces, and is for holding the canisters at the time of delivery. It hangs bottom up on the cart, for fear of rain.

38. I must refer you to my original statement in your *Journal* of the 15th November (a printed copy of which statement I can furnish if required), for some particulars relative to district offices or agents—the respectable shopkeepers of the neighbourhoods where we shall operate. These agents, I said in that statement, will keep books like those banker's cheque-books having three cheques in a page. In giving orders, the agent, after recording particulars in the ruled-off printed spaces, will tear out one portion for the consumer, will keep a second portion, and one portion will go to head-quarters the same evening by a collecting clerk. Now, inasmuch as we could not supply dinners for over (let us suppose) 3,600 people, it might become desirable to have a dispatch clerk on the look-out during the day—say on horseback—who would stop all receiving of orders at the district offices as soon as much over the limit of our issue was reached. Say at three o'clock the limit is reached, then he rides through the district as he would do to polling-booths in an election, and stays the receipts of orders. At elections the advice is, poll early; our advice would be, order early. I may here remark there are at Islington as elsewhere business establishments where young women and others are employed in considerable numbers, where they would be only too glad to have their dinners from us—and I mention this because I may have appeared to confine myself to retail delivery—where they are so busy they cannot spare time to bother much about dinner at all, and where they fall into ill-health in consequence—places to which young women have to carry their dinners from home, and have them warmed up. To benefit such a class or classes would alone repay generous minds for some reform, and this project of a sort of portable commissariat seems calculated to do so effectually.

39. Each (ordinary householder) buyer of tickets will hire or purchase a felt-lined "Sorensen" box*—a box covered with red cloth, or grained, so as to stand in the hall or passage of the house without disfigurement. These may vary in price, say from 7s. to 20s. each, or may be had on hire at a small monthly payment. Large establishments would have a larger box.

40. The conductor of our cart will knock a postman's knock, on delivery, and will give 45 seconds to have the door answered. He may carry a small reversible sand-glass attached to a chain or ribbon round his neck, and reverse this when he knocks or rings, keeping it in his waistcoat or outer jacket pocket; he will then know when to leave, for the sand will go on running out as he stands. Time at such moments is very deceptive, and some rule of this sort may seem puerile, but may become necessary. A watch would not so well answer the purpose, even with a hand making a circuit on the dial in sixty seconds.

41. The servant of the house will answer the door with the voucher, given by the district agent, in her hand; she has taken it from the inside of the lid of the box in the house passage; the conductor compares it with the one he has taken off his file and holds in his hand; as the spaces are printed—ruled off like a small card almanack, printed in squares—comparison is the work of a moment. The conductor opens the box in the house passage, takes out the empty tins, and puts in the box the full ones, which he has brought with him in the portfolio of leather and baize; the conductor shuts and hasps the box. The servants cannot tamper with the meat-canister on account of its seal, and the other cases cannot be meddled with because they are quite full, and detection would follow. The conductor files the voucher given up to him under a hanging leather flap on the side of his cart, and also the one he compared.

42. Supposing the dinner delivered at 11 o'clock, and dinner required at 3 o'clock. It is delivered hot, say 200° to 206°, or 212°—and is shut up in the box, and Mr. Sorensen can tell us how long it would keep hot—say four canisters: meat, potatoes, greens, pudding—inside a box, not too large, and closed in a $2\frac{1}{2}$-inch jacket or wall of felt. However, the servant can pour a kettle of boiling water if she likes into the box, if it is lined with thin tin, and next morning this may be drawn of through an india-rubber plugged hole in the side of the box; for this the box would permanently stand at least eight inches from the ground, to allow this drawing off. If boiling water were used, the inside of the lid of the box

* This box would be an adaptation of the principle of the Norwegian cooking apparatus described in the *Journal*, Vol. XV., p. 664

would also require metal lining, or the felt would get damp. This metal won't interfere with the heat. Two teaspoons of boiling water will warm an ordinary teapot. For supper purposes, or where dinner is unusually late, the tins of food may be placed in a vessel, with some water in the vessel, and the vessel covered. This may be placed over any sort of fire, and the steam or boiling water will raise all to a proper temperature. As the water will be quite clean the supper plates may be inserted in the vessel just before serving up, as without a hot plate one cannot well have a hot dinner. A boil up will steam-heat or water-heat the plates. I try to look at matters practically. We should give out to customers printed instructions.

43. The returned empties placed in the portfolio will be put on top of the cart, or in the receptacle beneath it, and the portfolio reversed will hang on its hook at the back or side of the cart; in the rear above the wheel, if at the side.

44. All this will take a shorter time than the description of it. I would, were I manager of our establishment, drill each new conductor before he went out. I have had workmen who, set to new processes, have said, "We can't do them in the time," and have replied by taking off my coat and doing the thing required to be done, and I have then replied, "What I can do I think you can do." I would let a conductor go through a rough drill, for it is astonishing how stupidly some untutored people set about the most ordinary proceedings.

45. If returned empties cannot be got in "to time," we must send for them early in the morning. The baker's sort of hand-barrow would do well for this; but if we print a notice urgently requesting no delay, and paste it on each box hired from district agents, many, and perhaps most people will oblige, and those who will not answer the street door may go without their dinner.

46. The back of our building (for I have only described one-half of it) is appropriated to stabling-stalls for 12 to 18 horses, cart space, harness, fodder, and water-hose for washing down carts with the water-brush well known, and other arrangements. I believe Thorley's food for horses may be good; some of our waste may be good for them. I don't know. Iron and glass will absolutely hermetically seal off all ammoniacal vapour from coming from our stables to our kitchens, and indeed, if not, we can erect a special building for horses; but I don't think it will be wanted, as our horses will be at the other end of building.

47. The rear of our building will also contain counting house, manager's room, clerk's room; also scalding tin and tin washing room, and tin store room for new and spare tins; also tool-maker's and engineer's shop, and tin setting up and repairing room, where bruised tins will be set straight or rectified.

48. Returned empties are to be scalded in a wooden vat, where water is laid on and the water may be drawn off. Then the tins are brushed in the following apparatus:—A vertical spindle brush, revolving through a stuffing-box in a sort of tub. The tins are cleansed by being put over the brush one by one. The brush revolves at proper speed, turned by the steam engine by a belt over the wheel. The dirty water runs away through any sort of india-rubber valve or through a tap, and water runs in from a cistern of soda and water. Vertical spindle brushes revolving in a larger tank might be better than as arranged above. The principle is obvious.

49. Our scrubbed tins will be rinsed and inverted on galvanized or wood racks having a drain floor below; these are obvious arrangements. All new tins will be scalded before issue. All tins will be kept bright on the outside. In the common milk-can, by the way, we have a good example of a tin vessel for its special service.

50. The rear of our building, if any part can be called the rear, will also contain the engine and boiler-house, bricked in where necessary; also coal and wood stores; water cisterns, unless water is on at a pressure from the main; also surplusage stores, viz., returned full tins, which I will deal with presently; also mop and broom-house; lavatories; waiting-room; watchman's, or "general," or servant's, or workman's room, &c., &c. Please mark, that the nature of our building is such that a few castings and some strips of glass, &c., and we can add on a 20-foot square at any time. There is a cement used for aquariums which might also answer for iron and glass buildings:—Take one gill of litharge, one gill of plaster of Paris, one gill of fine white sand, one-third of a gill of fine powdered resin; sift and keep tightly corked until required for use, then make it into a putty with boiled linseed oil. It can be used for marine or fresh water aquaria. Let the tank dry three or four hours, when it will be fit for use.

51. In commencing the undertaking referred to in this paper, the building and plant might be got ready while the neighbourhood where we were going to operate was canvassed from house to house, by persons employed on commission and instructed how to place the facts before those we should desire to benefit—in other words, the consumers. We should have the benefit of the local journals, such as the *Islington Gazette*, which is respectable, old-established, and has a considerable sale. We could state facts, and show advantages (I would do so, if no one else), at Myddelton Hall. We might send the first two or three dinners round gratis, for prejudice might exist where in that way it would be dispelled. As soon as we have a sufficient number of prospective customers we can fairly commence. Our district agents would have boards outside their shops, such as the Parcels Delivery Company instituted.

52. On a smaller scale than I have named, even for a commencement, I don't think the project could be well and satisfactorily done.

53. Mr. Corbet, of the Glasgow Dining-rooms, told me that he gives a very fair dinner for 4d., and has to find a good room, and warmth and cutlery, waiters, cloths, condiments, rent of room, repairing furniture, &c., &c., all in the 4d., and yet a profit remains. Setting our costs against the above costs, we can provide a good dinner (a better one, of course) for six persons for 8d. a head, consisting of meat, potatoes, greens, pudding, all of the best, and thoroughly hot.

Say the prime cost per head, of raw material, would be:—

Meat	3d.*
Potatoes	0¾d.
Greens	0½d.
Pudding	1¼d.
Dinner	5½d.

That is to say, prime cost of materials, 2s. 9d. for six. Charge 4s. (say for six) or 8d. a head for such a dinner—plenty to eat for every body of the six—to eat and to spare.

54. Calculation (approximate).—600 dinners for six (say average), or 3,600 people charged 8d. each, or 4s. for six, is £120 daily.

Now, in charging 4s., we added 1s. 3d. to 2s. 9d., the prime cost of the food. This gives £37 10s. daily received, in excess of what we pay for food.

We have the following expenses per day:—

Coals, 1 ton (I am assured I am exceeding)	£1	0	0
12 conductors, 12 drivers, 21s. a week each	4	10	0
18 horses' feed, or less (Thorley's) (14 horses might suffice.)	2	0	0
Commission on sale of tickets	3	0	0
20 young women, 10s. a week each (we give them a dinner each)	1	10	0
12 carvers, 5s. a day each	3	0	0

* If this seems little, it must be remembered that children do not require much meat, and that Mr. Corbet charges only 4d. for the whole dinner, and that we shall buy in the cheapest market—not the cheapest London market, but the cheapest accessible by rail or telegraph. I am speaking of prime cost to us.

Weighing and sealing canisters, 24 young people, 12s. a week	2	8	0
Cooks, engineer, stable-hands, &c., say six at 5s. each	1	10	0
4 clerks, 6s.	1	4	0
I think, by changing about, these hands would be more than ample.			
Gas, water, wear of plant, rent, insurance, interest on money, manager, waste, bad debts	4	0	0
	24	2	0
	37	10	0
	£13	8	0

Add (if you like) another £3 8s. for contingencies, such as telegrams, stationery, and innumerable matters I cannot now recollect—£3 8s. daily. This will leave £10 net profit per diem on a capital of £7,000, or £3,720 a year net profit. It sounds enormous, but is consequent on—

55. Our absence of system of credit. Our "quick returns." Our organization for prevention of waste.

56. Our £7,000 capital would be thus laid out:—

*Building	£1,500
Cooking Apparatus	800
Sewer arrangements and foundation	200
12 carts, at £60 each	720
18 horses, at £40 each	720
600 boxes, felted	300
4,000 canisters, at 1s. each	200
Engine and boiler, &c.	250
Machinery	300
*Ground (premium)	250
Fence round building, gravel, fittings, &c.	300
Total	£5,540

Leaving us a balance at the bankers of nearly £1,500.

57. With a larger capital we might safely attempt a bill of fare more elaborate, and could produce wholesome varieties of made dishes, under the public eye (if they chose to pay 6d. to come in, as I have said, under regulations), which would create some surprise for their excellence and cheapness; this because of using condiments or materials in bulk, a hundred lemons instead of a quarter of one, and so with spice, or preserves, &c. With regard to excellence of flavour, cookery is essentially a science, and it is an absurd waste of time for a *chef* to be using high faculties over a dish for a few. Such science expanded over quantity would obviously be better spent; and it is needless to add, as the inference, that excellence of quality and flavour would be a consequence of measures of magnitude wisely conducted. A larger capital would be necessary; and quite as exact but a different organisation would be required. However, this last is premature. But it would not do to depart from organisation. To do so would inevitably cause eventual bankruptcy.

58. Take the American hominy, a food I can get as cheap as rice, and as much better than rice as wheat is better than rice; take the potato patty, such as I have eaten in Bombay. The potato patty is of mashed potatoes, and looks like a dinner roll when fried, but it has juicy meat (fresh meat minced) inside it. I have an arrangement by which this could be made in thousands by machinery, and put into tins carefully with gravy. I know the demand would be very large, it is so good and wholesome. The remains of meat on our joints from the carver could be taken off by girls with keen knives, and then minced for these patties by machine.

I may remark that I have an appendix of details to add sometime to those I have described.

59. My own opinion is, that the whole project to which this paper refers hinges entirely upon organisation

* Estimate by an architect.

If principles laid down at first are violated six months after commencing an undertaking of this sort, then it will fail. How could the General Post-office, or Huntley and Palmer's Biscuit Factory, or even that little affair of Watling's pork pies (a paying business), possibly succeed unless conducted on system? I dare say most readers will think my bill of fare a very plain and unsatisfactory one even to commence with, but we have to provide for the million, who eat to live, not the thousand who live to eat. We will think of the latter afterwards. We cannot too rigidly do everything by "rule and plummet" in the project I have ventured to place before you.

60. One word in conclusion:—Mr. Newman Hall quotes a Government report, that fifty millions sterling are annually spent (or were in 1849) in the United Kingdom on beer and spirits; spirits twenty-five millions and beer twenty-five millions. Mr. Hughes, M.P., writes me that better and warmer food would do more than anything else to expel the "demon gin." (I have his letter.) Mr. Stuart Mill writes me from Avignon, saying—"Waste is enormous. Your objects therefore have my entire sympathy." Mr. Chester wrote me—"I see no weak point in your project." Regarding this vast outlay on inebriating beverages, it is easy to enter a public-house and get beer and gin, but is it easy to enter a public-house and expeditiously get a warm and plentiful wholesome meal?—I have not found it so, and I have knocked about a good deal. Can it then be doubted that if we can bring steam and coal, and organisation and machinery, to bear on this question of food, we strike a blow at intemperance and immorality at a critical period in our history?

I may add further extracts from letters received from Mr. J. Stuart Mill, M.P., and Mr. Thomas Hughes, M.P.

Mr. Mill says:—"Every one must see that whatever enables food, or the other necessaries of life, to be obtained of better quality and at less cost, must be good, not only for the economical interests of the country and mankind, but for all their other interests. It is also well known that there is enormous waste in the preparation of articles for domestic use; and there is no item of expense in which the waste is more conspicuous than in that of fuel. Your objects, therefore, have my entire sympathy."

Mr. Thomas Hughes says:—"I am obliged by your letter, which has lain so long unanswered in consequence of my absence from home. I am glad to find you working at the problems to which you call my attention, and which are indeed the most pressing for us in England. I wish I could give you any efficient help, but unfortunately I have my hands so full already that it is impossible for me to undertake anything more. As to the 15th of this month, it is out of my power to make any positive engagement, as our Courts are sitting and I have many other calls on all my spare time; but I will come to hear your paper at the Society of Arts if I can. All you say as to the drunkenness of our city poor is too true. I feel that if we could only wash and feed them properly the gin demon would soon be powerless. Wishing you every success in your work, I am, &c."

DISCUSSION.

The Chairman, in inviting discussion upon the paper, said it was almost needless for him to remark that a great deal of time had evidently been bestowed upon it in endeavouring to make the scheme as perfect as possible, as shown by the minute details which had been given. But the point on which he chiefly invited discussion was, as to the feasibility of conveying hot food for consumption in the way suggested. There could be no doubt of the advantages of some such system as had been propounded, in neighbourhoods where large numbers of people were engaged in various manufacturing branches, and who had not time or means for the proper preparation of their food. That was one of the most important points to be considered. Members were

aware that for some time past there had been sitting a committee of the Society on the subject of the supply of food to the people. At one of the sittings of that committee the proposition of Mr. Riddle was brought before them, and it was then suggested that that gentleman should embody his ideas in a paper to be read before the Society, in order that the proposal might be ventilated by discussion.

Mr. G. Warriner remarked that, probably, there was no person in the room who had sent out a larger amount of cooked food than he had done, especially in Dublin, during the period of the famine in Ireland. On that occasion he supplied rations of Indian meal and rice in a cooked state for 26,000 persons per day. The food was sent out hot, before twelve o'clock, to the different wards of the city, and thence distributed to those who applied for it. This proved that there was no serious difficulty in sending out hot food. By the use of Capt. Grant's waggons he had sent cooked provisions from Aldershot to a distance of several miles, and they were distributed to the soldiers hot, and in excellent condition. These waggons were similar to those which were sent to China, and there was no difficulty in sending cooked food in that way to almost any distance. With regard to the scheme now proposed, he feared it was surrounded by many difficulties, but if it could be carried out, it would be a great boon to the class of society to whom it was suggested to apply it. Even if some of Captain Grant's waggons were employed in the east of London at the present time in the distribution of pea-soup, such as was prepared by Mr. McCall, at Whitechapel, and sold at one penny per quart, it would be a great boon to the district. Captain Grant's waggons could, no doubt, be obtained, as there were a large number of them laid up in the arsenal at Woolwich.

Mr. S. Redgrave thought the chairman had touched upon the real point for discussion, viz., the practicability of distributing the food in the way that had been proposed. They could scarcely entertain the idea of carrying it from house to house, and expecting the call to be answered, and the provisions delivered in the way described, in the space of only 45 seconds! It certainly would be a great boon if they could carry food cooked to the doors of the middle and poorer classes, but at present he could not see the practicability of Mr. Riddle's scheme, although it might look well on paper. At Glasgow they had the example of a good meal being supplied at the charge of 4d.; Mr. Riddle's charge was double for the food he proposed to supply, and he had put down a margin of profit on the working of the concern which was excessive. These were some of the points which occurred to him as being worthy of consideration.

Mr. Botly said the point which most struck him was the large disparity between the charge for the Glasgow dinners, with all accommodation provided for the visitors, and that which Mr. Riddle proposed. Although 4s. might not be too much for the middle-class to pay for a dinner for six persons, yet it would be beyond the means of the class below them, whom it was especially intended to benefit, and that class included the great mass of the population. He questioned, moreover, whether even the middle class would like to pay so much as 8d. per head, which, according to the calculation given, left a very large profit. If Mr. Riddle could supply a good dinner at the Glasgow prices, it was a thing which every one would be inclined to support. With such commercial results as had been pointed out by the author, there would be no difficulty in procuring the necessary capital, but it carried with it the idea of too much profit taken from the class of people whom they wished to benefit.

Mr. Campin did not gather whether Mr. Riddle had made provision for ventilating the compartments of the food carts, for if vapour got to the food and there were no means of letting fresh air in, the effect would be injurious. There was, no doubt, a large expense incurred in carrying out the plan of distribution by means of horses and carts, involving a driver and attendant to each; and it struck him that the dinners might be supplied at less cost to those who would send for them and take them away in their own vessels. This plan would no doubt be of extreme benefit to many classes of society, because there were persons above mere labourers, whose time was so engaged that they were not able to give that attention to the preparation of their food which was desirable for their proper sustenance. People often ate cold food when they might have hot meals at the same cost, and probably this scheme might meet the wants of the classes above the mere labouring class, who were able to pay something like a fair price for their midday meal. Whether the charge of 8d. was not too high was a question. He thought it was; and that Mr. Riddle would find that price detrimental to the success of his scheme.

Mr. Riddle remarked that Mr. Corbet gave a dinner for 4d., but he (Mr. Riddle) had mentioned the arbitrary sum of 8d. for a dinner of a totally different kind. In Mr. Corbet's charge were included the furnished rooms, waiters, table-cloths, knives and forks, wear and tear of plant, breakages, &c. These he (Mr. Riddle) put against the expenditure involved in the system of distribution. Further, with regard to the charge of 8d., he could say he did not contemplate going to a very low class of the population at the outset. The system might ultimately be extended to reach the means of the very lowest classes, but he did not think it would do to go to them at first. They did not go to the lower class for fashions; these came from the higher classes, and they must get the intelligent classes to recognise this project before they could get the uneducated classes to adopt it at all. The lower and most uneducated classes were at the present time—as in all periods of our history—naturally suspicious of any new thing; and if a project were started on a large scale for supplying them with food on a plan similar to this, there might be a suspicion that public aid was given, either by the Government or from some other source, and with the natural independence of Englishmen they would be apt to reject it altogether. He was well acquainted with Islington, and he knew scores of instances in which this particular project would be very serviceable. He was told a few days ago of a large establishment for the manufacture of artificial flowers, where the females employed took their dinners with them, and either ate them cold or got them warmed in the best way they could. If they could take dinners to such persons as these ready cooked for eating, he conceived that it would be a great advantage. He repeated he had put down the sum of 8d. for such a dinner as he proposed to give, and he thought they could hardly give a good and satisfactory dinner of roast or boiled meat, of good quality and plenty of it, good pudding, and a good quality of vegetables, for a less sum than that. If, however, the price were reduced to 7d., as possibly it might be, the projectors must be content with less profit, but at the charge he had stated the profit came out as he had calculated it. As to the parties going to dining-rooms, as at Glasgow, that was out of the question, because the people to whom his system would most apply were the families of those who were engaged in daily occupations away from their homes, and the mother could not take her children to a dining-room every day for their meals.

Mr. Charles Hart said the Society was indebted to Mr. Riddle for having brought this important subject before them so much in detail. Upon the probable success of the project he would not offer an opinion, but it was obvious that the people required to be educated to it. He was glad to hear that it was not proposed to confine the price to 8d., but that figure was mentioned as leaving a profit to the concern of some £3,000 a year, which might be an inducement to people to invest money in it. He had personally tested the Glasgow dinners, and could

state that they were very good for the money, and the general arrangements were most satisfactory. He thought this project commended itself to the support of all well-wishers to their fellows. It would supply a great want of the present day, and, if it proved a success amongst the class to whom it was proposed to apply it in the first instance, it might probably be extended to a still lower class of the people, to whom it would be of the greatest value.

The Chairman said, whatever difference of opinion obtained in the meeting on the subject before them, the Society always felt indebted to gentlemen who occupied themselves in giving useful information on any subject of public interest, and he was sure they would all accord their hearty thanks to Mr. Riddle for the paper he had laid before them. Before putting this motion, there were one or two points which he would briefly notice. Many years since he was asked to meet the late Dr. Lardner, at an extensive building erected on the Thames Bank as a baking establishment, but that proved a failure. They did not attempt to send out any cooked food; they only proposed to supply bread to different parts of London, and those who had that bread could not get their victuals baked for them by the bakers of the locality. Perhaps of all things in which the poorer classes were most deficient, that of the proper dressing of food was the greatest. In France the labouring population succeeded better in this respect. By means of the universal *pot-au-feu* a very savoury and good soup or stew was readily concocted; but out of Spitalfields, perhaps such a thing did not exist in this country. Therefore, to improve the means of cooking food, for those classes who do not possess adequate appliances of their own, would be to effect a great good, and, if the proposed scheme was successful, it might be extended to meet the requirements of a lower class of society still. The whole question turned, as he suggested in the first instance, upon the practicability of delivering the food on the plan proposed. It would be a pity, in starting the scheme, to start it in a neighbourhood where there was not a fair probability of obtaining sufficient customers. It was shown by what had been done at Aldershot that, to a certain extent, this plan was practicable, and had been successful. It had also been shown that Mr. Corbet's system in Glasgow was eminently successful, but it was only right to mention that a similar system attempted in London had failed, probably from not having a Mr. Corbet to manage it. If it was thought that the details of this plan were numerous and lengthy, it should be borne in mind that upon the completeness of the details the success or otherwise of the whole scheme depended. He was sure they would join him in a vote of thanks to Mr. Riddle for his paper.

The vote of thanks having been passed,

Mr. Riddle offered his acknowledgments for the patience with which the lengthy details of his project had been listened to by the meeting, but, as the chairman had said, the value of the scheme entirely depended upon its details. With regard to the point as to the time to be allowed for delivery at each house, probably Sir Rowland Hill would be able to tell them what the average time was in the delivery of letters. It was certain that the postman delivered a great many letters in a short time, and he thought 45 seconds was not too short a time for answering a call; it was often that a knock was answered more quickly than that.

SCIENCE SCHOLARSHIPS.

The following important minute, establishing local scholarships for science throughout the country in elementary and other schools, has lately been issued:—

At Whitehall, the 21st day of December, 1867, by the Right Honourable the Lords of the Committee of Her Majesty's Most Honourable Privy Council on Education. Present—His Grace the Duke of Marlborough, Lord President of the Council; the Right Hon. the Lord Robert Montagu, M.P., Vice-President of the Committee of Council on Education.

Scientific Instruction.—Local and Central Scholarships.

My Lords consider the subject of scientific instruction with a view to its further encouragement and diffusion.

1.—They refer to the Science Directory of the Science and Art Department, and to the minute of the Education Department of the 20th February, 1867, making additional grants for secular instruction to elementary schools.

2.—In order to assist the artisan classes who may show an aptitude for scientific instruction, my Lords resolve to aid local efforts in founding scholarships and exhibitions. The scholarship is intended to maintain the student while remaining at the elementary school, and the exhibition to support him while pursuing his studies at some central institution where the instruction is of a high grade.

3.—*Local Scholarships.*—These are of two kinds, the elementary school scholarship and the science and art scholarship.

4.—*Elementary School Scholarships.*—The Science and Art Department will make a grant of £5 towards the maintenance of a deserving student to the managers of any elementary school who undertake to support him for one year, and subscribe also at least £5 for that purpose.

5.—*Conditions.*

a.—With any number of scholars up to 100 on the register of the school there can be but one such scholarship; above 100 and up to 200 two scholarships, and so on for each 100.

b.—The scholarship must be awarded in competition to the most successful student or students in some examination of the school. The absolute terms of the competition and the award of the scholarship will be left to the managers of the school, subject to the approval of the Science and Art Department.

c.—The scholar must be an artisan or poor student, as defined by the Science Directory, and be between 12 and 16 years of age.

d.—He must not be the teacher, pupil-teacher, or other paid servant of a school.

e.—He must continue regularly to attend the day school and—

f.—Pass in some one or more branches of science at the succeeding May examination of the Science and Art Department, after which the Department grant of £5 will be paid.

6.—These grants will be made from year to year on condition that the student each year pass in a new subject or in a higher grade of the same subject in which he first passed. It will be for the locality to determine for how many years the student may hold the scholarship, but in no case can he be allowed to hold it for more than three years.

7.—The Science and Art Department will hereafter consider such alterations in these conditions as appear necessary.

8.—*The Science and Art Scholarship.*—The Science and Art Department will make a grant of £10 towards the maintenance of a student at an elementary school who has taken a first grade in freehand or model drawing and elementary geometry (see Art Directory), and passed in one of the subjects of science (see Science Directory).

Note.—By elementary school is understood any school where elementary instruction is given, whether aided by the State or not.

9.—*Conditions.*

a.—With any number of scholars up to 100 on the register of the school there can be but one such scholarship; above 100 and up to 200 two scholarships, and so on for each 100 scholars.

b.—The scholarship will be awarded to the most successful student or students in the school.

c.—The scholar must be an artisan or poor student, as defined by the Science Directory, of between 12 and 16 years of age.

d.—He must not be the holder of an elementary scholarship, the teacher, pupil-teacher, or other paid servant of a school.

e.—He must continue regularly to attend the day school, and—

f.—Obtain at least a third class in the same subject of science in which he had already passed, or pass in some other subject.

g.—In each year of holding the scholarship he must pass either in a higher grade of the same subject or in a new subject.

10.—*Local Exhibitions.*—The Science and Art Department will make a grant of £25 per annum to the managers of any school or educational institution, or any local committee formed for the purpose, who will raise the like sum by voluntary contribution for the maintenance of a student at some college or school where scientific instruction of an advanced character may be obtained. The exhibition may last for one, two, or three years.

11.—*Conditions.*

a.—The exhibition must be awarded in competition in one or more branches of science at the May examination of the Science and Art Department. The managers may select any branch or branches of science for the competition, and if more than one be taken, they may fix any relative amount of marks they consider best to assign to them.

b.—The place where the student is to pursue his studies may be fixed by the managers, subject to the approval of the Science and Art Department. If a government institution be selected, such as the Royal School of Mines or Royal College of Chemistry, London, or the Royal College of Science, Dublin, the fees of the student will be remitted.

c.—The exhibitioner must be of the artisan class or poor student, as defined by the Science Directory.

d.—The grant of the Department will be paid from year to year, on condition that a like payment has been made by the managers or local committee, and that the student has pursued his studies satisfactorily, according to regulations fixed by the Department.

12.—Transmit a copy to the Treasury, and request sanction to provide in the estimate for the increased expenditure likely to be occasioned by this minute.

TECHNICAL INSTRUCTION AND METROPOLITAN PUBLIC SCHOOLS.

The following copy of a letter from Mr. Ayrton, M.P., addressed, some time since, to the President of the Council, respecting Metropolitan Public Schools, has recently been published:—

To the Right Honourable Lord Granville, President, &c. &c.

My Lord,—I avail myself of Mr. Bruce's suggestion to place before you in writing my views respecting the Metropolitan Public Schools, which have recently been the subject of inquiry. As you have doubtless read the Report of the Royal Commission on these schools, I will only notice very briefly the leading facts which are there set forth at length.

1. Westminster School has no separate endowment, but is maintained at an expense of about £2,000 a year out of the funds of the Dean and Chapter of Westminster, which now amount to £60,000 a year. The school buildings and playground are provided free. The school is a mixed boarding and day-school. About 130 boys receive a classical education, 40 of them being also maintained. These 40 boys pay £17 17s. a year for their education, the others £26 5s., and those who board pay £68 5s. a year in addition.

2. St. Paul's School is supported by an endowment vested in the Mercer's Company, now producing a gross income of £9,500 a year, which will in a few years be greatly increased. The school buildings are free. It is exclusively a day-school, at which 153 boys receive a classical education without payment.

3. The Charter-house is maintained out of the endowments vested in the governors, amounting to about £22,700 a year, of which about one-half may be applied to the purposes of the school. The buildings and playground are also provided free. It is a mixed boarding and day-school for a classical education; 44 boys are maintained and educated free, and the other boarders at a charge of £80 to £90 a year.

4. The Report notices the great difference between public schools in London and in provincial towns, but without entering fully into all the circumstances, and arrives at this conclusion:—"Archdeacon Browne is of opinion that in order to maintain a large school in London, it must be made principally a day-school, and that everything must be sacrificed to the day-school principle. We are disposed to concur with him in this opinion, and to deduce from it the conclusion that as day-schools are what London principally wants, the course which would be most for the interests of London would be to improve and enlarge the schools which are to be treated as day-schools, and to remove the boarding-schools to a distance."

5. Nevertheless, the Report, instead of treating the question of Metropolitan Schools in a comprehensive manner, as a separate question, on the basis which it rightly suggests as the true one, mixes up the Metropolitan and Provincial Schools in its general recommendations, without distinction. Had the Commissioners fully investigated the grounds of the importance of day-schools in the metropolis, it would have been made apparent why they are so much desired. I will only notice those grounds shortly.

6. In London there is a very large professional class, and also a very large class of residents, who desire to qualify their sons for professional and other intellectual pursuits; but the professional class consists, to a great extent, and the other class to a much greater, of persons unfortunately possessed of very limited means. They are compelled to keep up a certain establishment at a much greater expense relatively than in provincial towns or in the country; they cannot contract and expand this establishment as their children may be absent or at home. Thus the cost to them of their children at home is mainly the expense of the additional food, and even this extra expense is in some measure compensated for by their being able to keep a more comfortable table. A comparison of all the heads of expense would show a considerable balance in favour of children living at home, even as compared with boarding at the cheaper schools. But it would seem from the facts stated in the report, that the cost of maintaining pupils as boarders at the public schools is so great, or the charge for it so high, that none but the more wealthy can afford it. In addition to the sum charged for boarding at school, there are contingent expenses of a considerable amount.

7. The number of persons in the metropolis to whom these remarks apply cannot be easily estimated, but I believe it amounts to many thousands; and the question I now wish to submit for your consideration is, whether it is not desirable to deal with the public schools in the metropolis in a manner which will best meet their case.

8. There are not only all the great public schools, but there are numerous other grammar schools in all parts of the metropolitan counties, some of them, like Tonbridge, well endowed, which can be resorted to with great facility. Many of them admit of considerable extension; and they may be regarded as sufficient to satisfy the wants of those who can afford to send their children to boarding-schools. No necessity exists for adding to the number of endowed boarding-schools in the provincial towns or rural districts.

9. After making due allowance and deduction from the gross amount of the endowments, every one must be

struck with the slight impulse given to education, and the trifling results which accrue from the large resources of the public schools in question. The increase of their endowments is chiefly due to the great increase of the metropolis, but no attempt has been made to improve their establishments in the manner best calculated to meet the wants which have been created by that increase. The fact that such institutions as King's College and London University Schools have been established by voluntary support, and have been eminently successful, is a cogent proof, no less than the City of London School, both of the nature of the want and of the propriety of the reform which I venture to suggest.

10. Unfortunately these unendowed schools, like Cheltenham, and all similarly formed institutions, are compelled to resort to the practice of affording a diversified education, because they are obliged to humour the wishes of their various supporters. At the same time they have not resources enough to provide separate schools for the rival claims of those who want classical, and those who prefer what is called modern education. It is only by taking advantage of the resources of endowments that this unwholesome tendency may be combated, and a sounder system introduced.

11. The amount charged to students in these new institutions is but little more than the average of that paid at Westminister. This shows how little the public benefit by the present system at the great endowed schools

12. Already attempts to deal with this question piecemeal have been begun. The Trustees of the Charterhouse propose to submit a Bill of their own next session. Considering the relations of the Ecclesiastical Commission to the cathedral funds, we may expect some further isolated arrangements respecting the endowment and management of Westminster School. But if regard be had to the enormous increase of these funds, may it not be fairly asked whether the school is not entitled to some share of the increase, which is admitted to be beyond the ecclesiastical requirements of the cathedral?

13. I would propose that all the three London Schools shall be dealt with in a comprehensive manner, with the view of providing day-schools of the highest order.

14. In treating of the nature of the education which should be carried on in the public schools, the report directs attention to the question of modern education, and suggests that various subjects should be grafted on the scheme of classical education now prevailing in the grammar schools. This suggestion is entirely at variance with the views contained in Mr. Gladstone's letter, which clearly points out the dangers and evils likely to flow from this kind of rivalry between two systems of education when brought into conflict in the same school.

15. Whilst the evidence shows that the majority of the pupils are unable, within the limits of the ordinary school opportunities, to compass a moderate education in the two dead languages and mathematics, the report proceeds on the assumption that boys possess an almost unlimited capacity for learning. It assumes that the schools are maintained for the benefit of the few who are gifted with remarkable genius and ability, instead of the many of average intelligence, while not a few are below the average.

16. The introduction of more than one system of instruction into a school appears to me to be an arrangement which may be excused as a misfortune when the necessity for it exists, but which should be carefully avoided as an evil when the necessity can be obviated by a more suitable management.

17. In the metropolis the number of boys requiring different kinds of education is so great that there would be no difficulty in filling many schools of different kinds, if the schools were the best adapted to their circumstances, and were conducted in such a manner as to inspire the public with confidence that they were the best of the kind.

18. Instead of attempting to teach anything and everything in one school, I should propose to divide education into two entirely separate systems, to be carried on in separate schools—the one the existing classical system, and the other the modern system. I need only remark of the former, that I do not now propose to modify it, for any improvement of which it may be susceptible would not be peculiar to the London schools.

19. I do not, however, use the term "modern education" in the sense in which it is so often understood, as mere instruction in modern knowledge, for I see no reason why education should not be conducted on the basis of modern languages with as much accuracy, mental training, and discipline, and with as much regard to all branches of literature, as on the basis of dead languages. Whether English, together with French, German, or any other living language, should be taught, or after one language has been partially acquired, the study of another should be begun—as Greek is commenced after some progress has been made in Latin—are questions of detail to be determined on a careful consideration of many matters which it would be premature to discuss.

20. Admitting that the language and literature of Europe are not in some respects equal to Latin or ancient Greek, the real question is whether any living language, coupled with our own, is a sufficient medium for literature, moral, and æsthetic education. Living language will at least possess this advantage, that its cultivation will be kept alive amongst the classes for whom it is proposed, whilst the dead languages would be buried and forgotten.

21. If a foreign language be taught by educated Englishmen, as I think it should be, it may be objected that it would be learnt with an imperfect pronunciation. But a dead language is learnt with a pronunciation so widely different from that with which it is supposed to have been spoken, that a Roman would have failed to understand the Latin, and an Athenian would have never recognised the Greek uttered in the English schools. It would require no intellectual effort at any time afterwards to correct the defective pronunciation of a living language.

22. Natural science should also be made a basis for the education of the faculties of perception, discrimination, reason, and judgment. It is easy to guard against the degenerating of such an education into the mere acquisition of information, if the beginning be made with inorganic chemistry and the laws of physics, to be taught with precision, and the course ascend to the rigid investigation of physical phenomena and problems.

23. To these studies might of course be added the higher arithmetic and pure mathematics, which, again, could be made the basis of a considerable degree of education, if they were so treated in the schools, instead of being regarded as a kind of adventitious accomplishment, to be acquired at the pleasure of the pupils or in an unsystematic manner.

24. According to my idea, therefore, a modern school is one in which modern language, mathematics, and natural science would be the basis or medium of exact education, and in which the course would be pursued as high as the age of attendance would admit.

25. The study of drawing would in many cases be a necessity rather than an accomplishment, and considerable allowance of time would have to be made for other special acquirements not forming part of the school course of education.

26. I need not advert to religious instruction, as it would continue in the new schools on its present footing.

27. Without doubt, in the metropolis, there are thousands of persons who would be glad to send to such a day school children whose education is at the present time miserably conducted, and, indeed, thrown away, between equally imperfect efforts to pursue a classical

and modern education in combination, within the period of time during which they are able to be maintained at school.

28. The industry and commerce of the country are, I think, actually suffering from a want of knowledge of modern languages amongst the commercial, and of science amongst the manufacturing classes. But if, year by year, a few hundreds of youths could be received into English counting-houses thoroughly instructed in modern languages, and into English factories thoroughly imbued with natural science and mathematics, who would in time rise to be the directors of commerce and industry, a great want would be supplied, and a very great service would be rendered to the whole community.

29. Considering the care that is now bestowed on modern education on the Continent, it is a subject of grave concern whether foreign merchants and manufacturers are not obtaining advantages over our own from their better knowledge of modern languages, and of the principles of natural science and mathematics. In what proportion travelling agents abroad are foreigners, it is difficult to estimate, but the foreign houses established in England for the purposes of carrying on our commerce not only spread themselves through the interior, but constantly increase in numbers; we are frequently surprised at the great progress that is made abroad in various arts and manufactures, due to the science of those by whom they are conducted. It is time that some public effort should be made to place our commerce and industry on an equal footing in respect to education with that of foreign nations. This question concerns not merely the merchant and the master manufacturer, but the millions who are dependent upon the intelligence with which their affairs are conducted. It may be thought that this is an exaggerated view of the subject, but it is better to err on the side of improvement and progress than of indifference and stagnation.

30. Each system of education is not only desired by thousands of persons who have different objects in view, or belong to different classes, but these classes are for the most part grouped together in different parts of the metropolis. West of Charing Cross and the British Museum, the desire for classical education would prevail, while east of that line and on the southern side of the Thames, modern education would be preferred.

31. I would therefore propose that advantage should be taken of the opportunity of reforming the London public schools to deal with them in a comprehensive spirit for the purpose of promoting education in the metropolis. Without now inviting assent to any particular plan, I suggest one rather by way of illustration, in the hope that suggestion and discussion may lead to the development of some scheme which may meet with general approbation.

32. Instead of the funds being employed, to gratify a love of patronage, in the formation of free schools, I would suggest that they should be expended in the solid establishment of schools, and that each boy should pay a moderate sum for his education, until, by the exhibition of superior merit, he became entitled to a free scholarship in the school. The scholarship would then operate as a stimulus to parents to send their children to the schools, and to the boys to obtain it. The effect would thus be much greater than the mere limit of its money value, and the funds would admit of a large expansion of the schools.

33. I consider that the endowments would be sufficient to establish at least six schools, which I should distribute as follows:—

St. Paul's School would remain as at present a central classical school.

The Charter-house would remain as a central modern school.

Westminster would remain as a classical school for the rapidly-increasing district of the south-west.

Another classical school should be founded in the north-west as a branch of St. Paul's.

One modern school should be founded in the north-east, and another modern school on the south-east—that is, on the south side of the Thames—as branches of the Charter-house.

Thus, whilst the general requirements of each district were provided for in its local school, those residents in the district who might desire the other system would be accommodated as far as possible in the central school of that system.

34. A further stimulus might be given to these schools by extending competition for the scholarships to the students of all the schools on the same system.

35. The number of scholarships and fellowships at the universities which have now been thrown open to all students is so great that there seems to be no necessity for appropriating any portion of the school funds to the maintenance of scholars there, which is, in fact, only upholding the evil practices which it was the object of university reform to abolish. At all events, considering the very small number of boys who are in the higher class of a public school, the number of scholarships should be very limited, and should only be granted when a high standard of merit is attained.

36. The report also questions the suitableness of the present governing bodies of the schools, but I think fails to suggest any adequate remedy. If the London schools were treated separately, the means of providing a more active supervision over their educational arrangements could be readily found in the university of London, whose council, being expressly constituted for the purposes of supervising education, could readily undertake the duty of assisting the trustees in the performance of their duty to the public. It would be premature to discuss the precise manner in which this suggestion could be carried out, and, indeed, my present object is not to mature a plan, but to urge the prosecution of further inquiries to ascertain what could be accomplished.

37. I have purposely abstained from noticing Mr. Hare's able report on the Blue Coat School, because it involves very different considerations from those which I have here entertained. That school not having been established for the purpose of giving high education, but for the purpose of educating and maintaining poor children, I regard it as nothing more than an establishment like the orphan asylums. Indeed, it would seem to have been intended to meet the want which is now completely provided for by the separate schools maintained out of the poor-rates. The original purpose of the charity having ceased, the governors have applied its funds for the relief of the poor of the trading and professional classes. This institution might serve a very useful purpose in relieving real cases of distress amongst this class, if the funds were properly administered. I do not suggest that they should be still further misappropriated for the purpose of educating those for whom a gratuitous education is not necessary.

38. I hope, therefore, that the Government will not proceed with any measure which may treat all the public schools on the same footing, but that they will regard metropolitan schools as entirely distinct in their character and circumstances from the others, and will acquiesce in whatever course may be deemed desirable for the purpose of legislating for them in a comprehensive spirit.

39. It had occurred to me that a Committee of the House of Commons might be appointed to take the report of the Commission into consideration, so far as it relates to the metropolis. There is the more reason for adopting this course, as metropolitan views were in no degree represented in the Commission, but in the House of Commons there are several metropolitan members who are peculiarly well qualified to investigate and report on the subject, which they would approach with a due sense of responsibility.—I have, &c.

(Signed) ACTON S. AYRTON.

11, Bolton-street,
January, 1866.

Commerce.

The Comacchio Fishery.—The lagune of Comacchio, similar to those of Venice in their mode of formation, occupies an extensive area between the Pô di Volano on the north, and the Pô Primaro, or Reno, on the south, and is separated from the Adriatic by a long sandy spot. This lagune, which is about two hundred and thirty miles in circumference, contains forty basins, surrounded by embankments, each communicating with the sea. These lagunes have from time immemorial been celebrated for their fisheries, consisting principally of eels and grey mullet, which form an important branch of commerce throughout Italy. Each basin is under the superintendence of a chief or factor, who has several men under his orders, the whole forming a staff of about four hundred men, who are embodied and under discipline as on board ship. These men pass their time in fishing, and salting the fish that they are unable to sell fresh. By means of a most ingenious system the rivers which encircle the lagune, at a certain season of the year (the 2nd February) are allowed to flow in till the end of April, when the sluices are closed, thus introducing the young fry which ascend these rivers from the sea, and take shelter in the basins; this period is called *la montata*. The fish are allowed to increase in size. The fish do not attempt to escape until they are full grown, when the same instinct which has caused them to take shelter in the basins impels them to attempt to go back to the sea; this is called *la discessa*. The fishermen, taking advantage of their habits, place their nets so as to take the fish in quantities. These attempts at migration take place during the months of October, November, and December, and especially during the darkest nights. The fish taken in this manner are sent to the town of Comacchio, where they are sold to traders, who fill the wells of their boats with them, and take them up the Pô and Ticino. Those which are not sold are cured on the spot, and exported to every part of Italy. In 1865, the quantity of fish taken in the lagune of Comacchio was 9,595 last, weighing 371,570 kilos (370 tons), of the value of 323,988 frs. (£12,960); to this must be added the quantity of fresh fish sold, amounting to the weight of 123,082 kilos (121 tons), of the value of 57,536 frs. (£2,301). The contrivances for enticing the young fish, and for retaining the old from returning to the sea, are very ingenious, and have been described by Tasso and Ariosto—

> " Come il pesce colà, dove impaluda
> Ne' seni di Comacchio il nostro mare,
> Fugge dall' onde impetuosa e cruda,
> Cercando in placide acque, ove ripare.
> E vien, che da sè stesso ei si rinchiuda
> In palustre prigion, nè può tornare;
> Chè quel serraglio è con mirabil uso
> Sempre all' entrar aperto, all' uscir chiuso."
>
> *Gerus: Lib: vii.* 46.

Ariosto calls Comacchio

> " La città, che in mezza alle pesce
> Paludi del Pò teme ambe le foci."
>
> *Orl: Fur: iii.* 41.

Commerce Between France and Switzerland.—The commerce between France and Switzerland has considerably increased during the first nine months of the past year as compared with a similar period of 1866. This is in a great measure due to the Treaty of Commerce between the two countries. In 1866 the total value of the exports from Switzerland to France amounted to 29,409,000 fr. (£1,176,360), and in 1867 to 52,267,000 fr. (£2,090,680), showing an increase of 22,858,000 frs. during nine months. Of this, 10,000,000 of francs represent the increase in the exportation of cattle; the export of cheese has increased from 3,025,000 frs. to 5,700,000 frs.; silk, from 9,227,000 frs. to 18,557,000 frs. There has been a falling off of 1,360,000 frs. in exports of timber. The exports of jewellery in 1867 amounted to 1,368,000 frs. The imports from France to Switzerland amounted, during the first nine months of the past year, to 149,148,000 frs., showing an increase of 27,000,000 of francs on those of 1866. The principal items of this amount relate to silk, the value of the imports of which have increased from 20,008,000 frs. to 32,902,000 frs.; cotton and wool, from 15,267,000 frs. to 23,881,000 frs.; silk stuffs, from 21,841,000 frs. to 37,554,000 frs.; tallow and fatty substances, from 572,000 frs. to 1,250,000 frs.; refined sugar, from 3,958,000 frs. to 4,835,000 frs. The falling off has principally been in the cereals, the importations of which have decreased from 8,086,000 frs. to 1,681,000 frs., in consequence of the insufficiency of the harvest in France. The imports of wines and spirits have also fallen off from 15,800,000 frs. to 10,189,000 frs. A great part of the raw silk, cotton, and wool imported by Switzerland is not of French origin, but comes merely through France to supply the Swiss manufacturer. From this it appears that although the exports from Switzerland to France have increased about 50 per cent., the imports from France to Switzerland have not increased more than from 5 to 6 per cent. in the same period. Thus the international trade of Switzerland with France has a tendency to import less and export more.

Colonies.

General Colonial Statistics.—The official returns of the colonial office give the following statistics of the several British colonies and dependencies:—

	Area. Square miles.		Population.
India, British........	956,436	....	144,948,356
,, Native States..	596,790	....	47,909,100
North American Colonies	632,631	....	3,701,461
Australasia..........	2,582,072	....	1,599,580
British West Indies ..	88,683	....	1,097,627
Cape of Good Hope and Natal	119,328	....	425,767
Ceylon..............	24,700	....	2,049,728

Other colonies with the above bring up the total area to 4,427,232 square miles, and the population to 154,810,787. The public revenue of these vast possessions in the year 1865 was nearly £63,(00,000. The public debt is not quite £140,000,000. The tonnage entered and cleared in 1865, exclusive of the coasting trade, was about £26,000,000. The imports into these colonies in 1865 amounted to £128,375,053, and the exports to £141,368,102. The wool exported from these colonies amounted to £12,234,580; raw sugar, value £7,158,163; coffee, £3,308,963; wood, £3,877,530; fish, £1,668,260; and the cotton from India alone was valued at £37,573,637.

Lead in Queensland.—It is stated on good authority that a lead mine has been discovered in the Burnett district, the ore of which yields a sufficient proportion of silver to make its working a profitable pursuit. The distance of the mine from port is about 100 miles. The discoverer has, in combination with others, some of whom have capital, applied for 160 acres.

Forthcoming Publications.

Modern Screw Propulsion. By N. P. Burgh, Engineer. *(E. and F. N. Spon.)*—This work will be published in fifteen monthly parts, demy 4to., price 2s. each part. (Part I. to be ready on the 1st of February.) The leading engineering firms of England and Scotland have combined in sending to the author valuable information, with examples of screw propellers of their latest practice hitherto published. The plates are copied from the working drawings lent for that purpose. The proportions are fully dimensioned and the details are fully depicted as completely as required for practical construction.

Notes.

TELEGRAPHY IN ITALY.—During the third quarter of last year, viz., from 1st of June to 30th September, the amount received for telegrams throughout the kingdom of Italy was 1,028,509 francs 10 cents. (£41,140), of this 155,554 francs 40 cents. was paid by foreign telegraph companies for messages sent to Italy; 165,283 francs 16 cents. for foreign dispatches in transit; 545,742 francs 72 cents. for dispatches for the interior; 133,004 francs 32 cents. for foreign dispatches, and 28,924 francs 50 cents. for various dispatches. The offices which sent the greatest number of dispatches were those of Florence, for which was received 104,851 francs 36 cents., and Turin, which received 102,076 francs 92 cents.; and the office which received the least was that of Cagliari (Island of Sardinia), only 15,960 francs. The Government dispatches, sent free, would, according to the tariff, represent 158,026 francs 35 cents., of which the largest share, naturally sent from Florence, would represent 157,045 francs. The total amount received during the first nine months of last year, that is to say, from the 1st of January to the 30th September, was 3,023,009 francs 79 cents. (£120,920), a decrease on the receipts, during the corresponding period of the previous year, of 1,689 francs 18 cents. (£67 10s.).

ITALIAN RAILWAYS.—The total length of railways in Italy amounted, on the 1st July, 1867, to 4,950 kilometres, including the 21 kilos. of horse tramway, from Settimo, near Turin, to Rivarolo; and, with the 258 kilometres belonging to the Roman States, the total length of the railways in the whole Italian peninsula is 5,310 kilometres. The total receipts of the various railway companies throughout the kingdom during the first six months of the past year amounted to 36,362,441 fr. 17 c. The following are the receipts of the principal lines:—

	Francs.
Upper Italian railways	24,235,847·59
Roman Railway Company......	7,302,660·29
Southern Railways	4,018,707·69
Victor Emanuel, or Calabro-Sicule Railway	556,736·73

The greatest annual receipts, in proportion to length opened, were those of the Central Italian Railway (Piacenza to Pistoja), namely 28,205·76 frs. per kilometre, and next the Piedmontese lines, 21,322·85 per kilometre. The line of which the receipts were the least, in proportion to length, was that from Reggio (Calabria) to Lazzaro (Victor Emanuel Railway). Compared with last year, the receipts per kilometre are less, with the exception of the line from Ancona to Orte; this is due to the opening of the line to Orte connecting it with the railway in the Roman States. The greater receipts during the previous year are no doubt owing to the great traffic during the late war, and to the cholera and financial crisis during the past year.

POSTAL STATISTICS OF ITALY.—The Government have the exclusive right of the conveyance of letters in Italy. The rate of inland postage, formerly of 15 cents., has been raised to 20 cents. on letters weighing less than 10 grammes (0·35 oz.), and great facilities are also afforded newspapers and other periodicals, which are transmitted throughout the kingdom for 1 cent. under 40 grammes (1·41 ozs.). The number of post-offices in Italy, up to 1st Jan., 1865, was 2,416, including 11 railway post-offices, and four offices on board steamers, of which two are on lakes and two on the sea. In 1865, 67,481,155 letters were posted, of which 60,557,610 were stamped, and 6,136,894 unstamped, 757,949 registered, and 30,702 insured, for the amount of 35,170,391 frs. (£1,406,815 12s.). The number of letters free of tax amounted to 28,669,472; printed periodicals, to 53,066,188; other printed matter to 6,321,337. The number of money-orders *(vaglia)* issued for inland payment was 2,900,958, amounting to 155,584,799 frs. 39 c.; the number of money-orders sent abroad was 32,732, amounting to 2,106,431 frs. 89c., whilst the number of foreign money-orders paid in Italy was 36,023, amounting to 1,953,537 frs. 49 cents. The number of postage-stamps sold in 1865 was 81,903,543, for the amount of 11,251,512 frs. 85 c. (£450,060 10s. 8½d.). The total receipts of the Post-office amounted to 14,527,562 frs. 60c. (£581,102 10s. 4d.). In 1864 were sent into the Venetian provinces 8,853,373 private letters; 2,139,826 official letters; 213,512 book packets; 1,823,315 newspapers, 54 express private dispatches, and 168 government dispatches were sent. The amount of money sent by the Government was 11,363,925 frs.; and 166,378,210 frs. for private individuals. 763 passengers were carried by the mail conveyances.

STREET NAMES IN PARIS.—The following are amongst the names given to streets recently opened, or now in course of being formed:—Aubigné, Bellay, Santeuil, Abbé La Salle, de Vigny, Andrieux, Treillhard, Meyerbeer, Glück, Rochambeau, Magnan, Dieu, Véronèse, Primatice, Philippe de Champaigne, Nansouty, Broussais, Excelmans, Isabey, Mozart, Mignard, Hamelin, Ornano, Custine, Championnet, Montcalm. It will be perceived that they are principally those of artists, writers, and musicians.

Correspondence.

THE MANUFACTURE OF FLOUR BY M. MÈGE MOURIÈS.—SIR,—This gentleman has suggested a beautiful theory of the structure of a grain of wheat, and developed that theory practically, on a large scale, with great ingenuity. M. Mège Mouriès does not seem, however, to be fully aware of the perfection with which corn is ground in the ordinary way, so as to produce the whole of the white flour contained in the grain without any contamination by browning matters. That gentleman is also in error when he states that, with the exception of the pure white, all the remainder of the grain is devoted to animal food, for every English miller can show that the offal used for that purpose contains no flour, either white or brown. We in England are are not quite so much prejudiced in favour of white bread as they are in France, and brown bread is much in demand, notwithstanding a prevailing idea that brown bread may, perhaps, owe its colour to the admixture of improper materials. It is, moreover, a recommendation from the highest medical authorities not to make use of white bread continually, but to take brown bread occasionally, or, in other words, that the use of white bread entirely is not conducive to the best health. In fact there are many peoples, even in Europe, who live and thrive upon black bread alone. It is also a mistaken idea that bran is of the nature of straw, and therefore contains no nutriment, for it is well known in all countries that bran alone will keep animals in good condition, which straw will not. English millers produce fine white flour by a most careful dressing of the faces of the stones, both the upper and the lower having the same cutting qualities. But other millers arrive at the same end more easily by using a bedstone of hard porcelaneous limestone, possessing no cutting qualities whatever. For the runner they choose a hard, sharp kind of granite, or other very hard stone that may possess the requisite cutting qualities well developed. By such means the coats of bran are spread out, as it were, and all the flour cleaned off. This operation is further promoted in powerful mills by the use of heavy runners, of great specific gravity, four feet two inches in diameter, and from sixteen to eighteen inches deep, or about a ton and a-half of solid stone. I have seen twelve bushels ground within the hour by one pair of stones, producing the finest flour, not over heated, and beautiful clean bran, not at all torn; but the power applied would drive an English millhouse into palsy. This work cannot be performed in English mills, partly from want of sufficient power, but more on account of the

runners being mostly made up of plaster of paris and brickbats, having altogether much less specific gravity than solid stone. The flour or meal is kept sufficiently cool at high speeds by dressing the runners very hollow, especially towards the eye, so that only about six or eight inches, measured radially from the circumference, does the real work of grinding, and plenty of cool air is necessarily drawn in. The additional precaution is also adopted of having no box-hoop covering over the runner, and using instead a light, open, upright hoop to confine the flour. The Bovill patent, the subject of innumerable lawsuits, intended, by means of blowing and exhausting apparatus, to remove the stive, is a useless piece of absurdity, calculated to increase the evil, and besides consuming a large amount of power, may, perhaps, afford the means of adulterating the flour with matters that ought not to be in it. Indeed, it may be said generally that in English mills a small portion only of the driving power is applied to the actual grinding, the remainder being consumed in driving many accessories, and friction. It is no argument in favour of this new process that it has been carried out on a large scale, because a new idea is always seized upon with energy in France, which is by no means the case with us—witness the decorticating process, now acknowledged to be a total failure. It may be within the recollection of some of your readers that a few years ago two French professors of the art of making bread came to England, in order to teach our bakers to make thirty or forty more loaves, of due weight, out of one sack of flour, than was usual in the trade. But the mystery was most successfully exploded by the practical lectures on this subject given by Professor Pepper in the Royal Polytechnic Institution.—I am, &c., Henry W. Reveley.

1, Baker-street, Reading.

MEETINGS FOR THE ENSUING WEEK.

Mon......Society of Arts, 8. Cantor Lectures. Dr. Letheby, "On Food."
R. United Service Inst., 8½. Major Fosbery, "On Explosive Bullets, and their application to Military Purposes."
British Architects, 8.
Medical, 8.
Asiatic, 3.
Victoria Inst., 8.

Tues ...Civil Engineers, 8. Renewed discussion upon "The Victoria Bridge," by Mr. Wm. Wilson; and "New Railways at Battersea, with the Widening of the Victoria Bridge," by Mr. Chas. Douglas Fox.
Statistical, 8. Mr. R. Dudley Baxter, "On National Income."
Pathological, 8.
Ethnological, 8.

Wed ...Society of Arts, 8. Mr. W. Hawes, Chairman of Council, "On the Reports of the Artizans selected to Visit the Paris Universal Exhibition of 1867."
Geological, 8.
R. Society of Literature, 8½.
Archæological Assoc., 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.
Mathematical, 8.

Fri.......Royal Inst., 8. Professor Tyndall, "On Faraday as a Discoverer."
Quekett Microscopical Club, 8.

Sat ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

Patents.

From Commissioners of Patents' Journal, January 10.

Grants of Provisional Protection.

Alcohol meter, for ascertaining the alcoholic strength of liquids—3662—W. E. Newton.
Blankets used in machines for printing textile fabrics, &c.—3674—E. J. Hughes.
Blocks and bearings, plummer—3654—W. Burley and W. H. Glasson.
Braiding machines—3672—E. G. and E. E. Rafer.
Capsules—3543—G. Whitehead.
Carders, condenser—3598—W. Preston and C. Walker.
Carriages, &c.—3692—R. Howarth.
Cartridges—3633—J. Davidson.
Chains, &c., manufacturing—2492—A. E. Gelhaye.
Chains, &c., preventing jerks to—3637—J. Davison.
Chains, &c., preventing undue strains upon—3641—W. Dixon and W. Brown.
Chimney-tops—3623—E. Field.
Chimney-tops—3686—J. Capper.
Clocks, &c., application of electricity to—3684—C. E. Brooman.
Coffee roaster—3653—S. Myers.
Colouring matters—3657—A. M. Clarke.
Compasses and dividers, proportional—3607—W. A. Hubbard.
Cylinders, steam—3530—N. Paxman, jun.
Emery paper, substitute for—3615—R. Chauncy.
Explosive compounds—3652—F. A. Abel.
Fabrics, warp—3665—S. and F. Lennard.
Fibrous materials, carding and spinning—3621—H. A. Bonneville.
Fire alarm and extinguisher—3647—C. J. Adams.
Fish, salt-water, conveying through fresh water, &c.—3548—L. A. Damm.
Floors, fire-proof—3605—E. T. Bellhouse.
Fuel, artificial—9664—G. E. Allshorn.
Furnaces—3663—J. Addie and F. Kohn.
Furnaces—3702—J. Davison.
Gas burners—3696—C. Churchill.
Gas, &c.—3318—P. Salmon.
Glass bottle house pot carriages, &c.—3613—E. Breffit.
Gloves—3670—B. and J. B. Bowen.
Gutta-percha, &c., treating—3542—E. R. Sintzenich.
Hemp, &c., softening—3643—W. W. Urquhart and J. Lindsay.
Horn and whalebone, joining—3619—C. Beck.
Iron, steel, &c.—3667—G. J. and T. C. Hinde.
Life from drowning, saving—3556—A. McMurdo.
Liquid substances, heating—3678—D. Steele.
Metallurgical operations, &c., producing heat for—3698—R. Fothergill.
Milling tools, &c., manufacturing—3655—P. F. Tranchat.
Motors—3690—W. E. Newton.
Nails, cutting and heading—3651—M. J. Rice.
Needle wrappers—3680—J. Clarke.
Optical illusion—3617—J. Simmons.
Pomade—3639—J. G. Tongue.
Pumps, steam—3630—W. Walker and E. Holt.
Railway breaks—3676—J. Cockshoot, jun., and H. Weatherill.
Railway breaks, &c.—3597—T. Comfield, jun.
Railway carriages and trains—3629—C. De Bergue and W. Dredge.
Railways—3661—T. Harrison.
Saddles—3611—J. Clay.
Shot and shells—3688—A. V. Newton.
Size, boiling—3627—J. Kenyon.
Smoke, consuming—3700—W. Kendrick and J. Wooldridge.
Soap—3659—G. Layton.
Tanning apparatus—3649—J. Dawkins.
Telegraphs—3608—J. S. Gisborne.
Telegraphs—3609—L. M. Becker.
Traps for pigeon shooting, &c.—3660—F. Render.
Valves—3421—W. Black and T. Hawthorn.
Whips, &c., holders for—3666—W. Hewitt.
Windows, &c.—3694—E. Evans.

Inventions with Complete Specifications Filed.

Furnaces, &c., feeding fuel into—27—M. J. Frisbie.
Telegraphs—3—W. R. Lake.

From Commissioners of Patents' Journal, January 14.

Patents Sealed.

2040. E. Hohenbruck.
2045. F. Wilkins.
2047. W. B. Haigh.
2065. H. Fletcher.
2067. E. T. Hughes.
2076. J. M. Hetherington and R. W. Pitfield.
2108. J. Palmer, J. Palmer, jun., and T. Palmer.
2112. R. T. Bradbury and T. Bottomley.
2180. P. A. Rohart.
2186. E. Ravenscroft.
3066. J. T. Caird & S. Robertson.
2078. A. B. Ibbotson.
2079. T. Redwood.
2082. F. B. Vallance.
2085. G. W. Hayes.
2086. J. Mannock.
2087. W. McAndrew.
2088. T. Pirie.
2094. G. Weedon.
2096. A. De Smet.
2098. G. H. Daw.
2106. A. Morton.
2117. G. T. Bousfield.
2129. W. Potts.
2158. C. H. Murray.
2166. C. E. Brooman.
2168. G. L. Barens and J. F. Ladougne.
2234. J. Edwards.
2282. E. T. Horsley.
2294. H. A. Avery and G. Penabert.
2408. A. M. Clark.

Patents on which the Stamp Duty of £50 has been Paid.

50. T. Richardson and M. D. Rücker.
82. J. F. Spencer.
55. G. B. Galloway.
60. J. J. Blackham.
77. H. Chamberlain.
89. J. Ramsbottom.
164. R. Mallet.
166. W. C. Hicks.
119. G. Davies.
96. J. G. Jones.
95. R. Chidley.
101. F. Barnes, D. Hancock, and E. Cowpe.
127. J. Young.
129. F. C. Fourgeau.
130. J. B. Farrar and J. Hirst.
228. J. Hamilton, jun.
725. H. Owen.

Patents on which the Stamp Duty of £100 has been Paid.

194. T. Gibson and W. and H. Knighton.
62. S. Moulton.
89. G. Whight.
251. G. T. Bousfield.
88. W. Bullough.
87. M. A. Muir & J. McIlwham.

Journal of the Society of Arts.

FRIDAY, JANUARY 24, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'clock :—

JANUARY 29.—"On the Climate and Industrial Prospects of the Colony of Natal." By Dr. MANN, Superintendent of Education, and Special Commissioner for the Colony. On this evening Sir CHARLES NICHOLSON, Bart., will preside.

FEBRUARY 5.—"On Trade Museums." By. J. FORBES WATSON, Esq., M.D., Reporter on the Products of India.

FEBRUARY 12.—"On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it." By WENTWORTH LASCELLES SCOTT, Esq., F.C.S.

Cantor Lectures.

A course of lectures "On Food," is now being delivered by Dr. Letheby, M.A., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health, and Food Analyst for the City of London, as follows :—

MONDAY, JANUARY 27TH.—LECTURE II.

Comparative Digestibility of Foods. Functions of different Foods. Construction of Dietaries.

MONDAY, FEBRUARY 3RD.—LECTURE III.

Preservation, Preparation, and Culinary Treatment of Foods.

MONDAY, FEBRUARY 10.—LECTURE IV.

Adulterations of Food. Conclusion.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each member.

Address to the Emperor of the French.

It will be in the recollection of members that, on the occasion of the Great French Exhibition of 1855, the Society presented a congratulatory address to His Imperial Majesty the Emperor of the French. Following this precedent, the Council, towards the close of the Universal Exhibition of 1867, forwarded, through their Chairman, the following address to His Majesty :—

TO HIS IMPERIAL MAJESTY THE EMPEROR OF THE FRENCH.

SIRE,—As the Council and Members of the Society for the Encouragement of Arts, Manufactures and Commerce, instituted in London in the year 1754, now visiting the Universal Exhibition, we desire to approach Your Imperial Majesty and to bear witness to the incalculable benefits which the Arts of Peace have received during Your Majesty's enlightened reign.

We respectfully thank your Majesty for the freedom of personal communication which you have established between France and England, and the free interchange of commodities between the two countries, which have been of great reciprocal benefit.

Your Majesty took advantage of the first Universal Exhibition in France to inaugurate this beneficial intercommunication between the two countries, and we venture to express a hope, Sire, that your Majesty will make the present Exhibition an occasion even for extending it.

Since we had the honour, in 1855, to present our respects to your Majesty, we remark throughout all parts of your empire innumerable signs of greatly increased prosperity and wealth, which have produced a visible effect on the health, education, and happiness of the people over whom you rule. The improvements in Paris amaze us for their extent and beauty, and impress us with suggestions useful for the improvement of our own metropolis.

Your Majesty was graciously pleased to accept, through the hands of our President, his Royal Highness the Prince of Wales, the "Albert Medal" of the Society, established in memory of the late Prince Consort, to be awarded for distinguished merit in promoting Arts, Manufactures, and Commerce, and we now beg leave to assure your Majesty of our strong personal conviction of the rightful claim of your Majesty to be considered throughout the world, and all ages, as one of the most distinguished promoters of Arts, Manufactures, and Commerce.

Sealed with the corporate seal of the Society of Arts, Manufactures, and Commerce, the 21st of October, 1867.

(Signed)
W. HAWES, *Chairman*.
P. LE NEVE FOSTER, *Secretary*.

The following reply has been received from His Imperial Majesty :—

Palais des Tuileries, le 19 Decembre, 1867.

MONSIEUR,—L'Empereur a reçu l'Adresse que la Société des Arts de Londres lui a fait parvenir. Sa Majesté a été sensible à une si flatteuse appréciation des efforts qu'elle a constamment faits pour assurer le développement et la liberté du Commerce. Elle m'a chargé de vous transmettre ainsi qu'à vos collégues l'expression de ses sympathies.

Agréez, Monsieur, l'assurance de ma consideration la plus distinguée,

Le Conseiller d'Etat, Secrétaire de l'Empereur,
Chef du Cabinet de sa Majesté,
CONTI.

Monsieur Wm. Hawes.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met at the Society's House on Saturday, 11th January. Present—Messrs. W. H. Michael (in the chair), J. T. Ware, G. F. Wilson, F.R.S., and J. Ludford White.

Mr. Charles attended the Committee, for the purpose of giving information respecting the wholesale fish trade, as conducted at Billingsgate Market, and was examined by the Chairman as follows:—I am largely engaged in the retail fish trade. I attend at Billingsgate Market every day myself. The market opens for public business at five o'clock in the morning. Before that we have an opportunity of learning what is there, and inspecting some of the articles—the early goods—that is, the fish which have come by water, for we never get them by rail at that time, or very rarely. There is generally a large supply of fish by railway every day. I cannot tell the proportion of the railway supply to the water supply. They vary very much, both of them. Sometimes we get great supplies by both, when the weather is favourable for fishing. In bad weather I think we get more by rail; for this reason, that the vessels in bad weather make for the ports, and the fish is sent on by rail to London. I cannot give the Committee any estimate for the year of the proportion of fish that comes to London by rail and that which comes by the vessels. Everything depends upon the weather. In fair weather we get enormous quantities; in bad weather you would wonder how the fishmongers are supplied at all.

Q.—Do you take any measures at your place of business to equalise your stock from day to day?—No.

Q.—You do not use ice for that purpose?—No. I have a large ice store at Chelsea. We keep ice as an article of trade. In the spring-time we get it from Norway, and lay in a supply for the season. We do not use it for fish, to regulate the supply. If it came on to blow hard to-day and to-morrow, when we went to market on Monday I should say, "We shall have nothing in to-morrow, and must buy heavily;" but, as a rule, that does not pay, because fish is an article that deteriorates in quality so rapidly.

Q.—It has been recently stated, in a French publication, that in America vessels are fitted with tanks for keeping the fish alive after they are caught. Are you aware whether there is anything of the kind in this country?—We are in the habit of getting live fish; those, for instance, caught on the Dogger Bank and other distant places are brought in alive. The vessels which fish off the Orkneys are provided with wells, but they fish principally for the continental markets, and on returning home they generally bring as much fish as they can carry in their vessels. Ordinarily, that sort of supply does not come to London; but we get cod, haddocks, and whitings that way, and we have live eels from Holland. Whitings are a very important article in summer. If whitings are caught overnight they are scarcely sweet the next morning. The gastric juices of the fish are so strong that in a short time they eat through the belly of the fish, and it becomes tainted to the finest bone of the fish, and it then becomes what is called in the trade "garlicy," from the peculiar odour which results from decomposition from the inside of the fish outwards. It permeates the whole of the fish after it is dead. If you were to lay a codfish on this table in warm weather the gastric juice would perish the cloth, and would take off paint in an hour or two. There is, too, another kind of decomposition in fish, resulting from separation of the acid in the juices of the flesh, which leaves an insipid flavour. In the cooking of fish which has been kept too long, lemons and other things are added in the boiling, while live fish does not require anything of the kind. Formerly, almost all the fish came to London, as a rule. At the present time a great deal of fish is sent to the country towns from Grimsby, and almost every town has now a fair supply of fish. At the present time very large supplies of fresh herrings are received from Glasgow. This is a trade that did not exist formerly. They are sent fresh from Loch Fyne. They are packed in barrels, as soon as caught, whilst alive, and in that way they are sent all over England. The Grimsby market is supplied with fish by its own boats. They fish in the North Sea and on the Dogger-bank; they also adopt the well system. Those of them who are not so wealthy, and not provided with well-boats, adopt a cruel plan. Upon catching cod they tie a piece of cord round the tails tight. These are fastened to a long rope and hove overboard. The fish, it is true, soon die, but there is a worse consequence; it makes it a bad article of food. The flesh of such fish is never firm, and you can easily press your finger through a thick slice of the flesh. It is spongy, with no elasticity in it. The same effect is produced upon other kinds of fish caught and killed in that way, and they are never good eating.

Q.—Are there any special means adopted to ensure a supply of fish coming to London regularly?—Those who fish for the London market are many of them salesmen, and they make London their home and place of business. The Grimsby people are a very peculiar class. The fish dealers there are, as a class, very sharp. They know they can get the best price for their fish in London. They cannot get above a certain price by sending it to the provincial towns; it must be cheap to go there. They have telegrams of the prices from several places in England every day.

Q.—Is Grimsby the only other central depôt besides London?—There is a great deal of fish sent from Hull.

Q.—Do you imagine that any large supply of fish is sent to Grimsby from other fishing towns?—I should say not. They will not send to Grimsby when they can get higher prices in London; and it is only when there is a surplus stock that Grimsby is supplied. It stands second by a very long distance.

Q.—Are there any means adopted that you are aware of by which fish is prevented from being sold in the localities in which it is taken?—None; it is only the natural effect of an uncertain demand.

Q.—Then the certainty of sale of fish at Billingsgate operates to get the fish there?—Yes, fishermen all work independently; there is no connectedness among them; every mans acts for his own benefit. If they could get better prices elsewhere Billingsgate might be broken up; but it is astonishing how little fish will suffice for a large town. Birmingham, for instance, gets its supply in this way: they take third and fourth class fish. The Torbay men fish at Brixham; they divide the fish into several classes. The first-class they send to London; the second and third they send to Bath and Bristol; and the rough fish goes to Birmingham and what is called the black country. It goes there direct, not through the London market.

Q. Then there is a Billingsgate on a minor scale at Birmingham?—No: the fish is consigned to individuals who keep shops. There is no public fish-market there for wholesale business. They are all retailers. A Birmingham man, hearing fish was cheap at Brixham, would go there or send a person to purchase for him. There is a large trade in the curing of herrings at Birmingham. Formerly the great bulk of the curing was done in Scotland, but now Scotchmen coming to London

take lessons with advantage. Herrings are cured in all stages; and it is sometimes wonderful how they hold together. The curing only disguises the taste; you cannot remove it; but it does so to such an extent as to make the poor adopt that kind of fish as an article of food; but these, as well as some kinds of dried haddocks, would not be tolerated by people who "palate" their food; but they are acceptable at the cheap prices at which they are sometimes sold to the hungry poor. They are much better when cured in Scotland, because they are cured alive there. Haddocks are brought to London in well-boats, but not in sufficient quantity to meet the demands of the curing trade, a very large trade in that article having sprung up within the last few years. There is always a large demand in the London market for haddocks in every state. Formerly trawl-haddocks were not brought to London at all; they were the perquisites of the men and boys in the boats, who cleaned and salted them, and hung them in the shrouds to dry. Very few indeed were ever brought to the market, as it was considered they would not pay for the carriage, except after being cured as they were in Scotland. Inferior kinds of haddocks are now the exception. Thousands and tens of thousands are cured in every possible state of freshness; but none are equal in quality and flavour to the Scotch cured. The fish there are cured all but alive. Some are dried with peat-smoke, instead of sawdust, which is used in the London curing. I spoke just now of the Loch Fyne herrings. It is no unusual thing, between ten and eleven o'clock in the forenoon, to see large loads of Loch Fyne herrings come into Thames-street. They are quickly sold, and the next morning they are brought into the market as bloaters, and the quality is generally very fine. The curing in those cases is of a very mild description, and they are an article requiring quick consumption if you would have them while good. Birmingham is also supplied with herrings from Glasgow, and they also have a great many Irish and Norwegian herrings, which are sent over salted in bulk in barrels. The Loch Fyne herrings are the best herrings in the world.

Q.—To make the matter clear, with regard to a place like Brixham; that is a large depôt for fishermen, is it not?—Yes.

Q.—Would they be governed as to where they would send their fish by the prices in London?—Yes, no doubt, to a great extent.

Q.—If the London prices were low they would send their fish to Birmingham?—The dealers there would not buy for London unless the price was likely to be remunerative. A man may send a lot of fish to London in good condition, and lose money by the transaction.

Q.—Are there persons at Brixham who buy the fish from the boats?—Yes; the boatmen know nothing whatever of what becomes of their fish. They sell it to men who forward it to market. They would send the rough fish to Birmingham, the second class to Bath and Bristol, and the first quality to Billingsgate.

Q.—Are the Brixham fishermen under any bond to dispose of their fish to those agents alone?—I should say they are quite free in that respect; and they might bring their boats up to London if they were so disposed.

Q.—Some information has been given before the committee with regard to the enterprise of the late Hungerford-market Company engaging a number of fishing-boats for the supply of that market?—Yes; but they went a wrong way to work. They set out with a determination to make money. They had wealth, and they went to a man who possessed five or six vessels, and engaged them at a certain sum per month, the company paying the working expenses. Those men did not fish with spirit. Their maxim was, "Sing or not sing, our pay goes on;" and they sat and smoked their pipes. It failed as a commercial enterprise, from the mode in which the business was conducted; from the want of the minute things being looked after. It happened in this way:—Hungerford is only a short remove from Billingsgate; people went to-and-fro with messages as to the supply of fish from different places; so many soles from Yarmouth, and so on. They got the statistics of what was coming. They saw how things were going here. The buyers knew from the quantity what the fish would fetch, and if it suited them they came to Hungerford to buy, for there was no one else to buy except the Billingsgate dealers. They bought at Hungerford and sent them to Billingsgate within the hour.

Q.—Do we gather from this that your opinion is that two wholesale fish-markets like Billingsgate would not be successful?—Impossible. An Englishman is more sensitive in his pocket than any other part. I know what my consumption is per day. I should not go to Paddington, or to the Great Northern, or the Great Eastern, till I was advised what was at either place, because I should make a mess of it if I did; and while people were thinking about it the fish would be deteriorated in quality. It is astonishing how cheaply fish may sometimes be bought an hour or two later. My yesterday's experience was this: I buy my fish for the supply of the day. My customers having fish of the same day, if I kept it over the day they would be sure to tell me of it. You must make sure of a supply. Yesterday morning some things were abundant, and lots more were expected of the same kind from the Great Western. At the first part of the market there was a supply from Hewitt and Co.'s screw cutter, as well as that from Yarmouth and Lowestoft. We could not tell what was coming from the Great Western, and by-and-bye the news came from the Great Western that the fish would not be at the market before ten o'clock. Fish coming into Billingsgate at ten o'clock is damned as far as the market goes. In the place of buying at that hour, the dealers are dispensing what they have bought. If the fish-market was an hour or two later, it might result in this: A man might buy one day for the next, because fish which comes late into the market cannot be transmitted to the country the same day. Fish, generally, was not dear yesterday, but turbots were fetching from 18s. to £1 each. The Great Western supply consisted of 250 baskets of prime fish—turbots, brills, and dorys—and they might have been bought at your own prices. The salesmen stood with the fish packed, and they could not move it. It was much the same to-day. We had the way-bills down at half-past six, and we were told the fish was not in. By-and-bye in comes the fish; by that time dealers were supplied, and many were gone home.

Q.—Do the costermongers sweep down on that kind of fish, and distribute it about the metropolis?—Turbots are not much use to costermongers and small dealers, and they can only touch them when the price, owing to a large supply on hand, is nominal; and in cold weather they may be put by for a future market.

Q.—Are you, as a large dealer, allowed to have the pick of the market, it being known to the salesmen that you are there every morning?—I know there is a sort of feeling of that kind, because the number of large fish buyers is rather limited, but no man who has fish to sell looks round to see if all his company is there. There are other people there as well as myself, and very sharp people. If you are not there in time other persons will buy the fish, and you must buy of them. But there is a kind of feeling. We will say the market opens at 5 o'clock; the salesmen are there at half-past 4; they read over their advices, and in their own mind they resolve at what price they will start the competition at the time the principal buyers are present.

Q.—Would a salesman say to himself, "Mr. Charles will want such and such a quantity of a certain quality; I will reserve a certain lot for him?"—They would not reserve it for Mr. Charles or anybody else. They do not give the public the pick till five o'clock. If A. B. got to the market a little sooner than myself, he would be as welcome to take the pick as I should, particularly if he gave a shilling or two more. A price is asked—they sometimes

ask twice as much as they mean to take. The plan is that of the Dutch auction, beginning at the higher and going down to the lower price. A man has an opinion of his own, and the opinions clash sometimes till one or the other gives way, or both advance towards each other. Directly I go into the market I ascertain, from telegrams received, the probable supply,—so many tons of cod from Grimsby, and so many tons from Harwich; so many baskets of prime from Yarmouth, and so many baskets of rough from Hull or Grimsby. The salesmen also have their advices. The porters bring the fish from the boats, it is laid on a form and you bid for the same. A salesman may ask £20 for a score of cod, and may take £12 or £14 for them. The salesman starts a price; it is a *quasi* auction; the larger buyers at the lowest price, and the seller at the highest. I should say, take Monday morning, there would be a dozen salesmen at their posts, and as the bell is rung at five o'clock they all begin at the same time, so that there is no criterion that the price of one salesman is the same as that of another. We may select one salesman or run from one to another.

Q.—We have had a statement made before us to the effect that the West-end tradesmen are allowed to have the first pick of the market, the clubs next, and the hotel-keepers next to them?—That, I believe, is a myth. Any person going to the market at five o'clock has the opportunity of getting the same quality of fish as I can myself. If you have the knowledge, you would have just the same opportunity of buying as the regular dealer. They would serve you with the same pleasure, and perhaps more, because they might get more out of you. It is the most open market that can be in the world.

Q.—Reverting to the Hungerford Market speculation, which failed, where did the fish brought there mainly come from?—The produce of their own fishings in the North Sea. It is like other great concerns which fail from want of proper management. It is not because you pay a week's wage you get a week's work. There is an adage, "The master's eye makes the horse fat." After the boats were hired, those who worked them and fished had no interest beyond their mere wages, which they knew were certain whether they caught any fish or not. After the boats were sent off, the managers had nothing to do but to take their pleasure. The men, finding there was no one to look after them, and the captains having no share in the catch of fish, they took it easier, no doubt, than they would otherwise have done. That made fish dear for the company, and they could not stand long against the competition with Billingsgate.

Q.—What we want to come at is this. Supposing commercially the speculation had been worked well, how, in your opinion, would it have answered to have had the fish trade at Hungerford as against Billingsgate?—They would have had to work hard for every pound they got at Hungerford. I consider it would not have worked advantageously for the public at all. The fish can only come to London, and when it comes the object is to sell it as quickly as possible.

Q.—Take the case of the Great Western Railway. We hear that very large quantities of fish are brought up by that line. Supposing there were a Billingsgate established immediately in connection with that line, running into a central market in the metropolis; how do you think that would act?—It would prove itself in this way. You would not get anyone to send their fish there, because it is the pride of every man to send his produce to the best market.

Q.—You think it is the certainty of sale and good prices that influences the thing?—Yes; there would be no chance of their getting better prices than at Billingsgate.

Q.—Did the Hungerford Market people, that you are aware of, try to get a supply of fish other than from the boats they employed?—They had no other means that I am aware of.

Q.—Could not the fishing-grounds be extended, or do you consider the supply in any way exhausted?—With regard to the latter part of the question, I think not. You will remember, some years ago salmon ruled scarce for a long time; and I said to an old gentleman at the head of the trade, "Are we never going to have any more salmon?" "Oh, yes," he replied, "we shall have plenty by-and-bye." But salmon are very eccentric. Sometimes they will go away from a locality for two or three years, but they return again, and afterwards we get a larger supply than ever. The late owner of the Spey arranged that not a net should be put into that river for a year. He gave it a holiday for that period. The result is, it paid every year after. The supply of salmon has much increased lately. We have supplies from Norway and Holland. But, while the area of supply is increased, the area of consumption has increased very much more, because we never exported or imported salmon till Sir Robert Peel's tariff came into operation. Then the French and other continental nations felt by our taking their fish, there ought to be reciprocity. They sent us a little of theirs, but they took a great deal of ours. We are now actually supplying nearly the whole of the French capital with fish from Billingsgate.

Q.—Are they not now getting increased supplies from America and Newfoundland?—I think you cannot get fresh fish from Newfoundland.

Q.—I have read an account of the Americans having fitted up tank vessels?—They could not take the voyage to this country, and the difference in the quality of the water would destroy the fish.

Q.—Do they not use ice to keep the fish?—I should hardly think it possible to bring fish in good condition from so long a distance.

Q.—Are the French buyers in regular attendance at the market?—Some few attend occasionally. The principal business is done by English agents in the market, on the same terms as that done by the French agents. This, no doubt, makes fish scarce sometimes. This year, early as it is, we have had several thousand pads of mackerel in the market from Plymouth and Brixham, and some have come up from Portsmouth, which were caught at the back of the Isle of Wight, but the salesmen could not dispose of them to our dealers, because there is a prevalent idea that mackerel are not good at this season of the year; but that is a mistake. The supply of mackerel I have alluded to was almost entirely taken by the French buyers.

Q.—We may infer from that it would be advantageous to increase the supply of fish?—Yes; and endeavours are being made to do so.

Q.—What is the difficulty in the way of it; there are many grounds unworked?—We do not have such large supplies of cod and soles. Formerly you would see cod fish for sale in almost every fishmongers' shop. Forty years ago, you would see in Oxford-street from 20 to 30 women selling really good cod on their stalls; but you will not find that the case now. I attribute the relative diminution of the supply to there being a greater demand for a supply of fish to all provincial towns than was formerly the case. The general supply is more divided. This is no doubt one of the effects of railways, by means of which fish is so rapidly transmitted from one place to another, and arrives in good condition from that circumstance. There are more vessels employed in fishing now-a-days; take Hull, for instance. There are perhaps, 20 vessels for every one that existed twenty years ago, and they are magnificent vessels, fit to go to any part of the world.

Q.—What would you say the increase is at the present time in London, as compared with 20 years ago?—Perhaps, on the whole, the increase is not so great. If we get more fish from Hull and Grimsby than formerly, we have lost the large supplies we used to receive from the Hollanders. I have seen as many as 20 vessels at market at a time, laden with fish bought of

Dutchmen, but they do not come now because the Dutch fishermen take their supply to the Continent, and the fish is carried inland by the railways. We do not now get the supplies of Dutch turbots we formerly had, which were distinguished by the head and tail being tied with a string for convenience of handling. You do not see any of that kind of fish now. We have lost the supplies from Holland entirely, but we have sometimes large supplies of salmon and mackerel from Norway. To counterbalance that we do not get the large supplies of the latter fish which we used to have from the coast of Norfolk. The fish appear to have left that coast entirely of late years, and to have gone further northward.

Q.—Is there any way of accounting for that?—I can only compare it with other incidents of a similar kind; namely, the Bay of Mevagissy, in Cornwall, produced an immense number of pilchards. In one season a large shoal of these fish was hemmed into the bay, and nearly the whole were taken, and for many years after that not a pilchard came into the bay. The mackerel fishery is carried on on a scale that would scarcely be credited. The line of nets sometimes extends to a distance of 100 miles, and that is kept on during the whole season; and very large supplies of mackerel were brought direct from the fishing grounds by steam vessels to Billingsgate, as also by rail from Yarmouth to London. As I have said, the nets employed in catching the fish extended more than 100 miles. I think the fish took alarm at this, and they do not come near. It is one of those remarkable things we cannot account for. You may say there is no supply of mackerel from Yarmouth now. Fish are very eccentric indeed. For the last few years in Norway they have established a telegraph all along the coast, because the fish may come to one part and not to the other, or they may come to a part which they had never visited before, and abandon the other grounds. The appearance of a shoal of fish off one part of the coast is immediately telegraphed along the coast, and then they combine their forces in one spot, according to the advice received by telegram. We get very large quantities of mackerel from Norway, and they are bought as soon as caught by English speculators over there. There are merchants who take all the fish they get, but this is not so much the case in England. No man, so far as I know, is bound to take any quantity of fish, it is a matter for bargain.

Q.—Take the case of the fishermen of the Severn with regard to salmon, could they send the salmon where they pleased?—Yes: they do not, as a rule, make contracts. In Gloucester the take of salmon is very insignificant. Except in a few instances, the salmon fisheries are private property. It is my experience that the present supply of fish is less, in comparison with the additional amount of labour and means to get it, than formerly. It is a question whether the Hull boats counterbalance the loss of the supplies obtained from Dutchmen.

Q.—Reverting to the question of the fish market in London. How would it affect you if a West-end fish market were established in the neighbourhood of Paddington?—It is impossible to say how it would affect me. I cannot at present regard it as a feasible thing, especially a wholesale market. If a salesman does a good business he will sometimes get rid of his whole stock of fish in an hour, and then he has done for that day. Any such market at the West-end must be a retail market only, as Billingsgate is after about eight o'clock in the morning. People can then go and buy single fish at the shops and stalls. The wholesale men who make the early market are all gone then.

Q.—Is it the case sometimes that any large amount of fish is destroyed because it is not sold?—In my opinion, there never was such a thing done. Did you ever know a man sacrifice a penny's-worth of his own property to advance the price of yours in the same way of business? It is never done with a view of raising prices. No man is bold enough to do it. It is not done because there are not purchasers. The purchasers are unlimited, and you cannot overdo the market; and fish is an article which you cannot put on the shelf like mutton or beef.

Q.—There is a question at the present time as to what should be done with the view of improving the public market system in the metropolis. The Committee have reason to believe that the Corporation of London are moving in the matter. What are your own views as to what would be the best thing to be done with regard to Billingsgate?—To do away with the obstructions in the street is, I think, very easy. Just as you would act in the case of a warehouse. If the unloading of the goods caused an improper obstruction, you must have a larger warehouse. Billingsgate at present consists only of a ground-floor. Capital floors might easily be carried over the present market, and the accommodation for business thereby greatly enlarged. A hydraulic machine would keep three or four cranes at work, and a large waggon-load of fish might be unloaded and the waggon started away in ten minutes at each crane. I would not prefer to remove Billingsgate from its present site. Taking the bulk of the fish, two-thirds of it goes eastwards and south-eastwards. If you removed it westward, you would do an injustice to the people in the east and south-east.

Q.—If it were taken to Smithfield, for instance, with the railway facilities which exist there, do you not think that would be a public advantage?—It will never do to trust to the railways altogether. They serve you badly enough now, but put it all into their hands you would feel it still more. Wherever you move Billingsgate to, it is important it should be by the water-side, so as to admit of water-carriage as well as land-carriage for the sake of supply; to preserve the great highway of all nations for bringing up fish by water from the depths where they are caught direct up to the market. Hewitt and Co. had a steamer up yesterday with 1,000 packages of fish, and there was another to day with 1,200. They commenced to sell those goods at five o'clock in the morning, and by eight o'clock the whole were sold and the steamer despatched again. Every package averaged about 1 cwt. What would have been the expense of taking them to a market a mile or two inland? If you remove the market from the river-side it is immaterial whether you remove it one mile or three miles. It is not the time of the transit, but the time and labour of loading and unloading. You must keep up the competition between water and rail. There is another thing—there are bad smells in Billingsgate in hot weather, and wherever you take the market you vitiate the air with those smells for a quarter of a mile either way.

Q.—Could not that be obviated by the use of disinfectants?—No; the bad fish must be consigned to the manure tanks, from which it has afterwards to be removed.

Q.—Would it not be an advantage to have the means of preserving fish for an indefinite time?—It might be too expensive.

Q.—Supposing you could get a gallon of a certain kind of solution, which by brushing over the fish would preserve it for an indefinite time, would that be an advantage to the trade and to the public?—I hardly think it would in the article of fish.

Q.—In your own establishment are you never obliged to throw any fish away?—No; we always find customers. If you were at my place about 7 o'clock in the evening, you would see a crowd of people there for the express purpose of buying the fish that was left. We have different classes of customers through various parts of the day. Salmon and turbot are things which you always buy with caution; it will not do to overstock yourself with them; and we use ice to keep them in from the Saturday till the Sunday; but as a rule, fish is deteriorated every hour it is kept.

Q.—Then we come to this: In the first place, your decided opinion is that wherever Billingsgate market

may be moved to it should be located by the water side?—You would otherwise give up great advantages.

Q.—Supposing you had to establish a fish market *de novo*, would you retain the site of Billingsgate?—I should.

Q.—What would you do to make it more advantageous to yourself and the public?—Billingsgate, I consider, is sufficiently capacious if the supply were doubled, by being put into proper order, and a floor erected above the present market. I would have hydraulic machinery to lift the fish by cranes to that floor; that would answer for exposure for sale. The great hindrance at present is the obstruction of the street by the vans, &c. A van-load of fish is sometimes kept three or four hours waiting, owing to the want of some such arrangements as I have mentioned. The means of access are sufficient under proper arrangements, because the great business is done early in the morning. I repeat that I think doubling the present area, by carrying a floor over the existing market, with the appliances I have mentioned, would be sufficient for all purposes.

Q.—Do you consider there would be any advantage in having direct railway communication with Billingsgate?—No: I think the business would not pay for that, because it would be a very expensive place to approach.

Mr. LUDFORD WHITE.—Is there any toll levied by the Corporation on the fish sold in the market?—There is no toll on the fish sold. I believe there is a small wharfage charged for the boats that come to the market. Every salesman has a stall, for which he pays 20s. or 25s. a-week rent, which, I consider, is a very moderate rent indeed, and they have gas found them for that. Those who formerly paid a nominal sum of £3 or £4 a-year perhaps felt a little sore at the enhanced rents; but they are all very cheap places. If there is a stall to let there are fifty applicants for it. I believe there is a small fee charged upon the railway waggons. The additional floor over the market would be paid for very soon by a small toll upon each package taken in there. It would have the effect of keeping the street clear. With three cranes at work, say twenty or thirty waggons might be unloaded in an hour.

Mr. MICHAEL.—Are there any other subjects which have not been touched upon, on which you can give the Committee information?—I think you have treated the whole subject very generally and very comprehensively. I may add that a very large trade is done with France in oysters. Some merchants at Dunkirk bargained for 1,000 bushels of natives, for which they paid £4,000; and they sent over for another thousand, for which they paid £6,000. The great bulk of fish which we send to the Continent goes to Boulogne. Though the French fish largely, they do not appear to fish so successfully as we do. Last year we thought we were overstocked with herrings, but the French buyers took all they could get.

Q.—Do you know anything with regard to the comparative prices charged for the fish by the salesman and those paid to the fish-owners themselves?—In many cases the owners are the salesmen.

Q.—Is there any vast disproportion in the price when that is not the case?—No, I think not. Wherever there is competition that regulates the prices to a great extent. An owner may live at Yarmouth or Torbay. He sends his fish to a salesman. He has his choice of them all. He may send a dozen packages to one, and a dozen to another, and some to a third, if he pleases, which is often done, and he may have friends in the market to watch the sales.

Q.—Are the things sold on commission, generally?—A great many of them are.

Q.—Take the case of the Brixham fishermen. Say there is an agent there to buy the catch of fish they bring into port. Is there any very great disproportion between the price that would be paid to them and that which is charged by the salesman at Billingsgate to whom the consignment is made?—Sometimes there is loss on the purchase from the shipowners. There is no unfair disproportion; they are not under a contract to sell their stock to one middleman. Such a thing can never exist, because there are so many people ready to pick up a shilling if they can. The trade is open to competition, like all others. As a proof of that the buyers, as a rule, are not rich, but they remain as they have been, working men all their lives. There may be some careful men among them, who have put by a few hundreds for their old age, but as a rule they are struggling men.

Mr. WARE—At Brixham and Grimsby are the fish sold by auction on the beach?—By Dutch custom. The seller sets a price, and goes down till the price is accepted.

Mr. LUDFORD WHITE—With regard to salmon, whose habits you have described as being so erratic, has not the supply increased in the last two or three years?—Yes; and that is no doubt entirely due to the operation of the Fisheries Act. That is a law than which none was better accepted, and it is one which the people in Billingsgate will not lend themselves to see broken. I can give you an instance of that within my own knowledge. Some very fine salmon were sent from Waterford to London this week, and they were returned to the consignee, as a hint that the Billingsgate salesmen would not lend themselves to the infringment of so salutary an Act of Parliament, which has worked so well for all parties. On this very day there are ten salmon in London from Waterford, and I do not think they will find a man bold enough to vend them; the fish, however, are in a condition which would warrant their being sold. It is merely because it is breaking a really good law that this smuggling of fish into Billingsgate is not countenanced, as it would be bad for everybody. I think, under the present laws, there cannot fail to be an annual increase in the supply of salmon in our market. There is at the present time very fine salmon indeed from Holland, perfectly clean fish, and some of it has brought as much as 7s. 6d. per lb. There is no difficulty with people in the trade in distinguishing a Dutch salmon from a Waterford salmon. The fishing of one or two rivers in Kerry opens to-morrow week. Under the new regulations the fish come in finer than before the passing of the law. The supply from the Wye has wonderfully increased within the last year or two. I may add that, with regard to salmon, price is no consideration with the French buyers, especially during the last season, when there was a great demand for salmon for Paris consumption; and mackerel have fetched as much as a franc each. The expenses of importation of fish from this country include the *octroi* in Paris, but sometimes the fish is bought at too high a price here to be remunerative to the speculators. Prime large soles have been an especially dear article in our market, and for some months past they have been worth 1s. per lb. wholesale. If fish is scarce the costermonger class get but little; but if a large supply comes in good condition it is vended by them in that state at very low prices generally. The costermongers buy the same quality of fish as the large dealers, but of a smaller description. With regard to plaice, which generally forms the stock of the fish hawker when it is plentiful, there are only two descriptions—that is, the live plaice, and those which come in bulk or in boxes. Plaice at certain periods fetch very high prices. The live plaice is a favourite fish with the Jews, as that is a food which they are permitted to eat at all their feasts and fasts. I have known plaice to fetch as much as 7s. 6d. each. Eaten cold, dressed as the Jews dress them, it is a most delicious article of food, and they lay in a stock sufficient for several days' consumption.

Q.—The idea has been laid before the Committee, that it would be a very desirable thing for London to have one great central market, into which the various railways communicating with the different parts of the country should converge; and it has been suggested that the great fish-market of London should be embraced within

such an arrangement. The Committee would be glad to have your ideas on the subject?—I hope we shall be preserved from the railways. They are very useful; but if we are to be made dependent upon them for the supply of fish to our market, the Lord have mercy upon you! for they treat you just as they like. We get the intelligence that there is fish at the Great Northern and at Camden Town at four o'clock in the morning, and it does not get to the market till eight or nine o'clock. The Great Eastern are as bad. They have not room enough to transact the business. They have depôts at Shoreditch, the Minories, the Commercial-road, and Brick-lane, and they use them all for fish; but the goods which should be in the market at five o'clock in the morning, do not sometimes get there till two o'clock in the afternoon, and then at a dreadful loss, of course.

The Committee, having thanked Mr. Charles for the valuable information he had given them, then adjourned.

Cantor Lectures.

The first lecture of Dr. Letheby's course "On Food" was delivered on Monday evening, the 20th inst., the subject being, "Varieties of Food—their Chemical Composition and Nutritive Value." A full report of these lectures will be given in the *Journal* during the vacation.

Seventh Ordinary Meeting.

Wednesday, January 22nd, 1868; Lord Henry Gordon Lennox, M.P., Vice-President of the Society, in the chair.

The following candidate was proposed for election as member of the Society:—

Hogarth, Alexander P., Aberdeen.

The following candidates were balloted for, and duly elected members of the Society:—

Caley, J. W., Norwich.
Duckett, Sir George F., Bart., Fangfoss-hall, Pocklington, Yorkshire.
Parker, John, 11, Goldsmith-street, E.C.
Ridgway, Matthew, Dewsbury, Yorkshire.
Smith, Griffiths, 2, The Grove, Highgate, N.
Webber, Thomas, 82, Lombard-street, E.C.
West, W. Cornwallis, Hedgebury-park, Cranbrook.

The Paper read was—

ON THE REPORTS OF THE ARTISANS SELECTED TO VISIT THE PARIS UNIVERSAL EXHIBITION OF 1867.

By William Hawes, Esq., Chairman of the Council.

So many opinions having been recently expressed respecting the present state of our great industries, and their position and progress relatively to those of the same industries in foreign countries, it will, I think, be interesting to consider the effect which a careful examination of them produced on the minds of artisans who visited Paris to study the works of their foreign rivals exhibited in the Universal Exhibition, and to obtain all the information they could respecting the wages, social condition, education, and progress of French workmen.

With this view, I propose to lay before you an analysis of the information they collected in the most condensed form in my power, and I hope to satisfy you that among the various efforts the Society has made from time to time, during the 114 years it has been established, to promote industrial education—and they have been many and of no trifling importance—none will yield more certain or more immediate results than the arrangements made, in the spring of last year, to assist a certain number of skilled workmen to visit Paris and the Universal Exhibition.

But before I enter upon the examination of the reports of these artisans, I will briefly refer to the report of a committee of the Society, printed in 1853, with copious extracts from the evidence it had collected, on "Middle-class Education, and Class Instruction in Mechanics' Institutions," in which report public attention was directed to the relative positions held by English and foreign workmen, as indicated by the productions of their respective countries exhibited in the International Exhibition of 1851.

The most important recommendation of the Committee, and the one to which alone I can allude on this occasion, bears directly upon the subject now more immediately before us,—"That Mechanics' Institutions should, where practicable, be converted into industrial schools for artisans." This recommendation, with others, was distributed among the largest manufacturers in all parts of the country where such institutions existed, and received their almost unanimous approval. So decided was the approval, that the Council at once devoted itself to the consideration of the best means of bringing into one common system all educational institutions for adults, and of encouraging study by young men from 16 upwards, after leaving school and when in employment, by the offer of rewards to such of them as would voluntarily submit to an annual examination by examiners appointed by the Society. The success which attended these efforts of the Society I have recently had occasion to refer to, but I may repeat that last year 1,700 persons, principally of the class belonging to Mechanics' Institutes were examined, and that 1,430 received prizes and certificates of proficiency; and, further, that since 1858 nearly 9,000 of such students have been examined, and have thereby been in many instances enabled to take, in various manufacturing and industrial establishments, positions far superior to those they could have obtained but for the possession of the prizes and certificates of this Society.

But in addition to these aids to the progress of technical instruction, the Society has encouraged practical skill and taste, by awarding, in the course of the last few years, about 500 prizes and certificates to as many art workmen for specimens of work in various branches of fine art workmanship, the designs, models, and photographs from which such works were executed being, in most cases, selected by the Society.

Shortly after the Society's examinations had been instituted, the Universities of Oxford and Cambridge, following its example, established middle-class examinations, to encourage and improve the general and scientific education of the classes above those more immediately connected with Mechanics' Institutions—classes which would probably supply those to whom the direction of our manufactories and the improvement of our industrial operations would be intrusted.

The information gained by the Society from the examination of the specimens of art-workmanship exhibited in these rooms, and from the Reports of its examiners on the papers worked by the candidates for prizes at the annual examinations, satisfied the Council that the progress of art manufacture would be promoted if workmen could be induced to visit Paris and examine the industrial works exhibited in the Universal Exhibition; but the Council were also satisfied that, however beneficial such a visit might be to the workman, no real public good would be accomplished unless each workman not only visited the Exhibition and studied the works of foreign workmen in the department of manufacture in which he was specially engaged, but recorded the result of his observations on the spot, to be subsequently embodied in a report to be delivered to the Society immediately after his return. With such objects in view, the workmen who were selected

were requested not to confine their reports exclusively to the examination of the works in the Exhibition, but to record their impressions of all they saw of the customs and habits of French workmen.

The Council wished to induce them to reflect upon the operation of the totally different habits of French workmen, either in or out of the workshop (influenced as they must be by the laws and by the climate of France), on the production of industrial works, and to compare the rate of progress in manipulative skill obtained in countries with whose productions English workmen must compete, and where societies established to influence the rate of wages, or to restrict the independence of labour, are comparatively unknown, with that in their own country.

It is no slight tribute to the industry and ability of the workmen who went to Paris under the auspices of the Society so recently as August and September last, that every workman has written his report, and that all were so punctually delivered to the Society, that the volume now published is so soon in the hands of the public.

There is little doubt that almost everything these working men, visiting Paris for two or three weeks (most of them never having been abroad before), could see and record, has been before observed and recorded by writers in other stations in life, but their views and opinions originating from entirely different points of view, and being written for other classes, would be little read, or if read would be distrusted by those, to whom the opinions and observations of fellow workmen, derived from their personal observation, would be of the greatest interest.

The men were selected with reference only to their fitness for the duty they undertook, and this was judged of by the recommendations they brought, either from their employers or fellow-workmen, and it is remarkable that men so chosen, some belonging to the most powerful trades' unions, others taking an active part in political associations, and others priding themselves on their independence of any trade union or political association, should most of them breathe nearly the same spirit in regard to the superior position of labour in this country as compared with that in France and foreign countries generally.

There is no despondency in the minds of these workmen. They do not fear any competition on fair and equal terms, or doubt the activity of the inventive genius of their country; they freely admit superiority in certain branches of handicraft, and in the facility of producing certain articles, but they all attribute whatever superiority exists to the want of the opportunities that foreigners enjoy of studying, both as youths and adults, the finest works of ancient and modern art, and of becoming acquainted in early life with the scientific principles upon which the successful pursuit of the processes or manufactures in which they are engaged depends.

I will now proceed to classify the opinions of the various reporters, and bring into as small a compass as possible their views upon the status of English labour in the production of everything required to supply the trade and commerce of the world.

I will divide the reports into fourteen sections:—

Section 1.—*Relating to Wood-work.*—Cabinet making; chair-making; wood-cutting machinery; carpenters' and joiners' work.

Section 2.—*Iron and some other Metal-work.*—Saws and tools; cutlery; hammered iron; ornamental iron work; mining and metallurgy; mechanical engineering.

Section 3.—*Glass, Pottery, Porcelain, &c.*—Ceramic decoration; glass painting; pottery; tiles, pavements, and terra-cotta; pottery and porcelain.

Section 4.—*Textile Fabrics.*—Ribbon weaving and trade; lace and hosiery; woollen fabrics; shawls; machinery for worsted fabrics; tailors' work.

Section 5.—*Masonry and Brick-work.*—Bricklaying; plasterers' work; masonry.

Section 6.—*Coach-making.*

Section 7.—*Ship-building.*

Section 8.—*Silver-work, &c.*—Silver work and chasing; die-sinking; engraving.

Section 9.—*Wood and Ivory-carving.*

Section 10.—*Watchmaking.*

Section 11.—*Bookbinding, Leather, and Caoutchouc.*

Section 12.—*Horticulture.*

Section 13.—*Birmingham manufactures.*—Twenty-eight reports.

Section 14.—Two special reports.

Section I.—Workers in Wood.

C. A. Hooper (Cabinet-making).

Quality of Work exhibited.—French work is superior in design, skill, and taste. "I consider them more proficient in shaped work, but in preparing, fitting, and finishing carcases and inside work, drawers and dovetailing, we are decidedly superior."

Education.—"We want in our country a system of 'national education,' free from all sectarianism, and entirely secular, leaving everyone to exercise his own judgment in religion. Let government restrictions be put upon, and strongly enforced against, every thing and every place of a vicious, low, or degrading nature. On Sunday, our leisure day, let us have not only churches and chapels open, but let us have museums and lecture halls as freely open, where the mind can be elevated, improved, refined."

Sunday-work.—Not an advocate for Sunday labour; likes to see all places closed on Sunday for rest and recreation, but desires to see all national institutions open as well as churches and chapels.

Trade Combinations and Wages.—"Cabinet-makers I find to be the worst-paid men in France, as at home, averaging four to six francs per day; carvers and upholsterers, six francs; women, two and a-half francs. They generally work by the piece, about ten hours per day, but they go earlier to work than us, commencing at six, breakfast eleven, back at twelve, leave about half-past five to dine, when they have done for the day. I do not think they work so hard as we do. . . . . I find from inquiries that trade societies do not exist in France, at least not in the sense of our London trades unions. . . . . The laws of France are very strict in this matter, and punish every attempt at coercion, either by insult, or violence, or intimidation. There must not be any violation of the liberties of trade or labour."

Thomas Jacob (Cabinet-work).

Quality of Work exhibited.—"In England we have not only made no progress since 1862, but, it seems to me, we have retrograded. The English chairs and sofas do not at all compare with the French in elegance, and are by no means superior in make."

Education.—"France is certainly before us in design, but not in workmanship. If steady hard labour or good sound workmanship is required, the English mechanic is second to none in the world; but if art-workmanship is required, it must come from a man who, besides being a good mechanic, must be able to use the pencil also; this being the case, just as education proceeds and a taste for the beautiful is diffused among working men generally, by means of schools of art and free access to our museums, particularly on Sundays, so will art-workmanship in this country rise to a level with that which is so much admired abroad. . . . . A Parisian may very properly be considered to 'live' in a school of art; and a taste for the beautiful is so diffused amongst the people (a natural consequence), that scarcely anything is attempted that does not exhibit considerable taste."

Sunday-work.—"Now these are the men for whom opportunities are wanted to study in our museums and galleries; and I do not see any other means of affording such opportunities than by allowing them free access to such places for a few hours on a Sunday. . . . . But, then, I may be asked if I would destroy the Sabbath-

day's rest, and make all days alike, or would I assimilate the English Sunday to that of the French? Certainly not. The British workman does not want to be told he does not work hard enough, and that he must labour on continually all days alike, as they do in Paris; nor do I believe that the French workman, who makes no difference between Sunday and other days, performs a greater amount of work than the Englishman with his six days a week."

Wages.—"The French cabinet-makers, as a rule, polish their own work; but the chair and carved-work is generally polished by women, who, I was told, received at M. Fourdinois' rather over 4 frs. per day. They are preferred to men, as they do the work quite as quick, and generally better."

WILLIAM WALKER (Wood-cutting Machinery).

Quality of Work exhibited.—Finds that within the last five years certain improvements have been made, but considers that they are few when compared with those made in the five years previous to 1862. Gives a careful description of the machinery.

THOMAS J. WILKIE (ditto).

Quality of Work exhibited.—Takes the same view as the last reporter. Refers especially to a remarkable American dove-tailing machine, "the most novel invention in this class." Also describes the machinery with great care.

BENJAMIN LUCRAFT (Chair-making).

Quality of Work exhibited.—English inferior to French in art-workmanship.—"France exhibits a great number of beautiful chairs and settees, some of them so slight that to many they appear almost useless; yet they are so well constructed that their lightness gives strength by its elasticity; but the greater part of their chairs and sofas are of a very substantial, and many of a massive character. Yet you see no large lumps of wood to offend the eye. Not only are the carvings good,—the framing is equally so; the curves and sweeps are perfection, and the upholstery most beautiful." English defeated in chairs, settees, &c., both in design and finish. Want of cultivated taste. The mere workman has no chance against the workman possessing cultivated taste.

T. W. HUGHES and JOHN D. PRIOR (Carpenters and Joiners' Work).

Quality of Work exhibited.—Carpentry is losing ground in Paris. Joiners' work rough, unfinished, and far inferior to English. "From what we have seen and heard during our visit, we have been led to the conviction that in our trade we have little or nothing to fear from foreign competition, and very little indeed to learn from them. . . . . On the whole, we consider Parisian joiners' work far inferior to that done in this country. Their mouldings, as a general rule, are very well designed, and their carving is remarkably well executed."

Education.—"If continental workmen have any advantage over us, it is that they possess a keener appreciation of artistic effect; and this, we think, may be accounted for in the fact that their museums and galleries of art are always open to working men at times when they have leisure and opportunity of visiting them. . . . . The system of education in France, we are told, is very good. In some of the departments as many as 96 per cent of the population can read and write; and 46 per cent. are educated even in those departments where the greatest amount of ignorance prevails . . . . but we would especially urge upon the carpenters and joiners of this country to become thoroughly acquainted with the principles of geometry, and their practical application to our own trade, as being of the utmost importance; at the same time to strive after a combination of the ornamental and the useful in the objects by which he is surrounded in his daily life."

Sunday-work.—"Sunday-work is general. The large workshops generally close at noon on Sundays; but at a very large number of the buildings, and in the smaller workshops, the men work all day. A few firms pay fortnightly, but the majority pay once a month, Sunday being generally the pay-day, so that Sunday-work often becomes compulsory. . . . . . In this respect, at least, we can hardly say, 'They do these better things in France.'"

Trade Associations and Wages.—Six francs per day is the largest amount paid to any working joiner. Ten hours generally constitute a day's work, the working hours being from seven a.m. to seven p.m., out of which two hours are allowed for meals. . . . . Associations of workmen (societies of resistance, as they are called) are but of recent origin in France. Till recently combinations were illegal. "In 1864 the law was amended, so that combination is now legal, except when accompanied with violence, menace, or fraudulent procedure. We could find no traces of a society of resistance existing among them. . . . . . There appears to be at present but little cause for complaint as far as the French law is concerned. The bronze-workers resorted to a strike, and subscriptions were raised for support of the men on strike, not only in France, but in England and other countries. The course pursued by the bronze-workers met with no opposition from the Government. The tailors, having also a grievance, adopted a similar plan of action, when active measures were taken by the authorities in order to put an end to their struggle, and the little property which they possessed was confiscated."

ALEXANDER KAY (Joiners' Work).

Quality of Work exhibited.—"British joinery holds its place amongst the nations of the world, although she has to import the materials which are the component parts of the joinery trade from America, Russia, Norway, Sweden, Prussia, Spain, Hindostan, Australia, &c." The exhibition of joiners' tools was very bad. With regard to France, "the cabinets or cases for the display of the various articles of manufacture are not so well made as those of other nations. The joiners seem to have still retained the style of the fifteenth century. . . . . There seems to have been no idea of putting two pieces together so as to appear as one piece. . . . . I asked the man what length of time was required to make that sash and frame. He replied, 'Ah! we have to do the work so much more quickly than you have to do in England.' He had been a little over two days, with the use of machinery, in completing the sash and frame. I was obliged to repress a smile, as any British joiner, if the timber had been cut to size and brought to his bench, would easily complete it in one day, and of superior workmanship, both as to strength and brilliancy of finish, without the aid of machinery, scraper, or glass-paper." The American work is good, and a new machine for preparing tenons and mortises, invented by an American, promises to be most useful to the joinery trade. Austria and Belgium good also; improved since 1862.

Education.—"The joiners of Belgium are in general well educated, as there is an extensive means of obtaining a first-class primary education, thereby opening the intellectual faculties in early youth, and adapting them to the various industrial pursuits which it is necessary to follow to obtain a living, and eradicating that false delicacy and superstition which are the inherent qualities of an uneducated mind."

Sunday-work.—"Why is it that Britons enjoy the Sabbath, and in many instances keep it as a day set apart for worshipping God, and France does not generally? On seeing the vast concourse of people enjoying themselves at the fêtes of St. Cloud, on Sunday, I could not entertain the idea that those noble living mortals were all to be lost simply because they do not worship God in churches, as Britons do. But, should Britons spend the Sabbath as Frenchmen do? I say, God forbid!"

Trade Associations and Wages.—The wages paid to a staircase builder on day-work 8 frs. per day, and made more by piece-work, and had his rent paid and a yearly gratuity of 250 frs. "I computed his wages to be actually about £2 15s. per week, besides his overtime. He said the ordinary workmen averaged 5½ frs. per day. . . . There are in Paris five societies; two of them are nearly like the British unions or amalgamations. They have branches in the most important towns in France. Their aim is to find employment for their members. . . . The other societies are benefit societies, numbering in the whole 500 members living in Paris."

Secton II.—Iron Work.

William Bramhall (Saws and Tools).

Quality of Work exhibited.—"I find considerable progress made in my own branch of trade, even to astonishment, since 1862, with French, German, and Belgian exhibitors, not only in the number of exhibits but in the character of the work. Although English exhibitors are few, those that do show are a credit to themselves, and evince no falling-off in point of excellence. Of course there is a greater scope for progress in an article the further it is from perfection. . . . . Out of the Exposition, the shop windows of Parisian dealers should be seen to ascertain who suit the fancy of buyers. The saws, files, and tools that seem most in demand are from Sheffield, bearing the marks of Spear and Jackson; T. Turton and Sons; Flather and Sons; Bury and Co.; Bramall and Bedford; R. Sorby, Brown and Co.; Spencer, &c. I am informed by a file-maker in France, that for six years he marked more files with Spencer's brand than any other. Another authority says that the house does not make one-fourth of the files sold with that brand. . . . . England is still in advance of France, Belgium, and Germany for the highest excellence in the perfection of model and of a cutting edge in saws and tools (without regard to their price), principally owing to the finer quality of the steel and greater care in their grinding. The same does not apply to American tools, however, axes more especially, which for exactitude and finish have the appearance of being die-struck, so uniform are they in every respect. . . . The French—and I speak of the French as being our most formidable rivals for finish, surpassing us in matters of taste—are very defective in the paring department of saws. . . . Some houses have lately employed English saw-makers, at nearly double wages to their native workmen, in order to get a thorough knowledge of the English method of making the largest kind of circulars. The first-class firms pay every attention to having them flat and of a good uniform temper. . . . . France is making rapid strides in articles hitherto considered to be Sheffield ware. . . . . One thing is evident, that with the present rate of progress we shall shortly lose our marked superiority, unless new and extensive mechanical appliances be resorted to, or new markets are opened to us. . . . . Processes newer and better must be adopted if Old England would not be beaten by Young France."

Education.—"A knowledge of geometric forces would be invaluable to the artisan, and lift him from often only being an imitator of others, doing so and so because it has been the custom to do so; but reasoning on principles would make him in the highest sense of the word a master of arts, subduing rude matter to his will for his necessities."

Trade Associations.—In France "trades associations for promoting strikes are illegal. The 'Conseil des Prud'hommes' is a legal board for settling disputes between employer and employed. Its successes are well known. But recently, nineteen tailors were brought to judgment for the late tailors' strike in Paris, and were mulcted in various penalties, by way of asserting the law's authority."

John Wilson (Cutlery).

Quality of Work exhibited.—England badly represented, only 8 exhibitors; France 50.—"The conclusions I have drawn as to the relative position of England and other countries in the manufacture of cutlery, are as follows:—We possess, 1st. Superior natural advantages, more especially good grindstones, and a cheaper supply of coal and steel. 2nd. Abundant capital, which promotes economical production by the concentration of machinery in large establishments, and allows a better division of labour. 3rd. The extensive commercial relations of England give us the best markets for supplying ourselves with raw materials. . . . . These are advantages of no mean character; and in the adaptation of them to the specific object of this inquiry, we possess skill and industry unsurpassed. If the progress made by other countries seems greater than our own, it is because in the manufacture of cutlery we are much nearer perfection. . . . . By the application of capital and skill, we have won our position, and by the same means we must maintain it. . . . . In order to maintain our reputation and position as 'the workshop of the world,' capital and labour must work harmoniously together; and when this desirable consummation arrives, I have no fear of the result. Although the progress of France has been remarkable, as shown by increasing exports and imports, yet cutlery and hardware are not amongst the items of increase. . . . . An English foreman told me he could not get a French workman to use a very heavy hammer as efficiently as the British. The latter, however, were less tractable, and more tenacious of their own way."

Trade Associations and Wages.—"The division of labour is better carried out in Sheffield than in France; the conditions of labour, however, are different. In the former, piece-work is almost general, while in the latter more than 50 per cent. are day workers amongst the cutlers. As to the efficiency of the two there can be little doubt. Wherever 'piece-work' is practicable, it is not only the most efficient, but it is the most satisfacfactory form of labour. In education the French artisans contrast favourably with our own, at least if those in Paris are fair specimens; and this is not confined to particular trades. The women are better educated than with us. . . . . Trade associations, similar to our trades unions, do not exist in France. Previous to1864, strikes were illegal. Articles 414, 415, and 416 of the Code Pénal, 1810, forbid combinations to raise wages or reduce the hours of labour."

Willam Letheren (Hammered Iron).

Quality of Work exhibited.—"It is worthy of note that very little is exhibited of genuine hammered work, as finished at the forge; and where this is the case, as in an oak and olive wreath in this department, the leaves are riveted or brazed, instead of welded, showing a great want, on the part of the smith, of power over the material he was using. The repoussé work, in sheet iron, is beautifully executed; showing, not only the hand-work of a clever mechanic, but the finger of the artist. I found no good work in the workshop of the above exhibitor, and should have thought it second-class, had he not shown such work in the Exhibition. . . . . As far as I am able to judge, the French excel in taste and effect, but I do not consider them more skilful as smiths; in fact, I think the English excel in hammered iron-work. . . . The French make their work strong and very effective; but the ornamentation, being of thin sheet iron, is light and elegant, and forms a separate part from the other portion of the work, and consequently must decay very soon; another fault is that, being thin iron, recourse must be had to riveting or brazing. . . . If iron-work is to last a long time, it must be welded together, or worked from the solid bar. . . . . The only competitors in hammered iron-work are the French and English. In this class of work the workman must not only be practical, but have a knowledge of design and drawing. In this, as a rule, the English workmen are behind; for we may find many a good smith, but, having

no knowledge of drawing, he destroys the good effect intended by the designer."

Education.—"I think the schools of art in England have done much toward the improvement of the mechanic, but few avail themselves of the opportunity. The French have an advantage in this respect; the master of an apprentice is bound by law to give him two hours a day for education; and the class of schools formed for such have a peculiar advantage, inasmuch as the artisan is invited to bring specimens of work of whatever kind, and prizes are awarded, at certain times, to those that excel. In this respect the French are far before the English."

Sunday-work.—"The Frenchman has more time for study, his religion not excluding him from the museums, &c., &c., on Sundays; whether this be right or wrong (I think wrong) it certainly does not give him, as it does the Englishman, excuse for want of time."

Trade Associations and Wages.—"Another cause for their superiority is the greater demand for good work; not because it is any cheaper, but their love of display and good taste create the demand, I believe. The number of hours for a day's labour is about the same as in England. The wages the same. . . . . . . The present system of trades' unions in England is very detrimental to improvement; for this reason, they fix a certain price for labour, good and bad alike. It seems as unreasonable to me to attempt to fix a uniform rate of wages, as a uniform kind of weather."

T. WINSTANLEY (Ornamental Wrought-iron Work).

Quality of Work exhibited.—"The French Exhibition has shown us that England is far behind in art-manufacture, so that any suggestion for our improvement is worth considering. I believe the superiority of the French is owing to their education and study of their business, both in and out of the workshop. . . . . The French show they have taken great pains and anxiety to have a good display. They have spared no expense to attain their object, and they have succeeded so far as to show Englishmen they have a great deal to learn before they are equal to their French neighbours. . . . . In the most essential part of their work, that is, the repoussé work, they have arrived at such a degree of excellence as to leave almost nothing to be desired. . . . In no case were we allowed to see the men at work on the repoussé, or rather man, for there is only one man in a shop, and very few in all Paris."

Education.—"The French are first-class draughtsmen and modellers. . . . The majority of the French working men are more or less acquainted with drawing. . . . . I should like to see a number of institutions,—they might be called colleges, or any other name. I would have them fitted up with a number of workshops for different trades, and one large room to be used as a lecture-room, and for periodical exhibitions. . . . . There should be schools attached for drawing and modelling. Why I propose workshops is, because working men in large towns have a great difficulty in finding convenience to do anything for themselves by way of improvement."

JOHN EVANS (Mechanical Engineering).

Quality of Work exhibited.—Found little new in the English department of machinery. For finish and sound workmanship nothing surpassed the British display. The Whitworth tools were faultless to the eye, and made for work, not for show. Only the Americans approach us. The French are far behind. The best foreign locomotives exhibited are bad copies of English originals; the work less exact. No novelty in stationary engines. Considers the wood-working American machines the best invented. Swiss tools very cheap.

Sunday-work.—Hopes Sunday-work will not be introduced into England. Believes attention to Sunday has been beneficial to England.

Trade Associations, &c.—Believes the Conseil des Prud'hommes is found to answer. General bearing and behaviour of French workmen in the streets and cafés struck him as superior to that of our own men, but until the French have learned many things from us the British workmen will remain better off than their brethren in France.

WM. LEARMOUTH (Mechanical Engineering).

Quality of Work exhibited.—Nothing in the Exhibition to compare with the English machine tools. The French exhibited some good engines. The works from Creusot supply almost an exhibition of themselves.

FRANCIS OATS (Mining and Metallurgy).

Quality of Work exhibited.—Some good machinery in the English, French, Prussian, Austrian, and Swedish departments.

SECTION III.—GLASS, POTTERY, PORCELAIN, &c.

AARON GREEN (Ceramic Decoration).

Quality of Work exhibited.—"We now come to the consideration of the English department, of course commencing with Minton and Co., whose exhibition is an honour to the country, and one which must fill every Englishman with a feeling of satisfaction almost amounting to pride. First in importance, from their size, form, colour, material and decoration, are a pair of vases in royal blue, perhaps one of the finest colours in the Exhibition. The figure paintings representing the birth and toilet of Venus, after Boucher, are by Mr. Allen. . . . . The landscapes (likewise after Boucher) are by Mr. Mitchell. . . . . Turn we now to Wedgwood and Sons. This is decidedly the most remakable name in the whole history of ceramic art in England; and in this great special production—the Japan-ware—they are still unapproachable; indeed, in this they are unique. . . . . Our visit to the celebrated manufactory at Sèvres demonstrated one thing to us, viz., that their best performances are of former years, and that we are making greater progress than they, for I think it cannot be questioned that our productions at this Exhibition are greatly in advance of all our former efforts, while in the general commercial articles of our trade we are really ahead of them. . . . . It has been stated that in all matters relating to the higher branches of this art we are deficient.' . . . . What do the jurors who awarded the prizes say, and what is their verdict? Why, of five medals given to Minton's workmen for porcelain decoration, they gave four to English and one to a German workman; and of four medals given to Copeland's three were given to English and one to a German, and not one to a Frenchman at either place. So much for the charge of English inferiority or incapacity." England has successfully competed, without aid, with the Royal and Imperial factories, and no branch of art has made greater progress since 1857 than porcelain of the higher order.

JOHN RANDALL (Pottery and Porcelain).

Quality of Work exhibited.—"The ordinary run of Sèvres patterns, it strikes us, have nothing to distinguish them from the every-day productions of other manufacturers in France and England. In fact, taking the same class of goods, the superiority is on the side of the French and English manufacturers. . . . . Minton uses a softer glaze than formerly, and more of it; hence the rich grounds and soft sinking of the painting into the glaze, specimens of which are to be seen on his stall. The same may be said of Copeland; consequently their grounds rival those of modern France, in design, modelling, combination of colour, and general decoration; we should say those houses are equal to any, either French or English. . . . . In matters relating to the higher branches of art we are deficient. There is no English flower-painter equal to Hurten; and, if we except Allen, there are no English figure-painters equal to those employed by Raingo and other French manufacturers. We except a kinsman of our own, Mr. C. Grey, of Chester-

terrace, London, whose pictures on porcelain in the oil and water-colour department have been pronounced the best in the Exhibition, because he is a painter of pictures only."

Education.—There is more credit due to an English workman if he understands his trade than to a Frenchman, for he has so many opportunities to educate his eye and taste. "We have been groping our way in ignorant and bigoted security, and quarrelling in which way education should be given, or denying it altogether, while other nations have been getting before us." Our prosperity depends so much on new adaptations, discoveries, and improvements as to demand all the readiest and best educational training the nation can give us.

Francis Kirchhoff (Glass-painting).

Quality of Work exhibited.—"The French work, when compared with English, shows a greater diversity of design in construction, and more freedom and grace in the drawing of the ornament, but in excellence of colour and pleasing harmony the English glass is much superior. . . . . The first thing that struck me was the careful finish of the working drawings, or cartoons, drawn and shaded with black chalk on blue tinted paper, heightened up with white chalk in the lights." There are very few English exhibitors.—The best manufacturers are not represented.

Wages.—"I think there is not much difference in the cost of material in Paris compared with London, but, on inquiry, I found the wages were much lower, a good ornamental glass-painter receiving but 4s. a day, a figure painter earning, of course, more than that—no stated sum—but being paid according to his skill."

William Beardmore (Pottery).

Quality of Work exhibited.—"Having visited the Exhibitions in London, of 1851 and 1862, I can perceive a great difference between those years and the Paris Exhibition of 1867. We could in the former see specimens of work, from the most crude to the most refined, and from the smallest to the largest piece, forming, too, as those exhibitions did, a complete history of the pottery department. In the former Exhibitions the exhibitors were far more numerous, consequently there was far more competition in the home and foreign courts. However, I believe there are in this present Exhibition the best skill and the best art brought together from the various nations; in earthenware, for domestic purposes and sanitary arrangements; in porcelain, for enriching the table and ornamenting the side-board; in Parian statuettes for the mansion; and in majolica for the halls, conservatories, and gardens of the rich . . . . . After a minute examination of various stalls, both home and foreign, I have come to the conclusion, and the fact is forced on my mind, that the British workman is not to be surpassed, if he can at all be equalled. Take, for instance, the vases in the foreign departments; there are wood pedestals, metal feet, and where there are openings in the middle, a gilt band is introduced (I suppose to hide defects), and then brass ornaments for handles and tops. Now it must be acknowledged that metal can be worked sharper, and will give the pieces a sharper and lighter appearance, but it is not pottery; in the British department you will not, I think, find a single article so adorned. . . . . In concluding my remarks, I say it without fear of contradiction, that the British potters have nothing to fear in coming in contact with foreign workmen; our superior style of work, the beauty and simplicity of our designs, the excellent ornamentation, the richness of colours, the white firm body, the fastness of the glaze, make us feel proud of our position in the great Paris Exhibition, 1867."

Samuel Cooper (Tiles and Pavements).

Quality of Work exhibited.—"As to the manufacture of English encaustic tiles and other tiles for pavements, and for wall decoration and for other purposes, the specimens exhibited by Messrs. Minton, Hollins, and Co., Stoke-on-Trent, compare very favourably with all others of a similar character, and on the whole must be classed in the highest rank, whether considered with reference to perfection of manufacture or beauty and variety of design and colours appropriate to the recognised styles of architecture, and conventional treatment necessary to be observed in order to ensure success in this branch of industry. . . . . I must observe, I have little hesitation in stating that the continental productions are much below the standard in comparison to English manufacture in this branch of industry." Prussia superior to France; Belgium much below England.

Michael Angelo Pulham (Terra-Cotta).

Quality of Work exhibited.—"With regard to the quality of the work turned out by different nations, as shown in the Paris Exhibition, England stands foremost in the quality of works in terra-cotta, for specimens exhibited for architectural purposes, in beauty of design, good taste, displayed in harmony of colours, and in the adaptation of terra-cotta for building purposes; also for the execution of works, in this beautiful material, requiring artistic skill, forethought, and perseverance to bring about successful results, as shown in many of the English examples. It is not surpassed for good colour, finish, straightness of mouldings, and is in long lengths; it is also well fired to stand any climate. Next to England is Prussia."

Education.—"There seem to be about 450 men and lads of good conduct to 50 doubtful ones; some 60 or more like keeping 'Saint Monday.' There are about 270 who know how to read and write, 30 who can read only, and 70 who can neither read nor write; but the education of the working classes seems to be improving, as there are over 40 lads under the age of 16 who know how to read and write." This refers to Paris.

Wages.—"The wages or salaries paid to men, women, and boys, seem to be according to their grades or different kinds of work. Good finishers get from 8s. 6d. per day (10 hours) downwards, according to merit or skill; some as low as 2s. 6d.; but at piece-work they can earn sometimes 12s. per day. Women get 1s. 3d. per day of 10 hours; boys according to their abilities."

Section IV.—Textile Fabrics.

L. S. Booth (The Ribbon Trade).

Quality of Work exhibited.—"The ribbons, as a whole, are artistic in design, harmonious in colour, and perfect in workmanship. No painter ever put colour on canvas and made those colours appear like real fruit or flowers, with bloom and every variety of tint, with more success than the varied artisans engaged in this trade have done. The productions are perfect specimens of their kind, in which the artist has brought all his varied power to imitate nature in form, the chemist in hue and colour, and the artisan judgment and skill, to work the whole and make a success. Nor should it be forgotten that, in producing these patterns, there has been an enormous outlay by the manufacturer for design, draft, and cards. . . . . St. Etienne, the centre of the French ribbon trade, exhibits goods made especially for the occasion, so beautiful and neat as even to surprise themselves." Prussia next, then Austria. England a humble show of plain and slightly fancy goods—good in colour and workmanship. Only three firms exhibit.

Ribbon Weaving Machinery.—There are no new inventions. Visited St. Etienne and Basle. "The result of our inquiries is as follows:—For making good plain ribbons England has nothing to fear from the construction of the looms or the ability of the workmen. Our class of loom surpasses anything we have seen on the Continent for making a simple, plain, or very moderate fancy ribbon. . . But for making figures and brocades, our machinery is

sadly too restricted. . . . A hundred Jacquard looms, of moderate size, with five or six tiers of shuttles, brought into Coventry, would be one of the greatest boons that could happen to the city. There is more than ability to manage them. There are artistic skill, excellent dyers, steam-power, gas, and every facility at our doors to do a good trade. . . . The ribbon the people of Coventry have long made, and can make well, is not now required; other fabrics have sprung up, and it behoves the town to look into the matter, and adapt itself to the requirements of the age."

Education.—At St. Etienne "the weavers are a very intelligent class of men, and can mostly read and write. Every facility has been afforded them by the town to attain proficiency in their art. In the museum, containing sculpture, paintings, antiquities, minerals, birds, a valuable library, and all kinds of handicraft, are two rooms devoted to the staple manufactures of the town."

Trade Associations.—"There subsists a very friendly feeling between the manufacturers and workpeople; this has been attributed to the action of a society called 'Conseil des Prud'hommes,' or Society of Prudent Men, formed of various trades, of workpeople and masters, to adjust the differences that from time to time arise."

Joseph Gutteridge (Ribbon-weaving).

Quality of Work exhibited.—"I carefully examined the various sections devoted to the exhibition of wrought and unwrought silks, and paid particular attention to the manufactured products of St. Etienne, Switzerland, Prussia, Austria, and Germany. In intervals I visited the machinery department for the production of textile fabrics in silk, woollen, and cotton, and in particular those appliances used in the preparation of the raw material, and on which depends so much the marketable value of the finished fabric of manufactured ribbons. . . . I was much struck with the fact that while the Coventry goods were made for ordinary sale, those of the French section were goods made expressly for the Exposition, of extreme manipulative skill, and demanding machinery of more intricate complication than is used in ordinary fabrics." Visited St. Etienne and Basle; had no conception of such machinery as we saw. "One thing much impressed me, that while our mode was devoid of system, theirs was complete, and consequently there was greater perfection when the separate parts were combined in the manufactured article. . . . I felt convinced from what I saw, that with improved machinery, and a better system of treatment of the raw material, we should be able to compete successfully with continental manufacturers. In carefully going back through these investigations, I have come to the conclusion that the mental and physical capacities, on the whole, are in favour of the Coventry artisan, who generally as a class can read and write well, and in ordinary trade dress well, taking pride in their extra room, generally well stored with useful books."

Education.—"I think we require more theoretical education, through the medium of museums, schools of art, and classes, devoted to the general interests of our staple trade, so that all might have an opportunity of acquiring the knowledge of design, colour, and taste, so essential in the manufacture of silken fabrics."

E. Smith, J. Bird, and G. Dexter (Lace).

Quality of Work exhibited.—"In reviewing the notes taken upon the lace-goods exhibited, we are unanimous in opinion that French laces display a decided superiority in design and quality of material over the English goods. We believe the drier and clearer atmosphere of Paris, where the manufacturers of Calais send a large quantity of their silk to be dyed and stained, is one great cause of the brightness of the French lace."

Education.—"As a means of artistic education, the perfect freedom of access to the picture galleries appears to be taken great advantage of, and fully appreciated by the people. . . . The beautiful gardens are another source of attraction and instruction to the people. . . . The improvements in the methods and plans of instruction are manifest ever since the English Exhibition of 1862. The elementary books and treatises for the teaching of reading, writing, grammar, arithmetic, history, geography, and drawing, have gained much in simplicity and clearness; they are more practical; they are more impressed with the end they have in view, while they spare the child both time and trouble. . . . On the whole, we are of opinion the French have made great progress of late years; and there can be no doubt that the superior education of the working classes on the continent gives them an advantage, in some respects, over Englishmen."

Wages, &c.—"There are in Calais, and St. Pierre, near Calais, 780 machines, the best of which were built in Nottingham and its vicinity. They are all in factories, worked by steam-power, running all hours, commencing work from 6 to 7 o'clock on Monday morning, continuing until 10 o'clock on the Saturday evening; in some establishments working up to 10 and 12 o'clock on Sunday morning. . . . The prices for different qualities of silk are about the same in France as in England."

George Kendall and George Caunt (Hosiery).

Quality of Work exhibited.—"With respect to the machinery in the Exposition for the making of hosiery goods, both rotary and circular, there was little that was new to us, with the exception of some improvement in the racks of the cleared carriers, which were good. . . . . These improvements were on rotary frames, exhibited by Mr. Tailbouis, of St. Just, and worked well. All other parts of these machines appeared to us to be of English design, and are being constructed in France by English and French workmen, or under the superintendence of Nottingham and Leicester machinists." Few English exhibitors, and not very good. The Nottingham company were not surpassed by any. French have made great progress and are still going forward.

Samuel Boast and George Appleton (Figured Shawls).

Quality of Work exhibited.—French shawls finest possible texture, but no improvement in their manufacture. German department no improvement. Scotch badly represented. Norwich maintained her reputation. Indian shawls pre-eminent.

John French (Machinery for Worsted Fabrics).

Quality of Work exhibited.—Tools.—"In the Belgian Department I found tools, certainly in some respects taken from our own, with slight alterations made in them, which do not at all improve their efficiency, and destroy their original simplicity and usefulness. Taken as a whole, the Belgians are not equal to the English tool-makers of the present day. The Prussian Department was the next which I visited, and here again I found that I should have to look to England for the real original, although I must say the workmanship was of first-class character, they having imitated us to a nicety in every respect. In the French Department I found some good tools, and the workmanship not to be despised; but I cannot close my eyes to the fact that most of the tools, and other heavy machines, engines, &c., had their origin in England, or were made in France by English workmen. I now come to the English Department of Tools. In expressing an opinion upon the tools exhibited, I must say that in every respect they are of surpassing excellence, and stand unequalled within the area of the Paris Exhibition. It is admitted on all hands, that the tools exhibited, especially by the firm at Leeds, which has received the gold medal, are deserving the highest praise, in having sustained the honour of our country, by enabling us as Englishmen to stand in the envied position of being the best tool-makers in the world." . . . Visited Rheims, Roubaix, and Tourcoing.

. . . . "This ends our inspection of machinery. If an inquiry like this had been instituted twenty years ago, it might have answered a good purpose. I hope it may do so now, for you may depend upon it that every exertion is being made to supersede us; and, without some great effort on our part be made, the time is not far distant when such will be the case. I have every reason to believe that men are sent over to this country, whenever they hear of anything new being adopted, to ascertain all the particulars about it; and if it be practicable, and will serve any purpose of utility, it is not long before it is adopted by them. I still, however, think that by one great effort of a united people, England may, by the determined perseverance of her enterprising spinners and manufacturers, aided by the indomitable energy of her sons of toil, win back, perhaps not her pre-eminence, but an equality, which she may successfully maintain among the nations of the earth."

George Spencer (Worsted Yarns and Textile Fabrics).

Quality of Work exhibited.—Manufacture not equal to Bradford, but gaining rapidly upon us. French articles appeared to be made specially for this Exhibition. In merinos and cashmeres, French decidedly superior; quite unrivalled. English goods not exhibited with taste. English weaving machines best in quality, design, and cheapness. "Messrs. J. and S. Smith, of Keighley, are the only exhibitors of worsted spinning machinery which is of first-class character. In the weaving department we must take the credit of being unrivalled by our neighbours, both in quality, design, and cheapness. The prices for ordinary plain looms, French-made, are from 400 to 750 francs each." Visited Rheims and Roubaix.

Daniel Illingworth (ditto).

Quality of Work exhibited.—French superior in quality and dye; goods made regardless of expense for show; goods from Roubaix superior to English. English goods same as seen every day. In machinery nothing to learn, nothing new, no looms equal to English. Bradford goods made for the middle and working classes; most suitable and substantial, and surprisingly cheap. "With regard to machinery, we found it very difficult to gain admittance to the French department; at last, however, we succeeded, and on examining the looms, we did not find anything to learn. There was the plain and drop-box loom, but nothing new, and none equal to the Yorkshire looms for the Yorkshire trade. We consider it unnecessary to dilate upon the excellence of our looms."

R. Sinclair (Tailors' Work).

Quality of Work exhibited.—Austrian the best exhibition.

Sunday work.—"All French tailors, working for French firms, work Sunday morning, and generally get paid on Sunday at noon. English firms close on Sundays; the French tailors, when once used to it, like the change."

Wages, &c.—"The work is better paid in Paris than London, and I shall advise more English tailors to go over. The French masters treat you with more respect. Like the English master, he roars and finds fault with your work, but you are allowed to pay him back in that respect, and he does not complain." . . . .

Paris prices.		London prices.
26 francs (£1 0s. 10d.)	....	£0 17 1
30 ,, (£1 4s.)	....	0 18 3
34 ,, (£1 7s. 2d.)	....	1 3 0
40 ,, (£1 12s.)	....	1 8 0

"My conviction is that the West-end tailor of London is by far the best and greatly the quickest workman, and by far the worst treated. The peculiarity of the French working he would soon learn, and do as well; but it would never do for England, where men work three together in shops, instead of one at home, the same as in Paris."

Section V.—Masonry and Brickwork.

George Howell (Bricklaying).

Quality of Work exhibited.—Brickwork not so good as in England; but little attention paid to *bond.*

Workmanship.—"The French workmen greatly excel in purely artistic work. In stone carving they are superb. But in solidity, and the general details of plain work, they can learn much of us."

Education.—"It would be presumption to speak much of these subjects upon so slight an acquaintance, but I tried in a great number of instances, taken at random, and found every one could read. I was informed that they were all able to read and write."

Trade Associations.—"There are no trades associations in Paris as in London. Their associations are essentially political. Still they have combinations, and manage to plan and act in concert, pretty much as we do here. But it must be confessed that their Prud'hommes are of essential service in those conflicts of capital and labour which we so frequently witness in this country."

John Jeffery (ditto).

Quality of Work exhibited.— Work inferior. Very little brick-work in Paris.

Wages.—"They work all the time they can, Sundays as other days, and received wages for a day of ten hours, 4frs. 50c. (3s. 9d.). The labourer's wages are 3 frs."

George Broughton Forbes and John McEwen (Masonry).

Quality of Work exhibited.—English mason more skilful and systematic; better quality of work. No work in Paris equal to our large buildings. "We now claim for our countrymen in the trade as masons to be more skilful and systematic in the executing of their work, either for quality or quantity, than we have yet seen."

Trade Associations and Wages.—"The masons here do not object to work along with men who do not belong to their society. We did not hear of any strikes. All the differences that may arise betwixt masters and men are settled by the Court of Arbitration. This court is composed of an equal number of masters and men. They all bow to the decision of the court. Masons' wages are from 6d. to 8d. per hour in the city. There are three classes of workmen: roughers, at 7d.; fixers, at 6d; and finishers, at 8d. per hour. On hard stone they have to pay 5d. per day for sharps. On granite the employers pay for the tools sharpening. The cost of their living is about three francs per day. They work ten hours per day, seven days per week (including Sunday), and, when required, overtime."

Thomas Connolly (Masonry).

Quality of Work exhibited.—French masons do not use their strength or hands with such ease and effect as the English, but we might adopt some of their tools. No man can work to greater perfection than an English mason, but when the hands have to realise the imagination then the Frenchman surpasses him.

Trade Associations.—"The masons of Paris have no trade union to assist in maintaining wages or regulating the hours of labour, such as exist in England; but I learned that they have a secret society, that is, one not sanctioned by the Government, through which they are assisted while in search of employment, by means of lodges in the provincial towns, at which the members who call can learn where employment is to be had. . . . . Many of the disputes which necessarily arise between masters and men are settled in the Courts of Arbitration, or Council of Prud'hommes, of which there are four in Paris. Each court consists of a president, who is appointed by the Government, a secretary and twenty-six councillors—employers and working men—who represent the six categories into which the industries of Paris are classified. They are elected every three years by the workmen; and every man

who has worked five years at his trade, and has resided in Paris three years, is qualified to vote. There are about 12,000 cases annually adjudicated on in each court."

Education.—"It is impossible to estimate the loss which is entailed upon England through the neglect of art culture in every department of our industry. Through it we are reduced to mere hewers of wood and drawers of water for other nations. The bulk of our able-bodied population is engaged in manufacturing goods to be sold cheap, or in producing raw materials for other people to work."

Sunday-work.—"Nothing is more intolerable or repugnant to the mind of an Englishman than the desecration of this day of rest; to see the workmen employed on the streets and on the buildings; the shops open, and traffic carried on the same as on any other day of the week, is a thing for which the mind is quite unprepared."

C. BARTLETT (Plasterers' Work).

Trades Associations and Wages.—"Wages are paid once a fortnight, and in some cases once a month; but everything getting dearer—provisions, house-rent, &c.—there was a general move made by the men for shorter reckonings, and now the practice pretty generally prevails of drawing on account as often as twice a week—viz., Wednesdays and Saturdays— and settling up once a fortnight or three weeks; sometimes one a month. . . . . Sixpence per hour for those men who only do plain work; eightpence for those who run mouldings. The cost of materials—such as laths, nails, plaster—is about five per cent. cheaper than in England. . . . Trades unions are not permitted to exist in France. But does the French workman, living so much out of doors, and mixing continually with his fellow-workers, counteract to a certain extent the Government prohibition in relation to trades' unions? The writer of this believes he does."

SECTION VI.—COACHMAKING.

THOMAS MAGRATH (Coach-making).

Quality of Work exhibited.—Work not so neat or so light as ours; iron work well finished but heavy. English work exhibited not got up on purpose; French special work. English not surpassed, and more durable.

Education.—"It is of the greatest importance to the workmen that they should possess an intimate knowledge of drawing and mechanical appliances. And I regret to say that, in a great city like London, there are no classes or instruction given by any professional draughtsman in connection with this trade; and from what I have observed in the workshops in Paris, and also from the many drawings and sections of various parts of carriages, admirably executed, in the Paris Exhibition, I must confess that our French fellow-workmen have greater facilities for obtaining a more scientific knowledge of the construction of a carriage than the English workman."

Wages.—"From what I have been informed, as to the rate of wages paid to the class of men engaged in this branch of the trade, and the privileges of working seven days a week, the extra day making up the deficiency in wages, I am of opinion that the French coachmakers can produce carriages cheaper than the English manufacturer."

SECTION VII.—SHIPBUILDING.

E. F. MONDY (Shipbuilding).

Quality of Work exhibited.—English models best; French the next. Could not see anything new in shipbuilding or machinery. Visited Havre.

SECTION VIII.—SILVER WORK, &c.

R. E. BARRETT (Silve Chasing).

Quality of Work exhibited.— Cannot compare with French chasers, except in one or two instances.

GEORGE PAGE (Silver Work).

Quality of Work exhibited.—"It is gratifying to perceive, after passing a studious examination of the works of my respective branch in the Exhibition, that the most remarkable surface finish, as shown in repoussé, with some most excellent specimens of cast surfacing, are exhibited by English manufacturers; but I must add, that the most admired works exhibited by them have been worked by French and English artists and artisans combined. I say this, knowing the works to have been executed by them. I find the French artisans are in advance of those of other nations, with regard to the art of surface-finish in my respective branch. Their variety of tasty designs and designed textures, show admirable tact on the part of the workers."

P. A. RASMUSSEN (Silver-work).

Quality of Work exhibited.—"Taking a general view of the whole class, we see at once that France and England occupy the first rank as producers of high-class art-work in the precious metals; and of the two, the superiority must be acknowledged to be on the side of France; this fact has been fully recognised by the best English firms, who have, much to their credit, secured the services of some of the very best French artists and art-workmen, and at great sacrifice produced works of the highest character. The result is that we see in the English part of the Exhibition several specimens equal, or even superior, to any in the French; but they must be looked upon as exceptional instances. If we ask how far the presence of Vechte, Morel la Deuil, and other French artists in England, has influenced the character of English work, it will be seen that their manner of finishing the work, has been to some extent, adopted and followed. The coarse hard mat, for so long time applied to figure-work, is gradually disappearing before the softer, fleshy-looking texture produced by careful tooling, which the French chasers do to such great perfection. As far, however, as the style of art or choice of subjects is concerned, the English artists have very properly not followed the French. In the more ordinary kind of silver-work for the dinner or tea table, it is not so difficult to arrive at a comparison. Some of the English work of that description is very good; plain forms, easily kept clean, extremely well polished; in some instances beautifully engraved, and very substantial. They cannot be matched by any from the Continent; but their price is naturally much higher. Their heavy weight forms, of course, an important item in this respect."

Education.—Technical schools are established in Wurtemberg and Denmark. "One of the most important questions affecting the workman is that of his education, both general and special. In England the means of artistic and technical instruction or education within the reach of a workman are lamentably deficient compared with some other countries. I think that the instruction given is more calculated for art-designers and draughtsmen than for workmen, who, after having received a knowledge of elementary drawing, should have opportunities of a more special training, according to the business in which they are engaged. Taking my own trade as an instance, instruction in engraving, chasing, turning in wood or metal, spinning, enamelling, and some chemistry, so far at least as to understand the properties of the metals and acids, ought to be within the reach of every young workman, besides drawing and modelling."

Sunday-work.—"There can be no doubt that the English workman is in several respects better placed than his continental brethren. . . . . The English workman, as a rule, enjoys complete rest from labour on the Sunday, and has, moreover, the benefit, in most trades, of a half-holiday on the Saturday, leaving him considerable time at his disposal for instruction, rest, and recreation; he enjoys full political and civil rights, liberty of association, and equality with his master or superiors before the law of the land; along with all his countrymen, he is exempt from that great drawback to most continental workmen's liberty — the liability to

military service; and of late years many men of the highest class have taken the greatest interest in his welfare and improvement. I do not advocate the introduc- of the French Sunday in London, where it would be as much out of place as an English Sunday in Paris. . . . . I do not forget that the keeping the Sunday as a day of complete rest has been the principal cause of procuring for the working people the Saturday half-holiday—unknown in France. But I think that when public opinion shall have advanced so far as not to oppose the opening on Sunday of the British Museum, National Gallery, Kensington Museum, and similar institutions, such an act would be received with gratitude by the working-classes, and naturally assist in cultivating their taste. Hampton-court and Kew-gardens are much patronised on a Sunday."

Trade Associations and Wages.—"Wages are, generally speaking, higher in England than on the Continent, although a good increase has taken place—especially in France—during the last twelve years. Six francs per day was, previous to 1855, a good remuneration for a first-class silversmith in Paris. I was now informed, both by workmen and masters, that they were receiving 8frs. (or 50frs. per week of sixty hours), and with increased pay for overtime. In Germany, wages are much lower. . . . . . In France, a trade society exists, whose object is to support workmen out of employ, but the pernicious agitation to obtain a uniform rate of wages, which is a main object in several trade-unions, has never, to my knowledge, been encouraged by this society. . . . . Associations of workmen are now permitted in France (since 1864) in Prussia (since 1865), in Belgium (since 1866), as well as in other continental states, where previously they had been prohibited, but in no country have they obtained the same development and character as in England. In Paris, a society of workmen in the silver trade has been formed for the purpose of assisting men while out of employ. It does not appear to be conducted in a spirit antagonistic to the employers."

G. Berry (Engraving).

Quality of Work exhibited.—Few specimens of engraving, except historical. Engraving, as a decoration to plate or jewellery, far short of what I expected; the best specimens were on watch-cases.

Education.—"With regard to the education of the French art-workman, he has many advantages that the English has not, especially if his business be of an ornamental or artistic character, for the abundance of museums and works of art is so great that he cannot do else than learn. . . . . Besides Schools of Art, there is an abundance of schools for general education, both for day and evening, as well as public libraries, where a man can go and consult the best of books free of charge. . . . . . I think if the English workman had these advantages he would very soon be equal to, or even surpass, the French workman in the ornamental branches of business. . . . . I am very glad England has taken a step in the right direction, that is by having the Kensington Museum open after business hours, and thereby enabling a man to go and study in the evening."

Sunday-work.—"I think it is a great benefit to the French people that the museums are open on the Sundays, and consider it is one of the chief things that has made the French workman what he is. If we could have the British Museum open in the evening and on the Sundays, it would give the British workman as great an opportunity for study as that enjoyed by the French."

William Elliott (Die-sinking, especially adapted to Silversmiths and other Metal Trades).

Quality of Work exhibited.—Was disappointed in the stamped work exhibited. America some of the best. France some fair work. Sheffield and Birmingham so little and so poor a show, best not to notice it.

Sunday-work.—"Notwithstanding the apparent happiness enjoyed by the Parisian workmen, there is an unpleasant reverse to the medal, viz., the often compulsory and unnecessary amount of Sunday labour carried on in Paris. . . . I think few British workmen who have visited Paris will return home without feeling that their position in respect to the hours of labour is better than that of the Parisian workman; and also feeling that if more opportunities were afforded in this country for rational, and, I might say, national enjoyment, a visible improvement in manners and well-being would soon be evinced. If some of the large and numerous squares with which the metropolis abounds were opened to the public daily, or on Saturday and Sunday afternoons throughout the year, and on summer evenings, say from 7 to 9 o'clock, and government were to order military bands to perform, it would in time have a most beneficial effect on the working population of this country. As it is, we have none of those public and gratuitous enjoyments which the French possess."

Trades Associations.—"There is no trades' union amongst die-sinkers, neither in France nor England. . . . . The system of the Conseil des Prud'hommes appears admirably adapted to settle trade disputes. . . . . Government and trades' unions would do well to consider the system as practised in France. Trades' unions might employ their funds with great advantage for benevolent purposes in connection with their own particular trade. By adopting the Conseil des Prud'hommes, they would prevent those fearful strikes and wasting of funds; indeed, by adopting the system of Prud'hommes, trades' unions would become as it were an assurance society for the benefit of each trade."

Section IX.—Wood and Ivory Carving.

James Mackie (Wood Carving).

Quality of Work exhibited.—"The carving of the French is not equalled by other nations. Design, as shown in the plan and construction, is of the best, so that carving and good design being thus intimately associated together, we have the essentials of good work. Something good is found in the productions of other countries, but in no other do we find so much that is excellent, such correct principles, such a love of the beautiful, and a successful carrying out of the feeling of taste to its final issue. Good carving here finds its best exponents; it will live here if anywhere; and to it we must look for much that will guide and encourage us in the future. . . . . The works that England exhibits are not numerous, but several are conspicuous for elaborate and costly carving. In the exhibits of the leading London firms there is an ample evidence of an anxious desire to rival the best examples of industrial art as applied to furniture of the highest class. It would have been a great pleasure to have said that the works of our country in this branch of art were as successful as they were intended to be, but, when judged by a standard, brought up to a very high point, in the Exhibition itself, it must be confessed that the day has yet to come which will see our exertions crowned with that success that all desire." Italy takes very high honours, and displays great taste. Switzerland has more exhibits than France. Belgium exhibits vigorous carving.

Education.—"There is ample proof that France is a land of great beauty and fruitfulness, and it is also rich in works of art. The people of the present age are in the midst of glorious monuments of grandeur and beauty bequeathed to them by their forefathers. . . . The architecture of Paris is a great school, and the student who enters it, daily receives valuable instruction. . . . It would seem almost impossible to be in the midst of so many examples and not grow up imbued with a love for, and also instructed in the art of carving. . . . . An examination of the works of the Parisian and provincial schools in the Exhibition told the same tale, of a system that gives simple and varied exercises to the pupils, that eminently fit them to acquire

proficiency in those branches of art-industry to which their tastes incline them."

Sunday-work.—" On Sundays the galleries and museums are all open; and though it may be objected to as being an irreligious provision, it nevertheless exercises considerable influence upon the taste, and increases the workman's opportunity for study."

Trades Associations and Wages.—" With regard to the associations of the workmen, I could learn but one or two facts. The carvers are associated together, numbering several hundreds. The members consist of workers in both wood and stone, but principally wood, and also modellers. Their objects are to promote the exchange of friendly sentiments, furnish trade information to each other, and especially to the unemployed. They have also taken in hand the subject of wages. Having found that some of the Paris shops were paying a very low rate of remuneration, it was determined to ask for an increase of 20 per cent., and the demand was acceded to in each case."

R. Baker (Wood Carving).

Quality of Work exhibited.—" Works are exhibited in the styles of almost every period, displaying abilities in the great body of modern carvers. . . . . In this respect England has advanced considerably, but it is in the French department we find the greatest perfection, and the most general progress. The Italian renaissance forms the basis of modern French styles. . . . . The general design of the English furniture is good, and shows considerable progress; it may, in this respect, be favourably contrasted with the French, and for practical purposes it is superior. As an instance of the bad construction of the French work, the centre table of the pavilion of the Empress is obliged to be screwed to the floor, to prevent its falling over at the slightest touch. This is an error English manufacturers are not likely to commit, because they make utility the first consideration. . . . . Our inferiority is not through a want of natural abilities; but our natural genius wants encouraging and directing. . . . The English carving is sharp and keen, but the thick edges are unpleasant. When this is avoided, by rounding the work, it loses the necessary shadow, and becomes tame and heavy; the French not only avoid the thick edges, but, by a variety of effective touches of the tool, give life and vigour to their work. It is to these enlivening touches that I would direct the attention of the English carvers."

Wages, &c.—" I next visited the principal workshops of Paris, and, by a careful comparison of prices, confirmed a previous opinion, that work is produced cheaper in Paris than London. London contains about 1,700 carvers; Paris about 3,000."

Joseph Bentley (Ivory Carving).

Quality of Work exhibited.—Ivory carving not sufficiently encouraged in England to bring out a separate branch of industry. Much encouraged in France.

Section X.—Watchmaking.

John Gregory and James Stringer (Watchmaking).

Quality of Work exhibited.—" In concluding our report, we venture to offer the following observations with regard to the relative positions of the French, Swiss, and English trades:—The English watch is more durable and substantial, and less liable to get out of order than the French or Swiss watch, and is also, as a rule, a more correct time-keeper, owing to its having a fusee and lever escapement, instead of the going barrel and cylindrical escapement of the French and Swiss watches. But the French and Swiss watches are produced at a much less cost, and consequently in much greater numbers than the English. The advantages the French and Swiss workmen have, and which conduce to this result, are chiefly as follows:—The workmen are accustomed in their youth to receive instruction at horological schools, established for the purpose, by which means they have opportunities of obtaining a thorough knowledge of their trade, which the English workmen do not possess. They have also paid more attention to the introduction of machinery and tools for facilitating the production of the different parts of a watch, and the work is more subdivided than in England." Visited Besançon and Geneva.

Hermann F. Jung (The Horological Department).

Quality of Work exhibited.—" The English watch and chronometer maker still stands at the head of his profession. . . . . As for the particular merits of the different countries, England stands first in point of excellence for marine and pocket chronometers; they are superior to any exhibited in Paris; but with her cheaper watches she cannot compete with Switzerland or France." France and Switzerland are both second to England. No novelties in the general trade. Germany is not represented.

Wages.—" A good workman's earnings rarely rise above £2 a week. The average wages of the great majority of watchmakers do not amount to more than £1 10s. a week. Some of the very best never get more, although a few favoured individuals may realise as much as £4. In Paris the wages have risen during the last twelve years. Formerly the standing-rate was 5fr., now watchmakers earn from 6fr. to 8fr. a day. In England, while the price of provisions has risen, the wages of watchmakers have rather declined, or, at best, remained stationary. In Germany wages are very low, and the price and mode of living are in accordance."

George Cook (State of the Watch Trade).

Quality of Work exhibited.—" The watches exhibited in the English department are, for the most part, of the very finest description, showing a decided improvement, and leaving the foreign manufacturers little chance of competing with us, either in style, fine workmanship, intrinsic value, or chronometrical perfection; price from £25 to £160. The display of pocket chronometers, split centre seconds, chronographs, and others, indicating the fractions of seconds for scientific purposes, must give our first-class work the pre-eminence. It is in our second-class work we are losing ground; and we need not be surprised, when we compare our price and system of producing with that of the French and Swiss." In turret clocks France is second to no country.

Section XI.—Bookbinding, &c.

Louis Genth (Bookbinding).

Quality of Work exhibited.—" The general display of bookbinding in the building in the Champ de Mars was small as regards the number of firms represented. I much regret that others of our well-known binders, French and English, did not exhibit. In the English department the works exhibited form as fine a collection of binding as the 19th century has produced; and it is therefore no matter of surprise that the majority of medals for binding were awarded to the English. The French binders also display some very excellent work, but they are, like the English, represented by only a few exhibitors. Their style is certainly most beautiful in design, but decidedly deficient in execution."

Sunday-work.—" Although I know full well the power of religion, I feel confident that the Government of this country would be taking a step in the right direction if they would concede to the English workman a few of those privileges so much desired by them for this day, and which our neighbours enjoy. The freedom and enjoyment indulged in on the Sabbath by all classes, without intoxication, profanity, or immorality, surrounded with all the beauties of nature and art, was a sight that would cause any English workman to think that the working man is thought more of in France than he is in England."

Walter Blunt (Leather-work).

Quality of Work exhibited.—"With regard to the quality and character of the work I saw, I will observe, 1st, that as to Russia leather-work, France cannot, or at all events does not, compete with Austria and England. Indeed, from the best information I could obtain, nearly all the Russia leather-work offered for sale in Paris is imported from one or other of the places I have just named. . . . . In the production of small work, England cannot certainly be said to compete with Germany, or perhaps with France; I mean in the infinite variety of pattern and ornamental design."

William Bourne (The Manufacture of Caoutchouc).

Quality of Work exhibited. — English manufacture superior to French. First patent mackintosh, 1823; vulcanising (American), 1843.

Section XII.—Horticulture.

George Stanton (French Horticulture).

Quality of Work exhibited.—An interesting report. Calls attention to the preference given in Parisian gardens to plants with large, fine, or ornamental foliage, and to the scarcity of flowering plants. Directs attentions to the French mode of training fruit trees, and to the ingenuity shown in the forms into which they are trained. The construction of forcing houses is not understood as in England.

Section XIII.—Birmingham Reports.

James Taylor (Gas-fittings and Chandeliers).

Quality of Work exhibited.—Material cheaper. Work more expensive.

Education.—English workmen want knowledge of drawing and fine arts.

Thomas Bayley (Plumbers' Brass Foundry).

Quality of Work exhibited.—Men slow at work; work more hours. We do fifty per cent. more than a Paris workman.

William Gorman (Cabinet Brass Foundry).

Quality of Work exhibited.—Cabinet brass foundry in our hands. Foreigners gaining fast upon us. Have much to learn in casting.

Education.—Deficient in design. Must pay more attention to education.

Henry Dry (General Brass Foundry).

Quality of Work exhibited. — Brass foundry work, Birmingham prominent; in bronze, lamentably behind.

Education.—Surrounded by works of art. Their picture-galleries and schools of art refine their taste.

Wages, &c.—Wages 4frs. to 8frs. per day; ten hours per day; few at work day after pay-day.

James Ansell (Church Bells).

Quality of Work exhibited.—Report merely descriptive.

John Fisher (Tubes in all Metals).

Quality of Work exhibited.—French and English work, both good.

John Clay (Saddlery, &c.).

Quality of Work exhibited.—French saddlery and harness both inferior; nothing new. London exhibitors disdain style and finish, but show the usual sober, sound, stern utility.

Frederick Thompson (Leather, Saddlery, Harness, &c.).

Quality of Work exhibited.—French show of leather excellent; soon overtake us.

Education.—Workmen must aid employers to meet active competition.

Wages, &c.—Work by piece; for common goods wages low. Better classes paid as in England. Hours, six to six and Sundays.

W. G. Deeley (Jewellery; with Diamonds and Precious Stones).

Quality of Work exhibited. — Austrian, original. England little to learn to be equal to all the world.

Education.—French superior in art workmanship; taste cultivated; better workshops.

James Plampin (Jewellery and Gilt Toys).

Quality of Work exhibited.—No nation but France properly represented. England inferior.

Education.—Work superior in lightness; outlines free, artistic, graceful. English work heavy, inartistic. Education better; taste of the nation higher; drawing taught to all. Education of English boys must be improved.

Wages, &c.—Wages higher than in England. Have an association; good results attributed to it.

Thomas Johnson, Toolmaker (Buttons).

Quality of Work exhibited.—Exhibition not satisfactory. No new material. In the two recent applications—moiréd buttons and dyed vegetable buttons—England decidedly superior.

S. W. Richards, Manager of Button Works (Buttons).

Quality of Work exhibited.—Trade in England stationary. Trade growing rapidly in France.

Education.—Drawing taught in primary schools. Art knowledge wanted. Soon fail for want of skilled labour.

William Bridges, Button Toolmaker (Buttons).

Qualitty of Work exhibited.—Great and rapid increase in foreign manufacture. Nothing superior to what Birmingham can produce. England stagnant.

J. L. Petit, Steel Pen Superintendent (Steel Pens).

Quality of Work exhibited.—Only five English makers exhibited. Little advance since 1862, but French have improved more than English.

Wages, &c.—Labour cheap. Hours of work greater, and Sundays.

Charles Hibbs, Gunmaker (Small Arms, &c.)

Quality of Work exhibited.—England not properly represented. French beat us in their speciality—art workmanship. England excels in hers. Breech-loaders, England in advance. Beaten only by French in beauty of ornament, by Belgium in coarse cheapness. American work rough, plain, and good.

David Sarjeant, Japanner (Papier-maché).

Quality of Work exhibited.—Some French work in a new style. Many English workmen employed in Paris, and highly esteemed.

Thomas Archer (Japanning in General).

Quality of Work exhibited.—Much foreign work superior to English. No decided advance in English work. Foreigners have made more progress than former exhibitions led us to expect.

William Guise, Needlemaker (Needles and Fish-hooks).

Quality of Work exhibited.—English machinery destroyed in 1844. Defects of our manufacture must be remedied. Germany the competitor. Our present supremacy cannot be maintained without exertion.

Richard Pearsall, Glass-blower (Sheet and Plate-glass).

Quality of Work exhibited.—English window glass the best. French material (sand) best. No English plate-glass exhibited.

Wages, &c.—Wages the same as in England.

Thos. C. Barnes, Glass Worker (Table and Fancy Glass).

Quality of Work exhibited.—English style and work-

manship superior; design much improved. French design the best. In design and colour English far superior.

Wages, &c.—Wages little under English.

W. T. SWENE, Superintendent of Glass Works (ditto).

Quality of Work exhibited.—In colour English best, but fast losing superiority; form of French best. In cutting, French fast advancing upon us. Engraving, English very superior. Chandeliers, English first as a whole.

Education.—Art teaching wanted. Education better.

T. J. WILKINSON, Glass Worker (ditto).

Quality of Work exhibited.—British blown glass superior to any produced. Foreign good as worked; excel us in ornamented work.

Wages, &c.—Paid by the day; settling monthly. English workman works hardest for his money.

CHAS. W. MOORE, Die-sinker (Die-sinking).

Quality of Work exhibited.—Much to fear from foreigners, French and German.

Education.—Inferior mode of instruction. Want of art application in master and man. Want of art-education alone keeps us back.

HENRY J. FELLOWS, Silversmith (Electro-plate).

Quality of Work exhibited.—Electro-plating discovered by Mr. Elkington. French excel in cutlery. English in finishing.

Education.—Want of artistic knowledge spoils our work.

EDWIN POOLE (Tin-plate Working).

Quality of Work exhibited.—Machinery for stamping, raising, and shaping tin-plate, an English invention, 1849. No competitors in the best tin-plate work. No new idea or new principle in Exhibition. No new article since 1851 or 1862. French excel in certain classes of cheap stamped goods.

Education.—Workmen not better educated; one-third deficient in rudiments of education. Foremen intelligent.

Trade Associations and Wages.—Wages a little less than in England. Trade combinations, so baneful to the interests of working men, unknown. Absence of these cause of progress of trade in France.

HENRY FOWLER, Foreman-Engineer (Labour-saving Machines).

Quality of Work exhibited.—The best machine for screwing iron tubes, bolts, and nuts, was American.

BENJAMIN WHITEHOUSE (Railway Carriage Builder).

Quality of Work exhibited.—Foreign makers have watched the progress of this country, have visited our manufactories, inspected our method of working, and have taken advantage of it. They have then entered into competition, profiting by our experience, adopting our good arrangements, and avoiding our irregularities. Still we cannot lose our *prestige* and fame if we march onward with the times. Belgium, France, and Russia have made very rapid strides. England only exhibited three models. Foreign builders are using steel and iron for carriages.

FRANK J. JACKSON, Art Teacher (Design).

Quality of Work exhibited.—Art here most defective.—French universal application of art.—Defects in French work—straining after effect, and mistaking *prettiness* for *beauty*.—Apathy of the public the obstacle to our advance. Designers and workmen do not work together.

Education.—Facilities for study great in France.—More museums wanted.—Schools of Art want remodelling.

SECTION XIV.

TWO SPECIAL REPORTS.

Besides the reports I have already noticed, there are two "On the Condition of the French Working Classes," to which I must specially refer—those of Mr. Coningsby and Mr. Whiteing.

Mr. Coningsby, entertaining strong opinions upon the superiority of the education of French workmen, endeavours to prove that it is to be attributed as much to the early associations of the children as to the education they receive at school. He traces the progress of the child, the young workman, the *ouvrier* settled, and the *ouvrier* in the workshop.

I have not time to follow him through each of these phases of the French workman's life, but I will make an extract, showing the treatment of children in one of the most important manufacturing districts:—

"The age at which children are considered old enough to be taken into factories seems to be lower in France than here. I was under the impression, until I had visited some of the workshops in Lyons and its neighbourhood, that the French people were more merciful to their little ones than we are; but, from what I saw in the south, I am convinced that this is not the case. I have been in all the principal manufacturing districts of my own country, and witnessed the sorrowful spectacle of boys and girls, who should have had several more years of play, hurrying to their work on cold, dark mornings, with careworn faces and stooping figures; but for a sight which is most calculated to move a man of ordinary sensibility to compassion, one must go into the neighbourhood of the French silk factories, and watch the melancholy procession of babies (they can be called nothing else) dragging their little limbs slowly away from the places where their tiny energies have been tortured out of them. I was informed that in France, as in England, there are regulations concerning this sin, but that, more especially in the case of small manufacturers, the law is systematically evaded. This false economy—to take the lowest view of this sad state of things—should be apparent to a nation so logical as our neighbours. To deprive a country of its future labourers for the sake of such small present gains, is, to say the least, a most unbusinesslike proceeding."

For the young French workmen the Government has provided three large educational establishments, where they are carefully and scientifically trained for the position of foremen and superintendents in manufacturing establishments. Admission to these schools requires a payment of £80, to cover board, lodging, and education for three years.

The advantage the manufacturers of France must derive from a supply of young men technically educated, and properly prepared to discharge the duties of foremen, cannot be too highly estimated. It is by the employment of such men that the scientific and economical management which appears so conspicuous in large French establishments is secured.

These schools benefit only the few who can obtain proper recommendations for admission, and do not affect the condition of the great mass of the children of the working class, for whom night schools, in which they are taught drawing, mathematics, and other branches of education, are provided. There are also free night libraries, besides the great public libraries, open to all who are inclined to study; still, with all these advantages, our reporter says the young French ouvrier is not very studious, and spends too much of his time at the theatres, or in cafés, or in dancing, or at billiards; but he adds that even the cafés and billiard-rooms in which so much time is spent, are fitted up with such elegance, and ornamented with such beautiful paintings and sculpture, that by frequenting such places taste is cultivated, and civilisation and manners improved, offering a striking contrast to the only places of resort open to our working classes, the public-house or gin-palace, and

their debasing influences. In fact, our reporter thinks even the vices of the Parisian ouvrier are followed in a very much less mischievous form than with us.

Mr. Coningsby dwells at length upon the effect produced by the forced military service, which, he thinks, throws an element of uncertainty on the future career of the working classes, and lessens their inducements to study and industry. This appears to be felt by the large manufacturers, who frequently, he tells us, advance to promising young workmen exemption money, under an agreement to be repaid by instalments.

This, then, is one measure of the tax imposed by the conscription upon trade and skilful workmen.

To the military service he also attributes much of the subsequent immorality of the French workmen.

In the 3rd chapter of this report we have a comparison between the French and the English artisan's married life. He is not favourably impressed with what he saw of French domestic arrangements, and complains strongly of the manner in which women are often obliged to work whilst the men are idle. He compares their homes with our own, and finds them inferior, more disorderly, and uncleanly. His description of his reception by a workman at Lyons is well worth reading.

He complains of Sunday work as one of the unpleasant features of French life, and advises the advocates of the Sunday opening of museums and picture galleries, &c., to take warning of what is occurring in France where every year sees the fall of some barrier between the poor man and his Sunday's rest.

He thinks that in sickness and distress the French workman is better cared for than in England.

In the workshop he finds they have made great and rapid advances, but does not think the merits of the productions of the two countries can be fairly estimated by the inspection of the works recently exhibited in Paris, as the French, he says, are at home, and are therefore seen to the best advantage, whilst the English, from being rather tired of exhibitions, and abroad, are not fairly represented.

In opposition to many prevailing opinions, he states that French workmen, with whom he associated, are of opinion that art and handicraft are declining among them; they think that the excessive division of labour tends to make men mere machines.

There are no trade societies, as we understand them, in France, but there are, notwithstanding, "strikes" and trade outrages; and direct influences are used to oblige masters to conform to the demands of their workmen.

To appreciate this part of the report it must be read. I will, therefore, conclude my remarks upon it by quoting the last sentence:—

"Each of your reporters going home will spread in his circle the knowledge which he has gained; and, while sensible of some of the disadvantages of the lot of our English workmen, he cannot but congratulate himself and fellows on the position which Englishmen still hold in the earth; and he will probably form the resolve that no light consideration shall induce him to aid in jeopardising it."

Mr. Whiteing's report is equally interesting.

He first endeavours to analyse the general charater of the French workman. He states that it is remarkable for a strange union of capacity for exact knowledge, with brilliancy of fancy, which leads to that superiority in those arts for the cultivation of which a knowledge of principles is necessary, while in those for which the perfection of habit only is required, his English rival bears the palm. The French, he says, are the best workers in materials requiring careful handling and an exact knowledge of their properties; but that we are the best smiths, best working engineers, the best carpenters and joiners, &c., and our textile fabrics are the best in construction if not in design.

After a careful examination of the relationship which exists between the French workman and the State, he concludes that the French workman always looks upon himself as a protected commodity, and that his government is in a direct manner answerable for his individual welfare, and the writer proceeds to show how this is worked out and influences the character of the people.

Next as to education. He asserts that in the primary schools the system of education and instruction given so nearly resembles our own as not to require notice; but he adds that religious influences are brought to bear on parents with great effect to induce them to do their duty to their children, and that the scandal of having an uneducated child is keenly felt.

The great divergence between English and French education begins directly the boy passes from the primary school, when every facility is afforded for his obtaining a higher class of education, and the positive sciences then take a prominent place in school instruction, knowledge of them being indispensable to every man who aspires to any leading position.

The child destined to a particular trade serves a kind of preliminary apprenticeship to that trade, and education goes hand-in-hand with the special training requisite for the pursuit of his intended business. Then above these schools government has established institutions for the higher technical training of youths—that is, for the union of the highest theoretical with the best practical teaching in manufacturing art. These schools produce skilled foremen.

It is, however, asserted that notwithstanding the increased and improved character of these schools, French workmen do not resort to them in the same proportion they did 25 or 30 years ago; and it is assigned as a reason for this change that so much more and so much harder work is now exacted from them than formerly, that, from fatigue, they are unable to attend evening schools.

For Mr. Whiteing's views on labour, and its effect on education, on apprentices, on art-education, and the causes of its being so superior in France, I must refer to his paper, quoting only his conclusions:—"Upon the whole, looking at education in its entirety in France, we may conclude that it is not so much in the quantity as the quality that our neighbours have an advantage over us. Whether in art, in science, or the simpler elements of knowledge, their teaching is based on principle—ours on rote. Even children in the infant-schools learn to analyse, to combine, to think; ours learn to repeat. This would, however, hardly be a just observation in reference to our children of the working classes, who, happily, in the national school system recently established, have a far more perfect machinery for educational purposes than their little brethren of the middle class. We say deliberately, that the national school teaching of England is, in all the essentials of educational merit, far in advance of that in the numerous private establishments which are supported by the middle and even by the upper classes. The national system of art-teaching, too, is the only one worthy of the name we have ever had in this country, and this precisely because it is a national system, and its power for good is unlimited. If it will only first make quite clear to the world its principles of teaching, its aims, and its mode of attaining them, give a sort of state solemnity to all its more important ceremonies, secure to the utmost state assistance for its enterprises, and, above all, regard itself as a propagandist power, just as a good church, indeed, as every good institution should, there will be nothing to prevent its fulfilling its high mission. It is by these means chiefly that education in France has already produced such excellent results, and promises to produce more. We may add one more means to the list—frequent public examinations and exhibitions, and liberal awards. It is by these means that the Society of Arts has of late years so vastly extended its sphere of usefulness, and done so much towards putting English genius and enterprise on a fair footing with the rest of the world."

The next division of his subject relates to wages and disputes between masters and men.

The Conseil des Prud'hommes receives much attention; and the establishment of co-operative societies, and their probable future, are carefully considered. His paper concludes thus:—

"We have now finished our brief survey of the condition of the working classes of France, and it is no part of our duty to dictate the conclusions that are to be derived from it. We may say, however, that on a comparison of the condition of those classes with that of our own, it seems that the differences and resemblances are precisely those which exist between the two peoples in their entirety. There are, perhaps, fewer men very prosperous among the French working classes, but, on the other hand there are fewer very miserable. Extremes are not so apparent in the condition of any class across the Channel as they are here. England can always produce the brightest examples of extraordinary prosperity—France of equal and generally-diffused happiness. Perhaps England may one day learn that the welfare of a whole people is an aim superior to the spread of exceptional advantages among any of its parts."

Having thus rapidly passed these reports in review, I think it is impossible not to be struck with the general soundness of the views, and the freedom with which they have been expressed, on subjects which are now exciting great interest among the various trade societies in this country.

Most of the reporters acknowledge the good effects produced by the reference of trade disputes to the Conseil des Prud'hommes; and I feel sure that if boards of reconciliation could be established in all our great manufacturing towns, trades unions would become as useful as they threaten to become injurious to the best interests of their members.

Not one reporter advocates the principle that, in the interest of working men, all, whether skilful or unskilful, should receive one uniform rate of wages. The greater number approve of piece-work, which is the common practice in France, as the best means of stimulating the energies of the workman and of securing the best work for employers, as well as for affording to the workman the best prospect of advancement; and in many trades it is shown that, by the force of demand alone, without any aid from societies of resistance, as trades unions are there called, the rate of wages in Paris has been steadily advancing for many years past; and, further, as bearing upon this subject, it is important to notice the universal testimony these men bear to the good feeling which exists between master and workman, a feeling which, so long as it lasts, must tend to secure for labour the highest remuneration which the employer can afford to give without injuring, by an undue increase of cost, the demand for the article manufactured.

How far this state of feeling has been induced, or is maintained, by the action of the Conseils des Prud'hommes does not appear to have attracted the attention of our reporters, though most of them refer to the beneficial influence exerted by those councils in preventing differences between masters and men, which are too common in this country.

Without entering into any inquiry into the operation of trade associations, it appears impossible for the friends of the writers of these reports to be uninfluenced by the statements contained in the very graphic descriptions which are spread through the entire collection, of the superior condition in many respects of the French over the English workman; and I hope, when the experience which has been gained at Nottingham and Leicester, where boards of conciliation have been in operation for nearly three years, is thoroughly understood, they will be adopted in all the great manufacturing and mining districts, and that those who direct the affairs of trades unions will see the great advantage which will arise from restricting their action to the laudable and beneficial objects for which they were established.

Looking at the position held by some of the reporters in political associations and trades unions, the views expressed in these reports must be severely criticised by their fellow-workmen, and they will be obliged to maintain them against adverse opinions; but a controversy of this kind introduced into the debates of the meetings of political and trade societies cannot fail to correct many erroneous opinions, and remove many false impressions as to the effect of restrictive trade regulations on the price of labour, whether enforced by the arbitrary *dicta* of trades union councils or by Parliament.

Nearly every report states that our manufacturers and artisans have to compete with cheaper labour. The effect of this element of cost is not, however, to be measured by a simple comparison of the price paid per day, by the piece, or by the hour, but rather by the quantity and quality of the work done for a given sum of money; and measuring the price of labour by this standard, it does not appear to be the general opinion of these workmen that there is much advantage really gained by the nominally low price of labour; but by the more observant of them great stress is laid upon the greater economy observed in the management of workshops, and in the economical application of materials and labour than is the rule in England. Moreover, it is singular, while admitting freely various advantages enjoyed by foreign manufacturers, how confidently all unite in opinion as to the future of English productions if the men are but put on an equal footing with their foreign rivals in respect of scientific and artistic education.

It is evident the 80 workmen who went to Paris did not fail in early life, or at a later period, to obtain, or to give themselves, a good primary education, but they all admit the want of artistic and scientific knowledge,—the want of opportunities to learn those scientific principles by which they could understand the operations in which they were engaged, and to cultivate that knowledge of art or taste, which would enable them to apply artistically or usefully the little knowledge they might, by great industry, be able to obtain.

In this respect, in the admission of the general deficiency of the technical knowledge of our best workmen, they nearly all agree; and, as the best means of removing this deficiency, they ask for freer admissions to our public galleries, museums, and gardens. They do not lay any stress upon remaining longer at school—well knowing how many causes must always interfere to prevent it—but they ask for opportunities for self-instruction at an age when they know what information will be useful and available for their future progress in life.

All are struck with the good manners, behaviour, and politeness of the great masses of people they saw at Versailles and other places of public amusement; this they do not fail to attribute to their superior taste and their appreciation of the elegant and beautiful, and they ask, in decided terms, why as much should not be done to educate in art, to improve the taste, and to enlarge the mind of the English artisan as is done in France for the French workman. It is asked how much of the love and appreciation of art by the upper classes is the result of their constant familarity with the beautiful works of painting, sculpture, porcelain, &c., which are constantly before them at home, and it is considered a grievance that while the State has so many and such valuable collections of ancient and foreign art, the familiarity with which, by the people, could not fail to be beneficial to them, they who contribute annually to the purchase and maintenance of such collections should not have the opportunity of seeing and studying them, as they saw such collections in Paris, at the hours or on the day when alone they can spare the time or are not too fatigued to enjoy them.

Surely the State is deeply interested in the results which must follow from the introduction of a new and and intellectual amusement to the working classes, which has scarcely a single drawback, and from the enjoyment of which mental and moral refinement must follow, as the people themselves.

I hold that the opening of our national collections on

the only day on which they can be seen by any large number of working men—by which I of course refer to Sunday afternoon—has hardly a single drawback. I am, of course, aware that many will dissent from this view of the question, but I must maintain that, as all legislation has hitherto failed to make people religious, or to give them a love of church, it is time to try whether religious feelings may not be improved, and the love of worship advanced, by first inducing a taste for the beautiful in the works of nature, and an appreciation of the wonderful in the evidences of God's power as revealed by the examination of specimens of natural productions, at the same time giving them an opportunity of examining in art galleries man's finest works, which, however noble, only betray man's weakness and insignificance when compared with the greatness and omnipotence of his Creator. If such feelings can be inculcated by opening our museums, &c., on Sunday, will not every man become a better citizen than he can possibly be if his Sunday afternoons are spent in idleness, or, what is worse, in the public-house; or, if he be too intelligent for either of these modes of passing his Sundays, then, by being relieved from the sense of neglect he now feels, in being excluded from legitimate pleasures which others, more fortunately situated, can enjoy at all times?

Our artisans nearly all desire that museums, &c., &c., should be open on Sundays; not one wishes to assimilate the English to the French Sunday in other respects. Nearly all feel that it is the familiarity with the beautiful in nature and art from childhood that has given to the French nation, as a whole, that knowledge—that artistic skill and feeling for the beautiful—which threaten to make them the most successful workmen in the world, to the serious injury of this country.

In considering the advantages enjoyed by the foreign workman in consequence of his superior technical education, only one of the reporters has called attention to the great disadvantage under which foreign manufacturers labour, by the forced employment of the *élite* of the young working men in the army from the age of eighteen to twenty-four. The effect of this abstraction of young men is to encourage a younger class, say from fourteen to eighteen, to exertion. We find it stated by many that apprenticeships are much shorter than with us, and that from the combined effect of their technical and industrial training at school, and the provision employers make for the continuance of their education whilst serving their apprenticeships—lads from fourteen to eighteen are more efficient workmen than with us at the same age.

How far the good effect of this training is lost or impaired by the following six years of military service it is difficult to decide, but the apologists for the conscription say that the effect of military training, of discipline, of regularity, and of obedience to orders, and the industrial instruction which is carried on in the French army, is to make the man, when his time of service expires, a more useful and better *ouvrier* than he would have been without it. This may be so in foreign countries where, until within the last few years, employment in trade and manufactures has been that of the minority, and where all have been brought up to consider military service as an unavoidable necessity of their lives, but whether it will continue to be so, as the demand for labour, for employment in productive works increases, may be questioned. Certainly, no one can doubt that such a system is totally unsuited to the working classes of this country.

If, then, we stimulate that natural power and aptitude for industrial occupations which has already, with almost neglected education, made us as a whole the best and most inventive workmen in the world, and this country the workshop of the world, by adding to it as good scientific and practical teaching as is placed within the reach of foreign workmen (which there ought to be no difficulty in doing), and then throw into the scale the value of the labour of the men composing the vast armies of foreign countries, withdrawn for six years from industrial pursuits, there can be no fear of our not being able to continue to compete, as we have hitherto done, in price as well as in workmanship, with every foreign nation.

But then the question arises, How are the children of the working classes to be so educated?

One section of educationists asserts that so unwilling are the working class of this country to lose the wages their children can earn, that it is necessary, in order to ensure their education, that laws should be enacted to enforce compulsory attendance at school. Independently of the objections which may be urged against such a system, and the obvious difficulty of carrying such a law into effect, it would not, it appears to me, meet the present want or present difficulty, in which we, as members of the Society of Arts, are most interested. We are told that so rapid has been the advance of foreign nations, that they are not only rivalling us as manufacturers, but that the education of foreign workmen is so exactly suited to its purpose, that our inventive superiority is rapidly passing away, and that we shall soon be surpassed as well in workmanship as in the power of forming new combinations, and of inventing new processes.

It is necessary, therefore, that the children now at school, and just leaving school, should have an improved system of education. They have but a certain number of hours available for the work of the schoolmaster, and what we now want, next to moral training, is that every subject taught should be perfectly taught, and should tend to promote what is now commonly called industrial or technical education. Let us have no time wasted upon learning by rote, but let the teaching and training be such as will produce practical results immediately the boy leaves school. Let him be so well grounded in the principles of science and art that he will be able to apply his knowledge to some useful purpose when he enters the workshop; parents will then have an interest in sending their children to school; their increased usefulness in earning wages will soon pay for what may have been lost while at school, and school will be looked upon as part of an apprenticeship, on which future wages will depend.

We must not delay action in reference to technical education till Acts of Parliament are passed to compel the attendance of all children at school.

Our duty, as a Society for the Encouragement of Arts, Manufactures, and Commerce, is at once to press upon the Government the necessity of the immediate establishment of training schools for masters, and to insist upon some immediate improvement in the technical teaching at schools, assisted by the national funds.

Whether we refer to the very valuable information contained in the letter addressed by Mr. Samuelson to Lord Robert Montagu, or to the facts collected by the artisans, and contained in the volume of reports the Society has just published; whether we look at the progress of foreign manufacturers, or at the dismal forebodings of some distinguished English writers,—take whichever standpoint we may, no rational mind can come to any other conclusion than that it is our bounden duty to step forward with energy and determination to remedy, in the shortest possible time, the defects which all admit to exist most injuriously to the State, in the education of children of all below the middle class in this country.

I will not enter further into this question, as it will be fully discussed at the Conference, which commences its sittings, in this room, to-morrow. My object this evening has been to introduce this volume of workmen's reports on the industries of foreign countries to your notice, and I hope I have said enough to show the ability and impartiality with which the reports are written; and I feel sure their perusal will tend to raise the general estimate of the talent and knowledge now current among our artisans, for I cannot repeat too often that the reports, with the most unimportant corrections, are published precisely as they were delivered to the Society, and that the difficulty of the Committee was not

to find men fit to undertake the duty required, but to choose a few from the large numbers available and anxious to be appointed.

The reports written by the men appointed by our Committee in London are more discursive than those which have been received from Birmingham, but they are not therefore less useful or less interesting, but rather the contrary; and one difference between the Birmingham and the London reports may be found in the fact that some of the Birmingham reporters are foremen or superintendents of works, and not strictly, as our London men are, artisans actually engaged in daily work.

If the present demand for the volume continues, it seems likely soon to take off the large edition of 2,500 copies we have printed; and I hope the Council will find that this novel step will be so thoroughly approved by the members of the Society that they will be encouraged to assist a few men each year to visit other seats of foreign manufacture, on the condition that they report the result of their observations to the Society, as on the present occasion; I hope also that we shall be able to select such men from among those who have either taken prizes at our examinations, or from among those art-workmen who receive prizes at our annual competition, the works for which, for this year, are now shown in this room.

If the Council can carry out this programme, we shall realise one of the most important of the duties entrusted to us in relation to the Encouragement of Arts, Manufactures, and Commerce.

DISCUSSION.

Mr. W. Botly begged to congratulate the Society on the steps taken by the Council in sending these men to Paris. Indeed, the country at large was very much indebted to the Society for what had been done, for a vast amount of good must result from the printing and circulating of these valuable reports, and he was much gratified to hear from Mr. Hawes that the demand for the work was so considerable. The workmen themselves might be congratulated, both on their good fortune in having had such an opportunity placed in their way, and also on the able manner in which they had discharged the duty which devolved upon them. With regard to the system which was stated to prevail abroad, of masters allowing their apprentices two hours a day for education, he thought it might be copied in England with very great advantage.

The Rev. James Ridgway (Principal of Culham Training College) said he was rather diffident in speaking on the subject of the paper, because ill-health had prevented his visiting Paris during the period of the Exposition. At the same time, he was greatly interested in matters of the kind, particularly in schools of art, and in technical education on the Continent, and he had been convinced for some years that we must make great advances in some way or other in technical education if we were to hold the position we had hitherto occupied in the art and commerce of the world; and, having visited most of the art and technical schools on the Continent, he could bear out all that had been said on the subject. One or two things in the reports reviewed had struck him particularly, viz., that it was almost universally allowed that the English workmen were superior to the continental in two practical matters, in having the best tools and in having the best hands, their only deficiency being in the want of cultivation of their intellectual powers. Now, as regarded primary education, he could say that national schools in England had the very best system of education—far superior to those in vogue in middle-class schools—but they were not sufficiently practical. During the preceding week he had visited for the third or fourth time the technical schools of Paris, and he had been particularly struck with their eminently practical character. As an illustration, he might mention that in drawing, instead of the pupil being set to copy other drawings, as was the practice almost universally in this country, from the very first they were taught to draw from real objects. Even in drawing a line an iron rod was held up as the copy or model. One of the reports stated that we were superior to all other nations in the manufacture of iron, but this was not quite correct, for some two or three years ago, when visiting Russia, he was informed by some English workmen resident there, and engaged in the manufacture of iron, that the Russians were quite equal and some of them superior to us in this branch of manufacture. One man, who had risen to become a foreman and afterwards the master of an extensive iron works, showed him an inkstand of the most exquisite workmanship and beautiful design, which had been exhibited at St. Petersburg just as it came from the sand, without any touching, and told him that although he had been brought up to the trade from his childhood he could not produce any thing like it, and he was certain it could not be produced in England. With regard to the opening of our museums on Sundays, he might say that on the previous Sunday he strolled through the Louvre, and could not help exclaiming to himself how orderly the people were, and what a pity it was that we could not extend to the English working classes the same benefits which these Frenchmen enjoyed. The interest they appeared to take in every object of art was wonderful, and what was still more wonderful was that all these costly articles were not so much as touched by a single finger, though there were very few attendants throughout the building. At the same time, however, there was another consideration—that, although there were great numbers admiring and enjoying those admirable works of art on the Sunday, there were an almost equal number who gave up the Sunday entirely to hard work—and he could not help thinking it would be a great loss to England if her workmen were deprived of that necessary rest which they now enjoyed once a week. It had been remarked by one or two of the reporters that we had the Saturday afternoon, which the French had not, and it had occurred not unfrequently to those who would, perhaps, otherwise advocate the opening of museums on Sundays, that they were not visited, as they might be, on the Saturday afternoons when they were open. He wished, again, to refer to that which Mr. Hawes had so powerfully advocated—the immediate institution of technical schools throughout England. They had got primary education to a very great extent, not sufficient, it was true, but enough for a commencement; and if it could be seen that it led to a practical result it would soon be much further extended. The difficulty was, that people did not see practical results. Now at Stockholm, which was certainly not a very large city, there were the best primary schools in Europe, but, in addition to that, when a child left the primary school he could go to a technical school, in which there were evening classes for men and women engaged during the day, and here were taught not drawing merely, but also modelling, wood-engraving, engraving upon steel, lithography, painting upon china and glass, and almost every useful art down to the painting of a shop sign. Then, again, with reference to the conscription in France, which took off annually large numbers of the young men, it had been remarked that, notwithstanding this, great progress was made in matters of art and manufactures. He did not think that this fact was so paradoxical as it appeared. From the middle-class schools in France, which were called *lycées*, all those who reached a certain standard were taken and placed in certain establishments supported entirely by the Government, where they were kept two or three years, and received a thoroughly good education in science, intended to fit them for some department of the public service, civil or military, and from these they went again into higher establishments, as their own particular bias led them to choose—the army, the navy, the engineering, or some other department of the public service. These men, therefore, became thoroughly educated, in every sense of

the word, and in their turn became the instructors of those who were placed under them. It was thus evident that a man might easily, after a military career, return into society far better fitted to perform his duties than an Englishman who had had none of these advantages. This was not only the case in France, but also in Sweden, Prussia, Norway, Switzerland, and, indeed, almost everywhere except in England. Why should it not be the same in England? They had better material to work upon, and better materials to work with, and better scientific heads to direct; the only thing wanting was some stimulus, something which would compel them to apply the scientific heads to the willing hands, so as to teach the willing hands how to work to the best advantage.

Mr. W. C. Aitken said no one could doubt the great value of the paper they had heard, or the necessity which existed in England, according to all the reports, for something like a technical education for workmen. He understood, from what was said in the paper, that the men who were sent from Birmingham to report were some of them foremen or superintendents, whilst those from London were all actually working men. Now, having himself been at the Exhibition, he must say it did not strike him, from their appearance, that all the men from London were working men; while he would say that those of the Birmingham men who were foremen were working foremen, who worked like any other artisans. Only two of them, he believed, had never worked at all. Upon the question of technical education, he would say that, as long ago as 1853, the Society of Arts collected all the materials, and prepared a most able report on the subject, which he thought was the foundation of the very valuable work of Dr. Lyon Playfair upon Industrial Education on the Continent; and, valuable as was Mr. Samuelson's recent pamphlet, he believed it was, to a large extent, founded on Dr. Playfair's. Birmingham had been greatly interested in technical education, as he need hardly tell the Society of Arts, after the valuable assistance they had rendered to the Birmingham and Midland Institute, in which there were facilities for placing about 120 persons under a system of technical instruction. He did not himself see the necessity for any new machinery, but they must have Government aid, to render efficient and useful what they already had. His idea was, that local institutions of the class he had mentioned should receive good aid, at least, until they were able to stand by themselves. He certainly thought our art teaching was our weak point, and he thought all the artisans' reports laid more stress upon the want of artistic, than of technical instruction. It was very well for people in London, who had the magnificent South Kensington Museum to go to, but in Birmingham there was nothing of the sort. Birmingham had been stigmatised as the producer of lacquered shams and bad ornaments, but what had they to help them do anything better? They had a School of Art, but it was not particularly practical, and the strongest evidence of that was contained in the reports of the Birmingham artisans, who had themselves attended the school and knew what it was, and yet complained of the want of, or imperfection in, art education. Touching the opening of museums, he thought the right conclusion had been arrived at by Mr. Hawes. The French were a hereditary art-loving people; their museums and public galleries promoted art, and generation after generation was born thoroughly imbued with a love of art, and to such men it was much more easy to turn artistic ideas into a practical direction. A great many, even of the finest things made in this country, were produced by foreign artists, although it was, nevertheless, true that French taste was very much improved by being put under English control. If they wanted England to stand at the top of the tree they must begin, earnestly and immediately, technical education, and persist in it. He saw nothing in the French Exhibition which need frighten them, but much to lead them to hard and persevering work.

Mr. E. A. Davidson said that as the valuable reports, from which they had heard extracts, would form an interesting addition to the educational collection of the Society, he suggested that it would be useful to know how, or in what manner, their various authors had been educated or had educated themselves. If, as he believed would be found in many instances to be the case, they had received their primary education in national schools, it would be very gratifying to know that these establishments had produced such good results. He thought the publication of the volume would, in a certain degree, restore the tone of the public mind, which was at the present moment rather inclined to panic, the impression being so strong that we had been completely beaten at the Paris Exhibition. He was convinced that it was not so, but that we were only deficient in certain points from the want of certain means, and if those means were supplied we might again take the lead. The reports themselves were written in a most admirable spirit, and evidently showed the appreciation in which the writers held education. They had evidently felt the smallness of their own knowledge when called upon to investigate and record their observations upon the work of others, and as a consequence they themselves, and others in a similar position, would feel the value of, and necessity for, education more than they had done, and would not only see that their children went to school, but would inquire into their progress whilst there, whether they were really gaining valuable information on the practical affairs of life. The question of opening museums on Sundays was rather a wider one than he would enter upon then, but whilst residing in the country he had often met with incidents which showed the necessity for more of such advantages being open to the people. He had asked young men on entering a training college, "Of course you have seen picture galleries?" "No." You have seen pictures?" "Oh, yes; plenty." On further inquiry, it turned out in one case that the pictures which had been seen were only those on tea trays which a man exhibited for sale in "our village" every Saturday, the said village being within ten miles of a city. It was very evident, therefore, that picture galleries open to the public were required not only in London but also throughout the country.

Mr. R. Coningsby wished to say, in reply to a remark made by Mr. Aitken, who had seemed to intimate that the men who went from London were not *boná-fide* artisans, that, with the exception of two, all the men who went from London were, in every sense of the word, working men, earning their living by their work, and by nothing else. He happened to be one of the two exceptions, but as he did not wish to allude to himself, and as his own case was exactly analogous to that of Mr. Whiteing, he might say of the latter gentleman that two or three years ago he also was a working man, but had now fought his way to a somewhat superior position. Both he and Mr. Whiteing had, until quite recently, been, strictly speaking, working men, and in somewhat improving their position he could not but say they had been greatly assisted by the Society of Arts. On the Sunday question he happened to be in what he supposed was the minority, for he did not see the necessity for opening museums, &c., on Sundays, and thought the risk of losing the day's rest altogether was too great to be compensated by the possible advantage in the way of art instruction. Mr. Hawes's peroration on the subject was most eloquent, but he was still unconverted. He would rather see the experiment tried first of opening them in the evenings, as he should be very loth to see an alteration in the quiet manner in which Sunday had been kept by the Anglo-Saxon race for so many centuries. When every advantage was taken of Saturday afternoons it would be time to open them in the evenings; and when working men went to such places every evening and one afternoon a week, he thought they would find they needed for their minds as well as their bodies rest on the Sunday.

Mr. Connolly (mason) said, in reply to Mr. Davidson's

inquiry, that he had obtained his education at a hedge school in the south of Ireland, before the present splendid system of national education had been extended to his country. He was 30 years of age when he came to London, and he believed if he had come earlier he should not have known much, for notwithstanding what had been said by one gentleman about the advantages possessed by those living in London, he considered it the most difficult place in the world in which to get knowledge, except by actual contact with the people who possessed it. He lived in Lambeth, and if he wanted to consult a book he must buy it, for he did not know where to get at it. There was no public library accessible that he knew of. The South Kensington Museum had been spoken of, but it might as well be in the moon for any advantage it was to him. If a man left work at one o'clock on Saturday, and then had to go home to his dinner, it would be almost dark before he reached South Kensington, and if he did get there, and walk back again, he would have worked much harder than if he had had no half-holiday. He was not quite certain whether he ought to be thankful to the Society of Arts for sending him to Paris, for it was said by a certain poet, "Where ignorance is bliss, 'tis folly to be wise." Before going there he used to imagine as people told him, that none were equal to ourselves, but this he found to be all a mistake. Paris was the most magnificent city he ever saw, and every inch of land in France seemed well cultivated; the population were more evenly distributed over the country than in England, and he believed prosperity also was more equally diffused. A great deal was said about drawing six or eight hundred thousand men from the population for the army, but he thought as many were withdrawn from productive labour in this country as in France. Nor was there in that country so harsh a line of demarcation between class and class; noblemen, middle class, and working men were all one people, but here all classes were sharply divided. All the wealth, and education, and taste were in the upper classes, and, with some few noble exceptions, they hid their light under a bushel, and did not share their blessings with the poor; while as for the middle class, directly they got above the rank of a working man they looked down upon him a great deal more than did a nobleman. The working classes were left to themselves, and had their battle for themselves, and he hoped soon they would educate themselves, for they would soon have the power of doing so. No man had more physical energy than an Englishman, and if he could only get his brain to properly direct his hands, success was certain; and education alone would enable him to do that properly.

Mr. Lucraft (chairmaker) had been disappointed in the discussion so far as it had gone. All agreed that in artistic taste we were not up to the mark, but the only remedy he had heard proposed was the opening of picture galleries and museums on Sundays. Many of the reporters had suggested that there should be in all the centres of industry national museums, similar to that at South Kensington, and he did hope that the Society of Arts would turn their attention to that matter. Nothing less than that, he believed, would enable the working classes so to improve themselves as to successfully compete with other nations. In true cabinet work, however, he believed the English workman as far surpassed all others as they excelled him in artistic skill. The beautiful cabinets exhibited by Jackson and Graham, and Wright and Mansfield, were a pleasure to look at, and he hoped attention would be paid to the suggestion that, during the coming year, they should have an exhibition of English work, especially that of the eighteenth century. He believed that the English workmen during the latter half of the 18th century were superior to what they had been at any time since, at any rate until very recently, and they were now only coming back again to the point at which they left off at the commencement of the great French war. If it had not been for the great stoppage which then supervened in all matters of progress, he believed they would now have attained to a higher pitch of perfection than any country had ever reached. If they could have such an exhibition as he had suggested, they would not need to copy from Frenchmen, but could imitate and improve on their own models. There were two splendid specimens belonging to that period, a table and a chest of drawers, in the South Kensington Museum, both in satin wood; and in other branches of art-workmanship the period he referred to had never been excelled. If they could induce, as he had no doubt they could, noblemen and gentlemen to lend such specimens as they had for the purpose of an exhibition, he did not think they would talk so much about the superiority of the French. As to the utility of the South Kensington Museum to London workmen, it might almost as well be on Salisbury-plain as regarded those who lived in the northern or eastern suburbs. The real need was for similar collections in easily accessible situations throughout the country.

Mr. Campin, referring to a remark made by a former speaker, that there was a danger of Englishmen being led away by a panic on the subject of foreign superiority to ourselves, said he did not gather anything from the admirable paper they had heard to lead to such a conclusion. What he gathered was that in certain branches the French and other nations had made such great progress, that there seemed a danger of our being shortly surpassed by them, unless we took such measures as would enable us to keep in advance. But these measures appeared very plain and simple, and when they were adopted we need not fear the result. He quite agreed with what had been said about the inconvenience arising from the South Kensington Museum being placed practically out of the reach of the working classes.

The Chairman proposed a most cordial vote of thanks to Mr. Hawes for the admirable paper he had read; and said it would not be out of place to mention that the scheme of sending the workmen to Paris was in a great measure originated by that gentleman, and to him was due a great portion of the credit of bringing the undertaking to so successful a conclusion. There was no need for him to sum up the arguments for and against the paper, for they had all been on one side. He regretted that his many public duties had prevented him from reading the paper before that day, and giving it sufficient attention to go minutely into it, even if time permitted. One salient point, however, had struck him particularly, as being prominently brought forward by all the reporters, and that was that the only point in which English workmen were deficient was technical education. Now this was a most gratifying fact, because that was a matter which could easily be remedied, and he hoped would be remedied very soon. If he might be allowed a personal remark, he would say that he had nothing to reproach himself with on this subject, for almost the first step which he took in his public life was to call the attention of Parliament to the comparative want of utility of the magnificent collections possessed by the country as regarded the working classes; and in one of the earliest speeches he made in Parliament he called attention to the management of the British Museum, and the inefficient manner in which its treasures were made available for the instruction and amusement of artisans. Two of the speakers, Mr. Lucraft and Mr. Aitken, had complained of the want of models, and one of them had also alluded to the inconvenient situation of the South Kensington Museum. He cordially agreed with both those gentlemen, and there again he had nothing for which to reproach himself, for in that very room he had read a paper* in which he advocated as strongly as he could the circulation throughout the country of extra specimens which were locked up in inaccessible cellars. The South Kensington Museum was the only one managed on popular and responsible principles, and he believed his was the first voice raised in favour

* *Journal*, vol. XIV., p. 157.

of that which had been already agreed to by one House of Parliament, and, but for an accident, would have received the sanction of both, the establishment of a similar museum at the other end of London. Personally, therefore, while agreeing with what had been said, he could not say that he had been converted by what he had heard. He would not detain them longer except to express his cordial thanks to Mr. Hawes, and to hope that this expedition of artizans to Paris was but the beginning of a series conducted on the same principles. As regarded the Sunday question a great deal might be said *pro* and *con.*; but they never would get any benefit from the opening of museums on Sundays as long as the religious and conscientious mind of the people was against it. When there was a general feeling that such a course would conduce to the morality and prosperity of the people, he for one should certainly not oppose it. In conclusion, he would express a hope that while there was a very keen rivalry between England and France in all matters connected with science and art—that kind of rivalry, and no other, would long continue.

The vote of thanks having been passed,

Mr. Hawes, after thanking the various speakers for their remarks, said in reply to the argument that had been used against opening museums on Sundays, that they were not visited on Saturday afternoons, that the reasoning was fallacious. A man who left off work at one o'clock on Saturday, had, during six months of the year, really no opportunity of visiting the museums if they were open; but, if they were open until nine or ten o'clock in the evening, and no advantage were taken of the privilege, then he would admit there was something in the objection, but even then all those who were at work in the evening would be excluded, and the only remedy would be to give them the opportunity of visiting these places on Sunday afternoon. The result of opening the South Kensington Museum in the evening proved the advantages derived from that measure. As to the superiority of foreign work, the first moment that he saw the letter of Dr. Lyon Playfair in the *Times* he was convinced that it contained much exaggeration; and his visit to Paris confirmed that impression. Other nations had advanced from a lower to a higher point, and some had made more rapid progress than ourselves, but we still maintained our high position.

Fine Arts.

Union Centrale des Beaux-Arts.—This young and active society, while working towards its completion in the establishment of a college for industrial art pupils, is pursuing its career with promising assiduity. Its course of lectures for the opening of the present session is just announced, and consists of twenty-five lectures, to be delivered four times a week, namely, in the evenings of Monday, Wednesday, and Friday, and on Sunday afternoon. The following is the list of subjects and professors:—"Chronicle of the Applied Arts," by M. Chalons d'Argé; "The Effects of Lights and Shadows on Defined Surfaces," by M. Joseph Fouché, C.E.; "Primitive Man and his Industry," by M. François Lenormant; "The Artistic Genius of Foreign Nations," by M. F. de Lasteyrie; "Retrospective Exhibitions and their Influence on the Industry of the Day," by M. Albert Jacquemart; "The History of Labour at the late Universal Exhibition," by M. Ad. de Longpérier; "Anatomy applied to Art," by Dr. Motet; "On Health in connection with Artistic Trades," by Dr. Caffe; "Necessity of Geometry and Logic in the Study of the Plastic Arts," by M. Jacques Gautier, sculptor; "Elevation of Manual Occupations to the Rank of Liberal Professions, by means of Art and Science," by Alfred Maury, member of the Institute of France; "The Limits of the Arts," by M. Antonin Rondelet; "Enamel Painting," by M. Claudius Popelin, painter and enameller; "Execution and Processes of Construction in Ancient Architecture," by M. Beulé, member of the Institute; "Study of the Byzantine Epoch," by M. François Lenormant; and one lecture by M. Michel Chevalier, of the Institute, of which the subject is not yet announced. The above list is rather remarkable for its choice of subjects, some of which are novel, and all (or nearly all) the lecturers are men recognised as high authorities on the subjects with which they have to deal. The number of lectures on each subject varies from one to four, with the exception of M. Fouché's course on "Lights and Shadows," which will occupy six evenings. It should be mentioned that the library and museum of the society, which contain many valuable and some rare works and productions, and which are rapidly growing into greater importance, are thrown open to the public gratis. Those who take an interest in art-education should not, when in Paris, omit to visit the rooms of the society in the Place Royal.

Commerce.

Cattle in Europe.—The total number of cattle in the various European states amounts to not less than 94,700,000 head. The following are the numbers in each country:—France, 12,000,000 head; England, 10,000,000 head; Belgium and Holland, 2,000,000 head; Prussia and the German States, 13,000,000 head; Denmark, 1,200,000 head; Austria, 12,000,000 head; Russia, 23,000,000 head; Italy, 3,500,000 head; Switzerland, 1,000,000 head; Turkey in Europe, 9,000,000 head; Spain and Portugal, 4,500,000 head; Greece, 1,000,000 head; Norway and Sweden, 2,500,000 head. Taking these at £8 per head, the total value of cattle (bovine) in Europe would be £757,600,000 sterling.

Imports of Sulphur at Antwerp.—The quantity of sulphur imported at Antwerp, in 1867, was considerably less than that of the previous year, when an unusual quantity was landed; this falling off is partly owing to the immense quantity introduced into the country in 1866, so that at the commencement of 1867 the greater part of the manufactories in Belgium were well stocked. In 1867, 313 tons of sulphur were imported from Messina; 30 from Palermo; 391 tons from Licata; 952 tons from Girgenti; and 431 tons from Terranova, in all amounting to 2,117 tons, as compared with 2,848 tons in 1866, and 1,568 tons in 1865.

Colonies.

Maori Lexicon.—Students of the Maori tongue will be pleased to learn that the first part of the Maori-English and English-Maori Library Lexicon, now in course of preparation by Mr. Colenso, of Napier, under the auspices of the Australian Government, will probably be published this year, but the remaining part will not be completed until 1872. It seems that the work will be very elaborate, and will contain every known word in the Maori language.

Preservation of Meat.—It appears by the *Melbourne Argus* that, in that and the neighbouring colonies, boiling down sheep is carried on on a very large scale. Machinery for the carrying on of extensive melting operations has been sent from Geelong to Hawke's Bay, and similar apparatus will be forwarded to other ports of New Zealand as soon as it can be got ready. In New South Wales, also, this business is being greatly extended, and an ingenious speculator proposes to travel through Riverina with a portable melting apparatus to convert the unsaleable stock of the squatters into portable and marketable barrels of fat. Nearer home there is no less activity in the same direction. The "Melbourne Melting-down and Meat-utilising Company" has commissioned a plant capable of accounting for 1,500 sheep

per diem. "The only difficulty," says the paper above referred to, "lies in the transfer of the meat to England in good condition, and it is to stimulate enterprise in this direction that we now recur to the subject. Many plans have been proposed for the utilising of surplus meat otherwise than by the old process of salting, and several of those are now, more or less, in successful operation."

Notes.

Paris Exhibition.—The Imperial Commission has awarded a sum equal to £4,000, by way of honorarium, to M. Le Play, the chief commissioner; half that amount each to M. Tagnard, the treasurer, and M. Alphand, the engineer; a thousand pounds each to MM. Focillon and Donnat, assistant commissioners; and forty-eight pounds each to MM. Gassies and Dax, who managed the two aquariums gratis. M. Le Play has since been raised by the Emperor to the senate. The prizes in the agricultural and horticultural sections have been presented to the exhibitors by the Emperor at the Tuileries.

Sequoia Gigantea in the Paris Jardin d'Acclimatation.—The experiments which have been made with plants of this noble coniferous tree of California, which attains the height of three hundred feet, with a circumference of thirty feet or more, seem to promise well for its acclimatisation in Europe. In 1860, M. Leroy, of Angers, presented the Jardin d'Acclimatation with a young plant, about six feet high; the first year it grew but slowly, making a shoot about ten inches long, but its growth has since gradually increased, reaching more than three feet in 1866, and about four last year. The tree, in December last, was about twenty-five feet high, fifty-six inches in circumference at the base, and thirty-six inches round at a yard above the ground. The tree has suffered no injury from the cold, and promises soon to out-top all the trees around it. Should the present winter leave it unharmed the experiment may be considered as decisive. There has been considerable difficulty in obtaining seeds of this tree, except at a very high price, and this induced nurserymen to try cuttings, which was carried out with great care but little success. A gardener at last thought of proceeding in the simplest manner possible, setting his cuttings, *en masse*, in the open ground, and he has completely succeeded. Some of his plants were sent to the Jardin d'Acclimatation in 1861; they were then about ten inches high, and were planted out in the open air; they now average fourteen feet in height, and forty inches circumference at their base.

Newspapers in Austria.—In 1867 there were no less than 159 different newspapers and periodicals published at Vienna. Of these 25 were political; 5 on public economy; 3 on insurance; 27 commercial and industrial (of which 2 were exclusively devoted to the book trade); 16 literary and humorous publications; 7 on educational subjects; 5 military; 3 architectural; and 10 on agricultural, rural, and sporting subjects; 10 theatrical and art journals; 5 on domestic economy; 7 newspapers on railways, telegraphs, &c., and finally, 26 scientific periodicals, of which 5 were devoted to law, 10 to medicine, 3 to archæology, 2 to photography, 2 to stenography, 1 to mountaineering, 1 to metal founding, 1 to meteorology, 1 to pharmacy, and 1 to botany. In foreign languages seven newspapers were published, viz., the Roumanian *Albina*, the Hebrew *Bet Lehem*, the Czech *Cesicek*, the Croat *Glasonosa*, the *Journal Français*, the *Mercurio di Vienna* in Italian, and the *Postep* in the Polish language. Five other journals at one time were published, but have now ceased to exist: the Hungarian *Becsi Hirado* and *Govisi Baszat*, and in the Slavonic tongue the *Stracopud*, *Weistnick*, and *Duch csasu*.

Snow in the Streets of Paris.—Complaints having been made in the newspapers that the authorities had not caused the snow to be removed from the streets, which were in a sad condition, the following official statement has been sent to the Paris journals:—"The quantity of snow which fell within a few days was equal to a layer of six inches in thickness, which gives for the total surface of the streets of Paris 1,341,000 cubic metres. To remove such a mass of frozen snow would cost about six millions of francs (£240,000), and would require fifteen thousand carts during ten days; the whole of Paris and its environs does not possess this number of carts. These figures sufficiently prove that it is impossible to think of carting away the snow when it has fallen abundantly in the streets of Paris, and that we must wait for the thaw in order to get rid of the snow by means of the sewers. In order to facilitate this operation, the authorities confine themselves to the breaking and removal of the ice in the gutters, in order to leave them free when the thaw arrives. In the meantime every care is taken to carry out the necessary measures for the safety of circulation and traffic; with this view the pathways and crossings have been cleared of snow and ice; sand, cinders, dust, and other matters have been spread everywhere to avoid slipping, and, consequently, the circulation has not been impeded in any place, notwithstanding the rigour of the season. On this subject it is well to repeat: 1st. That in times of frost and snow no water is allowed to run in the public ways; 2nd. That the inhabitants in each street are compelled to break the ice in the gutters, to sweep the ice and snow from the pavement, and to sprinkle sand, cinders, or other similar substances on the footpaths when slippery; and that the omission of the above duties is punished by the police courts, besides leaving the streets in an inconvenient and dangerous condition." The value of such regulations as those above mentioned is self-evident, but the recent condition of the streets of Paris bears witness to the fact that it is far more easy to make rules than to cause them to be adhered to. It will not be out of place here to quote the following extracts from an account, recently published, of the circulation in the streets of Paris. The observations have been made at the most important points, crossings, and bridges, with the view to ascertain the relative importance of certain lines of communication. The highest result has been obtained at the intersection of the Boulevards Montmartre and Poissonnière, by the rue and faubourg Montmartre, namely, 400 persons a minute, or 24,000 per hour, at the most crowded hour, between five and six in the afternoon. The total number of pedestrians moving in all directions at this busy crossing is calculated to amount to about 120,000 during the five most crowded hours of the day. On fête and race days the number of vehicles counted at the end of the Rue Royale, on the Place de la Concorde, have amounted to more than two thousand per hour.

Public Laboratory at the Jardin des Plantes.—The free laboratory for the use of chemical students, which has been opened for two or three years at the Jardin des Plantes, is reopened this year. The experiments are carried on under the superintendence of MM. Chevreul and Frémy, members of the Academy of Sciences. The laboratory is opened three times a week.

Correspondence.

Rodger's Shipwreck Raft.—Sir,—The *Gentleman's Magazine* for the year 1822, vol. 92, part 1, p. 354, contained an engraving of "Lieut. Rodger's raft, for preserving persons from shipwreck." The sketch was presented by the Royal Humane Society, having been taken from a model in the possession of this society. By the description in the 48th report of this society, it appeared that "it had been tried at Sheerness, alongside of His Majesty's ship *Northumberland*, with 20 men, and in 1819 in Portsmouth Harbour, alongside of His Majesty's ship *Queen Charlotte*, with 24 men, on both which occa-

sions it met with general approval." It might be constructed on the ship's deck when required, and hoisted or launched overboard according to circumstances. It was an oblong raft, supported on each side by an empty butt capable of containing 108 gallons, equal to the weight of a man weighing 150lbs. As in the year 1819 the inventor had received the gold medal of the Society of Arts for this invention, I may inquire in your *Journal* whether this apparently useful lifeboat was perfected, and if so, whether the invention was successful. To me, as it may be to many of your readers, it is a novelty.—I am, &c., Chr. Cooke, Member of the Society of Arts.

London, 13th Jan., 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon......Society of Arts, 8. Cantor Lectures. Dr. Letheby, "On Food."
R. Geographical, 8½. Mr. E. D. Young, "Account of the Livingstone Search Expedition."
Entomological, 7. Annual Meeting.
Actuaries, 7.
Social Science Association (Jurisprudence Department), 8. Adjourned discussion on the paper, by Mr. John Westlake, "On Naturalization and Expatriation, or a change of Nationality."

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. Col. P. P. L. O'Connell, R.E., "On the Relation of the Freshwater Floods of Rivers to the Areas and Physical Features of their Basins."

Wed ...Society of Arts, 8. Dr. Mann, "On the Climate and Industrial Prospects of the Colony of Natal."

Thur ...Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Royal, 8½.
Antiquaries, 8½.
Philosophical Club, 6.

Fri.......Royal Inst., 8. Rev. F. W. Farrar, "On Public School Education."
R. United Service Inst., 3. Major-General M. W. Smith, "Cavalry: how far its employment is affected by recent improvements in Arms of Precision."

Sat ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

Patents.

From Commissioners of Patents' Journal, January 17.

Grants of Provisional Protection.

Animal hair, substitute for—3707—M. A. F. Mennons.
Anvils—17—D. Foster.
Books, &c., sewing—3306—R. Leighton and T. Kirkham.
Boots and shoes—3681—A. V. Newton.
Cameras—19—E. J. and W. A. Krüss.
Candles—30—W. J. Blinkhorn.
Cannon—3553—L. Christophe and J. Montigny.
Carriage brakes—3718—A. Allan.
Cartridge pouches—34—A. Albini.
Casks, metallic—3683—A. Dunn and A. Liddell.
Casks, &c., cleansing—33—W. H. Atkinson.
Churns—18—M. A. Hamilton.
Clocks—3693—L. Hasluck.
Coffee roasters—65—B. J. Heywood.
Coals, &c., transferring from railway waggons into barges—37—J. Nixon.
Creels or bobbin-holders—42—J. R. T. Mulholland.
Dress and jewellery fastenings—21—J. Cox.
Engines—15—J. Ramsbottom and T. M. Pearce.
Engines and boilers—3709—T. Messenger.
Engines, carding—3722—W. and T. Mitchell.
Fabrics, piled—41—T. Stokes.
Fabrics, &c., printing—3668—J. Lightfoot.
Felt, &c., manufacturing—3703—J. Aschermann.
Fibrous materials, preparing, &c.—3679—H. Higgins and T. S. Whitworth.
Fibrous materials, spinning—3719—J. H. Johnson.
Fibrous substances, spinning and doubling—9—R. W. Morrell and P. Craven.
Fuel, artificial—3706—M. A. F. Mennons.
Furnaces—3695—J. Jowett.
Furnaces—10—W. J. Fraser.
Furnaces, &c.—13—A. Beard.
Furnaces—14—F. Chamberlain.
Furniture, adjustable lock—36—G. Mudge.
Gas, &c., carburetting—3675—T. J. Ellis.
Gauges, pressure, &c.—61—J. L. Norton and W. H. Bailey.
Hat protectors—3671—E. C. Jetot, E. Hortensius, C. Cros, and M. M. A. E. De Jabrun.
Hats, felt—3723—J. G. Crompton.
Hats, manufacturing rims of—3601—H. A. Bonneville.
Hats, &c.—3716—W. Wilson.
Hinges—3689—W. E. Newton.
Iron—28—J. T. Emmerson and J. Murgatroyd.
Iron, &c., combining wrought and cast—59—G. Davies.
Jewellery, &c., fastenings for—63—G. E. Donisthorpe.
Knitting machines—3622—G. Davies.
Lamps—3701—G. Glover.
Lamps—53—W. T. Tongue.
Lamps, carriage—3711—W. Barnes.
Leather, manufacturing—2538—J. Bayley and T. Bayley, jun.
Locomotion—11—J. Imray.
Looms—2926—J. Hill and S. Shelley.
Looms—3699—T. and J. Robertshaw and J. Greenwood.
Lubricators—55—G. Smith.
Meat, storing and preserving—32—P. Spence and W. A. Smith.
Motive-power—3656—C. Pottinger.
Motive-power apparatus—31—W. E. Newton.
Needle cases—8—H. Milward.
Needles, &c., receptacles for—26—M. E. Roy and L. Prevett.
Paper-making machinery—3673—J. Edge.
Paraffine, separating from its solutions—39—E. R. Southby.
Paving, construction of—3713—V. L. Daguzan.
Pistons, metallic—3685—J. Goodfellow.
Printing machines, &c.—25—J. and B. Dellagana.
Railway carriages, re-railing or replacing—5—W. Stroudley.
Railways, preventing accidents on—2884—M. Fitzpatrick.
Road-sweeping machines—3720—A. M. Clark.
Safes—2—W. R. Lake.
Scaffolding—23—T. P. A. Key.
Ships, iron—14—T. B. Daft.
Silk, &c., preparing floss—3715—C. G. Hill.
Soap, cutting—3691—C. Morfit.
Spinning machines, &c.—35—W. B. Gray.
Stays—20—E. Izod.
Steel and iron—3537—A. V. Newton.
Steel and iron—3714—H. Bessemer.
Steel, moulds for casting—3677—J. M. Rowan.
Stone, artificial—3708—M. A. F. Mennons.
Stoves—3717—N. Smith.
Taps, liquid metre—49—C. Hutchinson.
Taps, self-closing—3687—W. Fryer.
Thread-polishing machines—3710—G. McCulloch.
Umbrellas, &c.—57—H. Smyth.
Valves, &c.—3578—W. Jackson and J. Dyer.
Vessels, raising sunken—3697—J. E. Gowen.
Wearing apparel, fastenings for—51—H. McEvoy.
Woollen goods, frame and knitted—16—B. Vette.
Yarns, steaming—3669—N. Greenhalgh, W. Shaw, and J. Mallison.
Yarns, &c.—6—W. and J. W. Wood.

Invention with Complete Specification Filed.

Mashing machines—90—O. H. McMullen.

Patents Sealed.

2107. T. D. Walker.
2113. A. Paton.
2114. J. Hargreaves.
2123. C. F. Whitworth.
2124. A. Budenberg.
2126. W. G. Creamer.
2132. T. A. Breithaupt.
2190. A. M. Clark.
2207. S. M. Martin and S. A. Varley.
2235. B. Harlow.
2996. J. H. Johnson.
3044. J. Smyth and S. Kirby.
3275. W. J. and A. Coleman.

From Commissioners of Patents' Journal, January 21.

Patents Sealed.

2135. J. Walker.
2140. J. H. Johnson.
2142. H. A. Dufrené.
2145. S. Bonsall.
2146. S. Bonsall.
2147. W. Thomson.
2148. W. Geeves.
2150. W. Simpson & W. Howitt.
2151. W. Betts.
2153. R. B. Roden.
2156. S. Turton and G. Holcroft.
2162. J. Brown and W. Lillie.
2164. A. Mackie.
2169. J. Edge.
2172. G. B. Northcote, jun.
2177. W. E. Gedge.
2182. H. Chamberlain.
2196. B. F. Stevens.
2206. A. James.
2224. J. Quin.
2225. R. Newhall.
2252. J. T. Hatfield.
2364. A. Lees and W. H. Rhodes.
2368. A. M. Clark.
2497. A. M. Clark.
3090. A. M. Clark.
3385. W. R. Lake.
3403. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

50. T. Richardson and M. D. Rücker.
125. T. Bourne.
141. F. H. Lakin.
142. S. J. Best and J. J. Holden.
137. J. Betteley.
144. C. T. Judkins.
173. J. Hewes.
143. J. Robinson and J. Smith.
154. J. Coulter and H. Harpin.
155. W. R. Foster.
165. J. A. Shipton & R. Mitchell.
152. W. E. Newton.
161. E. D. Farcot.
170. D. Munro and T. Wright.
418. A. Fryer.
147. W. Jeffreys.
160. M. B. Mason.
180. W. Clay.
189. M. Robinson.
197. J. B. Wood.

Patents on which the Stamp Duty of £100 has been Paid.

175. John Chatterton and W. Smith.
185. W. Wilson.
152. C. W. Lancaster, J. Brown, and J. Hughes.
167. C. W. and F. Siemens.

Journal of the Society of Arts.

FRIDAY, JANUARY 31, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's pubblishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'clock:—

February 5.—"On the Extension of the Commercial Relations between the United Kingdom and India, by means of Collections of Manufactures and Products, arranged and distributed so as specially to facilitate the Operations of Trade." By. J. Forbes Watson, Esq., M.D., Reporter on the Products of India to the Secretary of State for India in Council. On this evening Sampson Lloyd, Esq., Chairman of the Associated Chambers of Commerce, will preside.

February 12.—"On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it." By Wentworth Lascelles Scott, Esq., F.C.S.

February 19.—"Report on the Art-Workmanship Competition, 1868."

Cantor Lectures.

A course of lectures "On Food," is now being delivered by Dr. Letheby, M.A., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health, and Food Analyst for the City of London, as follows:—

Monday, February 3rd.—Lecture III.
Preservation, Preparation, and Culinary Treatment of Foods.

Monday, February 10.—Lecture IV.
Adulterations of Food.—Conclusion.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose have been forwarded to each member.

Institutions.

The following Institution has been received into Union since the last announcement:—
North Cheshire Chamber of Agriculture (Macclesfield).

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Musical Education Committee.

The Committee on Musical Education has been appointed, consisting of:—

H.R.H. the Prince of Wales, K.G., *Chairman.*

Lord Henry Gordon Lennox, M.P.
Lord Gerald Fitzgerald.
Sir John P. Boileau, Bart.
Sir John Harington, Bart.
Sir Francis Sandford.
R. K. Bowley.
Edgar A. Bowring, C.B.
Harry Chester.
Henry Cole, C.B.
Capt. Donnelly, R.E.
Herbert Fisher.
William Hawes, *Chairman of the Council.*
R. F. Puttick.
Samuel Redgrave.
Colonel Scott, R.E.

With power to arrange for a deputation to confer with Her Majesty's Government.

Proceedings of the Society.

Conference on Technical Education.

The Conference met in the Society's Great Room on Thursday morning, the 23rd January, at 12 o'clock. William Hawes, Esq., F.G.S., Chairman of the Council, in the chair.

The following is a list of the principal persons present:— The Earl Granville; the Earl Russell; the Earl of Lichfield; Sir C. Wentworth Dilke, Bart., M.P.; Sir J. D. H. Elphinstone, Bart.; Sir J. P. Kay-Shuttleworth, Bart.; Sir Walter Stirling, Bart.; Sir Walter C. Trevelyan, Bart.; the Right Hon. H. Austin Bruce, M.P.; Right Hon. W. Cowper, M.P.; the Right Hon. G. J. Göschen, M.P.; the Right Hon. C. Pelham Villiers, M.P.; the Hon. Auberon Herbert; Mr. T. D. Acland, M.P.; Mr. A. S. Ayrton, M.P.; Mr. Thomas Bazley, M.P.; Mr. Charles Buxton, M.P.; Mr. George Dixon, M.P.; Mr. B. Samuelson, M.P.; Mr. J. Stansfeld, M.P.; Dr. Lyon Playfair, C.B. (Edinburgh University); Mr. Edgar A. Bowring, C.B. (Secretary of the Royal Commission for the Exhibition of 1851); Mr. Henry Cole, C.B. (Secretary of the Science and Art Department); Mr. Samuel Andrews; Mr. Antonio Brady; Mr. Harry Chester; Mr. Samuel Redgrave; Mr. Seymour Teulon; Mr. G. Fergusson Wilson, F.R.S.; Mr. Philip Wright; Judge Manockjee Cursetjee; Rear Admiral E. Halsted; Rear-Admiral E. Ommanney, C.B.; Rear-Admiral A. P. Ryder; Major-General C. Dickson; Lieut.-Col. F. Miller, R.A. (Royal Artillery Institution, Woolwich); Lieut.-Col. A. Strange; Captain Beaumont, R.E. (Paris Juror); Captain Donnelly, R.E. (South Kensington Museum); Captain Gardner; the Provost of Dundee (William Hay); the Mayor of Kendal; Mayor of Macclesfield (David Clarke); Mayor of Sunderland (E. T. Gourley); Mayor of Wakefield (W. H. Lee); Alderman and Sheriff D. H. Stone; Alderman David Salomons, M.P.; Alderman Rhodes (Wakefield Chamber of Commerce); Messrs. Edward Webb

(Worcester Chamber of Commerce), H. W. Binns (Worcester Chamber of Commerce), Henry Brocklehurst (Macclesfield Chamber of Commerce), Thomas Browning (Manchester Chamber of Commerce), Alfred Field (Birmingham Chamber of Commerce), Wright Mellor (Huddersfield Chamber of Commerce). John Rotherham (Coventry Chamber of Commere), Prof. Adams (King's College, London), Prof. Anderson (University of Glasgow), Dr. F. Crace Calvert, F.R.S. (Royal Institution, Manchester), Prof. Goldstücker (University College, London), Prof. T. W. Goodeve (King's College, London, and Examiner for the Society of Arts), Prof. J. G. Greenwood (Owen's College, Manchester), Prof. William Hughes, F.R.G.S. (King's College, London, and Examiner for the Society of Arts), Prof. Huxley, F.R.S. (Royal School of Mines), Prof. Robert Kerr (King's College, London), Prof. Leone Levi (King's College, London), Prof. Hayter Lewis (University College, London), Prof. G. D. Liveing (Cambridge University), Prof. Fleeming Jenkin, F.R.S. (University College, London), Prof. Rymer Jones, F.R.S. King's College, London), Rev. Prof. H. Pestonji (King's College, London), Rev. Prof. Plumptre (King's College, London), Prof. W. J. Macquorn Rankine (Glasgow University), Prof. Thorold Rogers (Oxford University), Prof. Tennant (King's College, London), Prof. John Wilson (Edinburgh University); Revs. Edwin A. Abbott, M.A. (City Middle School), Jonathan Bates (Colchester Grammar School, and Examiner for the Society of Arts), Hon. Samuel Best (Southern Counties Adult Education Society), W. H. Brookfield, (South Kensington Museum, one of H.M. Inspectors of Schools), Dr. Carver (Master of Dulwich College), S. Cheetham (King's College, London), B. Morgan Cowie (Professor of Geometry, Gresham College, one of H.M. Inspectors of Schools, and Examiner to the Society of Arts), John G. Cromwell (St. Mark's College, Chelsea), Alexander J. D. D'Orsey (King's College, London), J. G. C. Fussell (one of H.M. Inspectors of Schools), W. H. Grey, M.A. (Watt Institute and School of Arts, Edinburgh), Dr. Irons (Vicar of Brompton), H. Jona (King's College, London), W. Jowitt (City Middle Schools), G. P. Keogh, M.A., W. C. Lake (School Commissioner), Canon Melville, Muirhead Mitchell (one of H.M. Inspectors of Schools), R. W. Morris (Hoddesdon Institution), Canon Norris, John Oakley (Diocesan Board of Education), Bartholomew Price (Oxford University, and Examiner for the Society of Arts), James Ridgway (Culham College, Oxon), Arthur Rigg (The College, Chester), T. Teignmouth Shore, M.A., F.R.G.S., Henry Solly (Working Men's Club and Institute Union), J. Woolley, LL.D. (Director of the Royal School of Naval Architecture, and Examiner for the Society of Arts); Drs. A. J. Bernays (St. Thomas's Hospital), Francis Bond (Hartley Institution, Southampton), E. Christian (Ipswich Working Men's College), James Ellis, Clement Le Neve Foster (Miners' Assoc., Cornwall, Paris Juror), Michael Foster (University College, London, Examiner for the Society of Arts), George Harley (University College), Charles J. Hare (University College), M. Forster Heddle (St. Andrew's University, Scotland), M. Henderson, Robert Hogg (Examiner for the Society of Arts), Stevenson Macadam (Royal Scottish Society of Arts), Robert J. Mann (Superintendent of Education, Natal), Alfred D. Sharman, Frederick R. Smith, R. Angus Smith (Manchester), Thomas Stevenson (Guy's Hospital), J. Storrar (School Commissioner), J. Yeats (Middle School, Peckham); Messrs. W. C. Aitken (Birmingham and Midland Institute), J. P. Baker (Inspector of Mines), John Banks (Hastings Mechanics' Institution), G. C. T. Bartley (South Kensington Museum), H. A. Bowler (South Kensington Museum), J. Bryce (Oriel College, Oxford), James Caird (Inclosure Commissioner), G. W. Clarke (N. Cheshire Chamber of Agriculture), Alexander Craig (Glasgow Institution), E. A. Davidson (City Middle School), P. De la Motte (King's College, London), George Griffith (Secretary, British Association for the Advancement of Science), J. W. Hales (Christ College, Cambridge), Thomas Hall, B.A. (City of London School), T. E. Heller (Lambeth Educational Board), James Hole (Associated Chambers of Commerce, London), John Howard (Islington Public School), J. F. Iselin, M.A. (Department of Science and Art), F. E. Kitchener (Rugby Evening Classes for Young Women), H. Latham (Oxford), Ben Lockwood (Huddersfield), William Marriott (Huddersfield Mechanics' Institution), G. N. Menzies (Highland and Agricultural Society of Scotland), C. W. Merrifield, F.R.S. (Royal School of Naval Architecture), H. Meyer (Hanover), J. Slaney Pakington (Worcestershire Educational Union), Thos. Paterson (Working Men's Club and Institute Union), J. H. Pollen (Science and Art Department), Hodgson Pratt (Working Men's Club and Institute Union), Richard Redgrave, R.A. (Paris Juror), George Robertson (President of the Royal Scottish Society of Arts), J. C. Robinson (Science and Art Department, Paris Juror), John Robinson (Owen's College, Manchester), W. Rossiter (South London Working Men's College), Charles S. Roundell (Merton College, Oxford), J. Russell (Trinity College, Cambridge), H. H. Sales (West Riding Educational Board), R. F. Sketchley (South Kensington Museum), R. P. Spiers (Architectural Association, London), F. Talbot (South Staffordshire Educational Association), George Wallis (Science and Art Department,

(Paris Juror) James Young (of Bathgate, Leeds), W. H. Ablett, Kenneth Austin, Charles M. Barker, T. Horlock Bastard, John Bennett, Samuel R. Bennett, T. T. Bernard, William Botly, William Brookes, Hyde Clarke, H. B. Clifton, Lloyd Clowes (Paris Juror), R. Coningsby, Thomas Connolly, W. Corbett, Thomas Danby, F. A. Day, W. J. Day, T. Despointes, Charles Wentworth Dilke, J. Passmore Edwards, George Foggo, John Fretwell, jun., W. Gilbertson, James Glaisher, F.R.S., George Godwin, F.R.S., Henry Gore, Edward Hall, F.S.A., J. Hamer, Charles Hart, T. H. Hartley, B. Waterhouse Hawkins, Alexander Haylin, Julian Hill, Paul R. Hodge, C.E., G. N. Hooper (Paris Juror), W. H. James, John Jenkins, M.A., Edmund Johnson, John Jones, H. L. Keeling, G. J. Knight, J. G. Liddiard, Benjamin Lucraft, James Macdonell, Robert Mallet, C.E. (Paris Juror), W. D. Michell, Thomas Muir, F. A. Myers, W. Newmarch, F.R.S., A. Nicholls, Ernest Noel (Paris Juror), W. O'Brien, C.E., B. H. Paul, J. Payne, Thomas Peard, J. Arthur Phillips (Examiner for the Society), William Pitman, H. D. Plimsoll, Wyndham S. Portal (Paris Juror), C. S. Ratcliff, J. Rebmann, F. W. Rogers, J. Scott Russell, F.R.S., (Paris Juror), Trelawny Saunders, C. L. Shadwell, Edward Spender, Henry Staines, Robert Stothard, J. Sutherland, C. J. Thicke, H. C. Thompson, W. Cawthorne Unwin, Cornelius Varley, Henry Vaughan, Henry Ward, J. B. Ward, J. Webber, Charles White, Henry Whitfeld, Charles Woolloton (Paris Juror), G. T. Wright, and Thomas Wright.

The Duke of Marlborough (Lord President of the Council) forwarded, for the use of the Conference, proof copies of a translation of the Report of a Commission appointed by the French Government to inquire into the question of Technical Education.

The Chairman—My Lords and Gentlemen—I feel that some apology is due from me for taking the chair on an occasion of this kind, in the presence of so many who are much better able, both from their position and the information they possess upon this subject, to fill that office. Still, as Chairman of the Council of the Society that has thought it right to summon this Conference, it becomes my duty to preside over it. I will not detain you by any statement of my own opinions, but will now merely introduce the subject for this day's discussion by reading the programme which the Society has issued, and giving you a general idea of the resolutions it is intended should be proposed. The programme to be submitted to your consideration is as follows:—

The Council propose the following programme of the topics for discussion at the meeting. As the Council have reason to expect that the Conference will be numerously attended, and it is only to sit for two days, it is thought desirable that it should deal rather with general principles than with details, and that the latter should be taken up more deliberately by the committee which it is proposed should be established:—

1. The necessity for improved national education for the working classes generally.

(a.) Improved primary education, and the measures necessary for securing the same.

(b.) Additional facilities in primary schools for affording the elder children the means of learning the elements of scientific knowledge.

2. The necessity for the establishment of schools for technical and industrial education in relation to science and art, in which pupils after leaving the primary schools may obtain instruction suited to the special industries with which they may be connected, as workmen, foremen, or managers.

3. The best measures for securing the foregoing object.

4. How far technical education can be promoted by the aid of existing educational endowments.

5. To request the Council to appoint a standing committee of members of the Society of Arts and others, to take whatever steps may be required to advance the objects approved by the Conference, and to send deputations to the Government, to support such applications as may seem desirable.

I will now read to you the resolutions which it is proposed to submit to you:—

1. That to establish and maintain a system of technical education adequate to the requirements of Arts, Manufactures, and Commerce in the United Kingdom, the three following educational reforms should be effected:—1st. In the universities, grammar schools, and other educational institutions for the upper and middle classes of society, instruction in science and art should be placed on the same favourable footing as other studies; 2nd. Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere, and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government; and 3rd. Special institutions for technical instruction, adapted to the wants of the various classes of society, and to the industries of the country should be established and maintained in the United Kingdom.

2. That in such measures as may be desirable for the general provision of the means of efficient primary and secondary education, it would be right to consolidate and improve, rather than overthrow, what has already been done, but that the voluntary principle requires to be supplemented by local rates for education.

3. That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the Legislature ought now to provide that all children between certain ages, employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools.

4. That the Council of this Society be requested to appoint a standing committee to take such steps as may give effect to the foregoing resolutions, to support all such well-advised schemes for technical education as may be brought before it, to send such deputations to the Government as may seem expedient, and to re-assemble this Conference when desirable.

The first resolution will be proposed by Dr. Lyon Playfair, and will be seconded by Earl Russell.

Dr. Lyon Playfair, C.B., F.R.S.—Since I entered, I have been very unexpectedly called upon to move the first resolution, which brings forward the general principles upon which the Conference will be asked to give an opinion. The first part of this general resolution asks us to affirm that the universities, grammar schools, and other public educational institutions of the country, should accept as part of their scheme instruction in science and art upon as favourable terms as they accept other schemes of instruction, which at present do not include these. Perhaps all of us are familiar with the report of the Public Schools Commission. That report tells us that only one-third of all the boys of the great public schools go to our Universities—that therefore two-thirds pass directly from the schools to enter into the various pursuits of life—and therefore it is clear that if the school becomes the only university for such a large proportion as two-thirds, and for a much greater proportion in proprietary schools, the education given in these schools should be of a character to fit them for the life that they are about to enter. Now, in this country, we know that is not the case. None of us here, I am sure, would wish to depreciate any branch of learning; none of us would wish to see intellectual culture reduced; but all of us would desire to see the public schools of the country made much more catholic in their character, and more fitted for the purposes of life. There are two systems, we may say, of education. One is the natural system, which prepares a man for his future pursuits in life; the other is an artificial system, which trains his mind by processes of education which are not adapted to, and which are rarely used in, his future life, but which are supposed to strengthen the intellectual faculties. I will say nothing whatever in depreciation of classical education. I believe that classical education is an excellent training of the mind in certain directions, but not in all; and I think all now admit that science has reached so high a

stage that it may be used as a means of high mental cultivation, while at the same time it gives a class of knowledge which may be made practically useful in every walk of life, and so may be wisely introduced into the great schools of the country. That is what we are asked to affirm. But we are asked also to affirm that it is to be admitted on equal terms with other branches of knowledge. At the present moment some schools have made great steps in admitting science on about equal terms with dancing, that is to say, they give one or two hours a week to it. Or they may even admit it on equal terms with French, which is very rarely the case, but it is generally made entirely subordinate, and where classics are made the subjects of high honours and scholarships or exhibitions in the schools, science receives no distinctions. The universities are ports into which the ships come from the schools, and the ports must be adapted to the character of the ships which they are to receive. Now, if our scholars go up from our public schools without any scientific knowledge, or any knowledge of art, the universities must suit themselves to the scholars who are sent up to them; and we know now that there is no encouragement, or very little, given in our universities to scientific education; in Oxford, notwithstanding the new improvements, they have only twelve professors of science as compared, if I recollect the number rightly, with 42 professors in Berlin. I contend, further, that experience shows that our great universities are not adapted to the wants of the time, because one-third (I speak from the Oxford reports themselves) of all the 1,700 students attending the Oxford University have to be paid in money for their attendance; that is to say, have to receive scholarships, of the average of £80 a year, to induce them to go to the education which they do not find fitted for the ordinary pursuits of life. In the other universities, such as the poor Scotch universities, the University of Edinburgh, for instance, where there are scarcely any endowments, we have 1,500 students compared with the 1,700 in Oxford; but we receive them because the education is of a more large and catholic character, and more suited to the wants of the age; because these institutions are woven into the national life of the country. Students come to us without large inducements. We therefore request that all these assistances—the mighty assistances of fellowships and scholarships in Universities—should be given for all branches of knowledge equally. By all means let them be given for high classics and mathematics, and for all kinds of culture; but let them not be confined to one kind of culture alone. Let us ask that those subjects, which are so essential to the progress of industry, and the progress of the kingdom, should be put on the same footing. There never was a time when those of us who wish to see education greatly enlarged in its character had greater hopes than now. Take, for instance, that admirable volume of "Essays on a Liberal Education," recently published—written by the masters of our great public schools—and we see how much the schools are endeavouring to reform themselves from within. Let us give them all encouragement, and show them that we appreciate their efforts. We do not want to see one atom of their culture lessened, but we believe that by introducing scientific subjects we shall fit men better for their after-pursuits, and that their faculties will be improved. At Rugby, they have recently introduced science into education. Not one master in Rugby would now wish, I believe, to go back to the old system; for they find that in enlarging the scheme of education, the standard of knowledge is rather raised than limited. Let us look at Cheltenham, an admirable example, which gives a general basis of education, and then bifurcates into two divisions, one a division giving scientific culture, the other a division giving high classical culture, the demand being nearly equal, because both divisions are nearly equally handicapped, the former by the Royal Military Academy at Woolwich, the latter by the Universities. Let us, therefore, go to the schools and say, we acknowledge their past efforts, and do not wish to depreciate their culture, but let science be placed on equal terms with other branches of education. The next point we are asked to affirm is a very important one—that "efficient means of primary instruction should be brought within the reach of the working classes everywhere, and that encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government." This is so much connected with resolutions that follow, that a single word on it will be sufficient. I will simply draw attention to the latter part of it. We are about to establish technical schools. These technical schools will not be fed unless we spread a taste for science and art. We have got some of them at present. There is an admirable technical school in Jermyn-street, the School of Mines, but the number of its matriculated students is very small; not from any want of efficiency in the conductors—the professors are of the highest position, and its education is excellent; but the large field of mining industry cannot supply twenty men (I think I am above the mark) capable of receiving the systematic instruction which is there given. We want, before we found these technical schools, to create the taste, and then our technical schools will be well filled. Let us once introduce the elements of science and art into the primary schools of the Government, and we shall soon change altogether the character of the secondary education of working men. The last part of the general resolution is that special institutions for technical instruction should be established and maintained in connection with the various industries of the United Kingdom—special institutions adapted to the wants of the various classes of society, and to the industries of the country. There is already a large movement going on for developing the institutions which we already possess, and no doubt many of them will soon be much better adapted for the promotion of technical education. I hold in my hand a letter which I received this morning from the Treasury, stating that the Treasury has agreed to recommend Parliament to give a vote of £200 a year to meet £200 given by a private individual, for the establishment of a professorship of engineering in the University of Edinburgh. This is a very important movement. I hope that soon we will have a professorship of engineering, through the enlightened intelligence of the manufacturers of Manchester, connected with Owen's College; just as Sir David Baxter has offered £5,000 to Edinburgh to found such a professorship if the government meet it with a vote of £200 a year, which, as I have said, they are willing to recommend to Parliament. We shall soon see, then, our institutions having these practical professorships; and all this is very gratifying, but it does not meet some of the important wants. We want special technical institutions, fitted for different kinds of industry in our great industrial centres; not fitted for one class of our community alone, but for all classes—one kind of schools adapted for workmen, another kind of schools suited for foremen and managers and sons of manufacturers. Unless all these different kinds of schools, suited to various classes and to various industries, are established, we shall not have reached what is the want of the country. Let us recollect what is the case with regard to France. Without speaking of subordinate schools, there are four *Ecoles des Arts-et-Metiers* at Paris, Aix, Angers, and Chalons, from which every year four hundred men, with the highest education as engineers and chemists, are poured into the industries of France, one hundred from each school; they are trained in the most admirable way, in the highest applied science—trained also to use tools and to work in workshops; and we cannot be surprised that under such circumstances French industry is advancing in the way we have recently observed. We want a certain number of these schools in our great industrial centres; one in Cornwall, one in Manchester, one in Leeds, one in Glasgow, and in various other places.

We want schools corresponding to these great schools of France, adapted to the industries of each particular district. We therefore ask for a general expression of opinion in favour of this resolution. I beg to conclude by moving the first resolution.

Earl Russell said—I rise to second the resolution that has been proposed by Dr. Lyon Playfair, and I am happy to second him because I felt sure—an expectation that has been fully justified—that he was so competent to the whole subject that he would be able to open the discussion in a manner that would carry conviction to the meeting. We are happily in a situation somewhat more encouraging than we have been in for many years in reference to this question, and, to use a phrase employed by Mr. Cobbett, "the straw moves." It is not, perhaps, very complimentary to our universities and grammar schools to compare them to a rat hunt, still, the illustration is an apt one. With regard to the first part of the resolution, referring to our universities and great schools, I am happy to learn that the Harrow school, one of our great educational institutions, has left off the habit of insisting upon all the boys writing longs and shorts in Latin verse, and has introduced the teaching of physical science. I am sorry to say they have not yet made those lessons in physical science part of the regular curriculum of the school. There is no necessity for boys to learn it, although they may get prizes for it. Still, it is a beginning, and we may hope that they will proceed to further endeavours in that direction. We must, however, be cautious in matters of this nature. I remember learning a lesson of caution in looking over the private library of the Grand Duke at Florence, where I was shown an essay that was written originally by Copernicus, and which had been revised and translated by Galileo, but Galileo, though he was afterwards tortured and imprisoned for venturing to speak the truth regarding the motion of the earth, yet was then excessively cautious and was very much afraid that the very plain way in which Copernicus had stated his doctrine—that, in fact, it was the earth that was moving—might offend the very strong asserters of the contrary view, and he erased many passages in the printed volume of Copernicus, in order that he might not offend people too much by stating to them the truth, which they were hardly able to bear—a truth in physical science that we now take as a mere commonplace. So, likewise, in our great schools and universities, we must proceed very cautiously in proposing the introduction of these new subjects of education. I am happy to say, however, that not only in a public school, but in the University of Oxford, they are making exertions in this direction. There are now some of the most eminent men in the country who are professors of science in that University, and although it is true that there is a very sufficient staff but hardly any soldiers, yet it is to be hoped that the University will before long—especially if Parliament should give some impetus—adopt some system of teaching physical science, and also throw open to those who earn distinction in those studies some of the rewards at its disposal. The fact now is that although these sciences are taught, and there are men like Sir Benjamin Brodie to teach chemistry, and there has been lately appointed a very able man (as I have been told), Mr. Clifton, to teach experimental science, yet the young men who study these subjects gain no rewards from the university, these being all given for classical or mathematical knowledge. I have been told that at an institution in Liverpool, where some are chosen as being of very quick intelligence, and sent to the University of Oxford, immediately they are destined to that university their studies are turned away from all matters of physical science, of commerce, and of manufacture, and they are obliged to attend solely to classics as the only mode by which they can obtain university rewards. You will permit me to say, perhaps, although it is not in this resolution, that I look to the Universities of Oxford and Cambridge as being hereafter really national institutions of which the country may be proud, and where persons may receive the education that befits the most instructed and th most enlightened citizens of our free and gloriou country. For that purpose I should say that men ought to be instructed in the history and the laws of their own country. It is well, indeed, that they should be acquainted with the history of Thucydides and Xenophon, of Livy and Tacitus, but also with the works of Clarendon and Hume, Hallam and Macaulay; that they ought to know something of what has been the history of their own country; what their ancestors have done for the freedom and greatness of the country; and not be contented with the laurels which were gained by Pericles or by Cæsar. I remember, and those who belong to the Social Science Association will probably recollect, a very powerful address of Lord Brougham, in which was a confutation of that line of Pope—"A little learning is a dangerous thing." Lord Brougham showed how much better it was, as he expressed it, to have half a loaf than no bread; that a little learning was very much better than no learning at all, that some knowledge was better than ignorance, and that every one ought at least to endeavour to attain some knowledge. Now, there will always be many at our public schools and universities likely to inherit large fortunes and to enjoy a life of ease and competence, and who are not likely to study very hard, but at all events it is desirable they should have some competent knowledge on various subjects, not only classics, but physical science, and the laws and history of their country, so that they may be useful members of society, although they may not be profound in any branch of learning, or in any department of science. I come next to the question (a very great question, upon which you will by-and-bye, as I trust, hear Mr. Bruce and others), that efficient means of primary instruction should be brought within the reach of the working classes everywhere. Now, I felt it to be my duty some time ago to open this subject in the House of Lords; and without proposing any plan, for I steadily and resolutely determined that I would propose no plan, because definite plans must be suggested at such meetings as this, and afterwards matured in the House of Commons, I proposed certain resolutions, and I had written as one of them that every child has a right to education. An early friend of mine, a member of the House of Lords, pointed out that it was not a fit resolution to be proposed to a branch of the legislature, because for every right that is violated there ought to be a remedy, and every right should be enforced, and no child at present has the means of enforcing his right to education; but I put in an epithet, "moral," that every child has a "moral right," and then all my friends agreed to the resolution. This seems to me to be an unanswerable proposition. I believe that every child has a moral right to education, and that you are doing a positive wrong to a child, who is to be a member of this great community, when you say, "You shall know nothing of the common arts of reading and writing; you shall have no instruction in morals or in religion; you shall be brought up utterly without any knowledge that there is a God and a Christ, and that there are branches of secular learning that shall be of use to you in after life; and you must be like the beasts of the field, brought up without any knowledge whatever." I say this is such an injustice to the children of the country, that it ought not to exist any longer; therefore I am delighted to find that my friend, whom I see is present, Mr. Bazley, has been fortunate enough to induce his friends at Manchester to adopt the principle of compulsory education; and I only wish that we could be quite certain that the two Houses of Parliament would be equally liberal. I am quite sure, at all events, that my friend Mr. Bruce will not shrink from the task of bringing forward a measure which, while founded on right principles, shall be, at the same time, such as to have a chance of success; because, as I said, we must not be bolder than Galileo, and we

must endeavour, at the same time, that we establish right principles, to look likewise to success. It was a saying of John Milton's, that this country ought to have the precedence in teaching nations how to live; but this is an object we have not yet attained with regard to education; because, if we look to Prussia and Germany, if we look to France, or if we look across the Atlantic, to the United States or to Canada, we find in all these countries that education is more attainable by the community generally, by the children of the poor as well as the children of the rich, than it is in this country. I hope, however, that this lagging behind, this following at a very great distance other nations of the world, will be not much longer a cause of humiliation to this country, that we shall be at least the equal of other nations; that we shall study their methods; that everything that is good in them we shall be able to secure, and if there are defects and faults, that we shall be able to avoid them. At the same time I cannot but see that between the questions of voluntary effort, and payment, either by local rates or out of the taxes, of large sums for education, there will be considerable difficulty. There is a system that was established—which I had a part in establishing—of aid by the State for voluntary efforts; and there is a system now proposed, of rates, which is established in other countries. Both of these, I think, ought to be employed; but the dovetailing these two systems—the putting them together, and making them both act, is a matter that requires the highest legislative abilities; and I only trust that my friend Mr. Bruce may be successful in the efforts that he may make in that direction. I am glad, I must say, that I have not to undertake the task myself in the House of Commons. I might some years ago have taken for my motto, what my friend Mr. Motley quotes in the frontispiece of his interesting volume, "*Luctor et emergo.*" I have struggled for a long time in the House of Commons, but I have "emerged" from there, and I shall not have to take my part in the buffeting of the waves and the roaring of the winds, which, no doubt, will soon shake the walls of Parliament. We lately, I think very properly, in the two Houses of Parliament, supported the government in a grant for the expedition to Abyssinia; it is an additional tax on the country. I trust it will be a very temporary one, and when it is over I do think we might afford for education some of that treasure that we have been so willing to give for the sake of the Abyssinian captives, not at all failing in our duty with respect to the captives in Abyssinia, but at the same time doing our duty to the captives—the poor children who are confined in the prisons of ignorance in this country. The last part of the resolution is one with which Dr. Lyon Playfair is so peculiarly qualified to deal, that I do not mean to enlarge upon it. I have read with great interest, and at the same time with some pain and shame, the report of Mr. Samuelson upon what has taken place on the Continent, and also what has taken place in some of our manufacturing towns, with regard to some branches of industry, in which we seemed to have a great superiority. I cannot expect that we can do anything better than establish schools for technical and scientific instruction. I think those are wanting; and I believe, with regard to the rest, that the good sense of the people of this country, when they are informed of what has been done in foreign countries, and when they see the foreign work that is brought into competition with the very best work that can be produced in this country, I believe that their good sense will teach them not to ask for such exorbitant wages as may throw impediments in the way of trade, while at the same time their skill will enable them to compete with anything that can be brought from any part of the world. But we do require, above all, education. Education is the great subject of this day. It is a subject on which too many minds cannot be exerted; it is a subject which requires the highest faculties, and at the same time requires the general concurrence of the nation, and I hope that both the highest faculties of the best instructed men and the general common sense of the nation will be given to this great effort. I second the resolution with much pleasure.

Mr. GEORGE GRIFFITH, of Harrow, wished to correct one statement of the noble lord. He was happy to say that since last Easter natural philosophy had been made part of the regular curriculum at Harrow, and it now had considerable weight in the school examinations.

Mr. DIXON, M.P.—I am happy to be allowed to support the resolution which has been so ably moved and seconded, and in doing so I will address my remarks mainly to what seems to be the duty of Government with reference to technical education in the manufacturing districts. But before doing that I should like to be allowed to congratulate Mr. Bazley and those who share his views throughout the country—a number of persons much larger than is usually supposed, and constantly increasing—upon the words that have fallen from Lord Russell to-day. If I understood his lordship aright, he stated that he would be glad if Parliament saw its way to enact compulsory laws with reference to primary education. These remarks, following others of a similar tendency from Mr. Bruce and Mr. Forster in Manchester, I think mark important steps in our educational progress. With reference to technical education, it must be remembered that the Associated Chambers of Commerce, in their meeting two months ago, and, I am happy to say, the Birmingham Chamber of Commerce a few days ago, both passed resolutions in favour of Government being called upon to provide schools for technical education throughout the country, and the point to which I am anxious to direct the attention of this meeting to-day is that it would be extremely advisable that in doing so Government should undertake to initiate or to control the establishment of these schools, and not simply to follow any movement that may be made with that object in the various manufacturing districts of the country. Hitherto it has been the policy of the Government merely to supplement what is done for education, and with reference to technical education this plan is now being adopted. The minutes of Council which have lately been issued indicate a continuance of this policy, that is, that where individuals or bodies of men choose to originate or to maintain schools, there and there only Government will come in to aid them. Now, it does appear to me that it would be wise if Government were to take a larger and a bolder policy, and were to say, "We are quite convinced that these schools are required in all the great centres of industry. There is no difference of opinion amongst educated people upon that point, and therefore we feel that it is our duty to see that these schools shall be established, and we will not wait until that conviction has assumed the form of large subscriptions in the various localities concerned." I believe that it would be far better if we had already passed a law enabling corporations to levy taxes for the general purposes of education, and if that law were already enforced I think the action of Government, with reference to technical education, might then be different; that is, that Government might leave to the various localities the performance of these important duties, and keep in the background until it was evident that the localities did not intend to perform them, or did not perform them properly. But inasmuch as we have not these powers, and as it may be some time before these powers are obtained, I do think it would be wise in the Government to say, "We will undertake to see that these technical schools generally are provided wherever they are wanted." For it must not be forgotten, that although these technical schools are in one respect less important than the schools for primary instruction, yet in another sense they may be considered to be equally important, if not more so, because, upon their existence, and upon their use by the great manufacturing people of this country depend the maintenance and the extension of our national greatness, our prosperity, and that wealth which Government requires to see increased, in order

that the revenue of the country may go on proportionally augmenting. I should like to mention what has been done in Birmingham with reference to this subject. We have an Institution called the "Birmingham and Midland Institute," which was established some ten or twelve years ago, and mainly for this purpose. We have also a Government School of Design. These Institutions have been considered to be very successful and flourishing Institutions, and they have certainly done a great deal of good. They are supported (at any rate the Birmingham and Midland Institute is) by the leading men of the town, and exertions have been made to extend these schools in a way that reflects great credit, I think, upon all those gentlemen. And, further than that, inasmuch as these schools are not able to educate the whole of the people seeking that education in our town, we find that, in a distant part of the town, some two miles or more from the Institute, a private individual has established schools for the working classes, and within a very short period upwards of a hundred men went to this school and took lessons in the evenings in science and art. In addition to that, in another part of the town, there is now a movement on foot for the establishment of an art-school of a superior kind—of a kind more adapted to the wants of the manufacturers than the Central School of Design. Therefore I think it is perfectly clear that in Birmingham, at any rate, there is a strong feeling in favour of the establishment and maintenance of schools of science and art. But what is our position? We find that the whole burden of the maintenance and the extension of these schools is thrown upon a comparatively limited number of persons, and that these persons are those men who take the lead in every other question, and are called upon to give their time and their money on every possible occasion and in every direction. I am sure there is not one of those gentlemen who grudges that his time and his money should be devoted to such purposes, but what those gentlemen do feel, knowing how important the question is, is that they are left unaided, and that their efforts do not secure all that they are seeking to obtain. So that they, of all others, would be glad to find that Government appreciates the efforts they are making, and is determined to second them in an efficient manner. But we know that such places as Birmingham may be considered rather as exceptions. There are many districts,—important manufacturing centres,—where, we are told, there are no such schools, and where those who desire to send either their own sons, or the sons of their better workmen to these schools, and would be glad to pay towards the necessary expenses, are unable to do so, because these schools do not exist. In such cases I think Government must, if they are to do their duty, undertake to see that these schools shall be provided. But what I am particularly anxious should be really understood is this,—that if Government shall continue to follow the system that it has hitherto adopted — the system of waiting until the locality shall have shown that it appreciates these great advantages, and shall then give its aid exactly in proportion to what is done in those localities, Government will, in reality, be abdicating that great function for which it exists, and, instead of leading, will be following the people, and we shall continue to suffer so long as this ancient policy is continued. We must not hide from ourselves the fact that, whereas on the one hand, educated gentlemen like those I see before me, and, on the other hand, the great mass of the working men of this country, are right upon this matter, and appreciate the great advantages that are to be derived, not only from education in general, but from technical education in particular, and are willing to do whatever may be necessary, a very large number of persons in the middle classes,—those persons who, at first sight, appear to be most especially interested in it, and who ought to come forward to the front in every voluntary effort that may be made for this object,—do not come forward as we could wish, and therefore that the utmost we can expect from them is, that they should not oppose us when we attempt to carry out what we think to be right and sound measures. They will not help as they ought to do a voluntary movement, but they will not oppose government action. Let us, then, with the educated people on the one side, and the great mass of the people on the other, impress upon government that the time has arrived when they may take this matter more strongly into their own hands, and say that technical education, as well as all other kinds of education, are wanted throughout the country, that technical education we must have, and that they (the government) must see that in some shape or other it is given.

Professor Rankine, F.R.S., said—I do not rise to make any remarks on the principles of this resolution, as to which there can be no dispute; it would be idle for me to do so; but only to state one or two facts that have been strongly impressed on my mind by my own experience of twelve years as professor of civil engineering in Glasgow University. That chair has been in existence for 28 years, and was instituted long before my appointment; but having derived information from my predecessor, I have, to a certain extent, the benefit of his experience as well as of my own. The first fact that has been impressed upon me is this, that the languishing state in which technical education has so long remained in this country, notwithstanding some isolated efforts to promote it, was mainly owing to a backward state of public opinion upon the subject. There is a well-known old English prejudice against theory; a misgiving or mistrust about the advantage of connecting science with practice; and I am perfectly convinced that the very bad success which that chair and other establishments of the same kind had at the commencement, was owing to the strong influence of that prejudice. By dint of great effort, and also by the advancing state of public opinion, that prejudice has been gradually dying away and weakened; it is mainly owing to an improved state of public opinion as to the advantage of science applied to practice, that the number of students of engineering at Glasgow in the course of a few years has about trebled. I think, too, we have arrived at this point, that the prejudice as to a supposed discrepancy or inconsistency between theory and practice has ceased to exist as an active principle, a principle that would lead people to actively oppose measures for the improvement of scientific or technical education. I quite agree with the last speaker that, to a certain extent, it still exists in the form of a passive principle of opposition, or rather a principle that gives rise to indifference and sluggishness in the promotion of this great object. It is easy to see, then, that one of the principal things to be done, in order to cure the evil, is to produce an improved state of public opinion; and no doubt such is one of the principal objects of this conference. I agree with the last speaker that it is only necessary for somebody to begin; and I believe that the practical taking of active measures to promote technical education in the manner that has been now proposed, will induce many of the indifferent persons to whom I have referred, to change their indifference into active support.

Mr. George Foggo said that, having spent the first eighteen years of this century in Paris, he had some acquaintance with the arrangements for scientific education in France, and he knew that its promoters derived very much of their knowledge from this country. There was in foreign establishments of this kind a material difference between the statements of their directors and the reports of those who inspected them, and he should advise Englishmen, while adopting the merits of those establishments, to avoid their defects.

Mr. B. Samuelson, M.P., said—I entirely agree with the last speaker in thinking that we should commit a very great mistake in depreciating what has been done in this country. To my mind, there can be no doubt that in the industrial career of nations England has taken the lead, and I believe also that she is still doing

so; and I think that if we are to found our views as to technical education upon the supposed advance of foreign nations we should somewhat weaken them. My short continental tour, and the limited means which I have had of judging, have convinced me that we still, in all those branches of industry in which we have hitherto taken the lead, stand at the head of all continental nations. But it is equally certain that many of the successes which we have achieved industrially have been achieved at an unnecessary cost—that we have arrived at many conclusions by a system of trial and error at which we might have arrived by more direct means if we (when I say "we," I speak as a manufacturer—of myself—of my class) had been better instructed, and therefore you find in me a very ardent advocate of technical instruction. Now, the resolution which has been proposed, and in which I entirely concur, is very extensive. It refers, in the first place, to our universities and public schools. I entirely concur in urging upon our universities and public schools the desirableness of their giving encouragement to scientific instruction. I am happy to find that they have already entered upon that career; and I learn by a letter lately received that the scientific classes of Oxford are at the present time attended by more than 150 pupils; and I have no doubt that if greater encouragement in the way of fellowships were given, many young men would choose a scientific career who at present occupy their time with classical studies. I may mention that I have recently learnt at Liverpool that from the collegiate schools, numbering altogether 800 students, not more than five young men are annually sent up to the universities; and I think that a town like Liverpool would send up a much larger proportion of young men to the universities if scientific studies were encouraged there. I do not, however, think we can expect that our universities and schools will ever afford precisely the same encouragement to scientific studies that they do to the classics. Experience shows us that in foreign countries that has not been the case,—that the successful technical schools have not been those engrafted upon pre-existing institutions, but that they have been institutions founded for the express purpose of teaching science; and therefore I have no hesitation in supporting the third paragraph of this resolution, which aims at the establishment of special schools for scientific instruction. I shall not enter into an argument with my friend Mr. Dixon as to whether any, or what, local encouragement should be required to precede the establishment of such schools. My friend has said a great deal in favour of immediate Government action. I believe that a great deal might also be said for the contrary proposition, that the initiative should in all cases be taken by the localities. Where, however, two centres of industry have claims so nearly equal to the establishment of a technical school that it would be difficult to decide between them, then I think the local acknowledgment of the want, and the local readiness to supply it, may be fairly taken as giving the casting vote in favour of one or the other. I think that many such instances will occur to you, and I will instance two only—Leeds and Bradford, with respect to the woollen and worsted trade, and Nottingham and Leicester, with respect to the hosiery trade. I think that wherever the greatest local effort is made, the Government should be the most ready to come forward to assist that effort; and if it be said that this instruction is probably most wanted in the locality which is most backward, I believe that the rivalry between two localities would very soon bring the more backward one to its bearings. I think it may be desirable to consider, before any very great efforts are made on the part of the Government, what is the provision for scientific education already existing in the country. I know no branch of this inquiry to which the Society of Arts may more profitably devote itself than to that of ascertaining what are our present local provisions for that purpose. Now, I have recently visited Manchester, and I was somewhat surprised to find that in a small house, formerly the property of Mr. Cobden, are housed some three or four hundred students, of whom, I believe, one-half are receiving as efficient instruction in those branches of science which are taught (for not all are taught) as can possibly be obtained in any continental scientific school —I allude to Owen's College. I was delighted to hear from Dr. Lyon Playfair that a contribution is about to be made by the Government for the endowment of a chair of engineering at Edinburgh. I think that a similar contribution might fairly be made to Owen's College, at Manchester. A very few individuals have subscribed their £1,000 each; in one instance, three partners in a concern had each subscribed £1,000 towards the endowment of a chair of civil engineering at Owen's College; and in order that a first-rate man may be obtained for that chair, one individual has promised £250 a year for five years towards the endowment of that one chair. This is not the place to state what further additions might be profitably made to Owen's College, as a first-class scientific institution. We have before us the programme of the Royal Dublin College of Science, which may fairly serve as a guide to Owen's College and to other similar institutions. But, I think, no one can deny that Manchester would be an admirable centre of instruction, and that the exertions of the men of Manchester deserve to be recognised by the State. Now, it is important that the schools which we are to establish must be suited to the various localities, and must not only be suited to the various localities, but must be suited to the various classes of society whom they are to benefit. I may mention the mining school at Wigan. I believe that that school is now in danger of being closed, owing to the death of a gentleman who was its chief support. But, even if that school were continued, it would have made very little impression on mining industry, and for this reason, that it is simply a night school, and not a school in which those for whom it was chiefly designed, that is to say the overmen or foremen of mines, could receive systematic instruction in science. Evening schools are all very well, but it is not to be expected that a man who has been working underground for six or eight hours in the day, should come up, change his clothes, and work afresh at severe intellectual labour, in order to acquire the education which is necessary to constitute a good mining foreman. We find, on the contrary, that in Westphalia, where coal mining is carried on probably with more success than in any other district on the Continent, a mining school of a very different character is established. What they do there is this—if a man working underground has shown superior aptitude, they take him out of the pit and send him to school for two years; they teach him surveying, the elements of mathematics, the chemistry of the substances with which he has to deal, and they fit him in every respect not only to direct, but also to be an example to the miners out of whose ranks he has been taken. These men form a link between the workmen and the technical engineer, a link which with us is entirely wanting, because our foremen are entirely uninstructed. This is another example of the kind of school which we require, and I believe that if such a school were established it would receive an amount of assistance from the mine owners in the locality which they do not think fit to grant to mere evening instruction. I have said that it is desirable that we should found special institutions, or that we should encourage those which devote themselves especially to technical instruction. Dr. Lyon Playfair, in his admirable speech, alluded to the University of Berlin. But the University of Berlin, although it is a great school, is not the school to which the future manufacturers and directors of works in Germany resort. The schools to which they resort are such schools as those at Carlsruhe, Stuttgard, &c. These are special schools; and I feel convinced that unless we establish special schools of various grades we shall not accomplish all that is wanted. I think that we have advantages

over foreign nations in this respect, that we have means of combining science with practice, which, in many instances, are wanting abroad. That brings me to this point, namely, that we have no occasion in this country to adopt the plan which was originated many years ago abroad—but which I think would not now be adopted abroad if they had to begin *de novo*—namely, that of establishing workshops in the schools. We do not require to do that, but we require to bring the school into contact with the workshop, and to establish schools in different localities, so that young men may have the opportunity of becoming both practically and theoretically acquainted with their future employment.

The Rev. A. J. D. D'Orsey said the public schools and grammar schools had been so frequently alluded to in the course of the discussion that perhaps the Conference would bear with him—a practical schoolmaster of 20 years' experience—if he talked, not of theories, but of what had been done in a school in Glasgow between the years 1834 and 1854. On his appointment as English master to that school—and an English master in a Scotch grammar school did not mean a ruler of copies and a teacher of A B C, but a man who is supposed to be capable of giving somewhat higher instruction than that —he thought it his duty to make himself acquainted with what was doing in foreign lands; and what Mr. Samuelson had done as a manufacturer he (Mr. D'Orsey) had felt it his duty to do as a schoolmaster. He visited the schools in Germany, and saw that there words did not constitute the sole or chief knowledge of a school. He found that words, ideas, and things were associated, and that whereas an English schoolboy would be very much puzzled indeed to tell the size of a room, a German boy would do it at once; that whereas an English boy, give him a sheet of paper, would feel himself sorely perplexed to draw a plan of England, a German boy would be able to do it without any difficulty. In most schools abroad there were not simply pictures, but there were objects themselves. A boy would know a gallon, a quart, and a pint measure, and what a gallon, a quart, or a pint really was. Coming back from Germany with some of this information, he tried to introduce it into the High School of Glasgow. Of course, being a novelty, it was abused but adopted. One individual had said, "What is this that this man is about with our boys? Here is a man that we pay to teach us the English language, and he is bringing scraps of chemistry, that have nothing to do with the English language." He (Mr. D'Orsey) replied, "It has a great deal to do with the English language; you must know what the thing is—the idea—and the word is to express that idea; and until you know that, you have no proper knowledge of what science really means." Further, he thought it well to have books that would convey this knowledge. The Messrs. Chambers at that time brought out an elementary scientific book, which he found very useful. There must be an alphabet of science; there must be preliminary steps before a further advance could be made. The want of this practical teaching it was that rendered our primary schools so inefficient. It was a rare thing to find anything like a practical use of the black-board and the chalk. He formed, by the assistance of the boys themselves, a little museum, where he introduced some simple chemical apparatus, and he showed them things, partly as an amusement, and partly as laying the foundation of science. Moreover, being in the centre of a vast manufacturing population, he took the boys every Saturday to the workshop, to see there in operation what they had been reading of in the school. Some of the boys were in Parliament, others high in office, and others distinguished engineers. Had the system which he had thus pursued towards these boys hindered them in obtaining knowledge? Certainly not. One of them at the present moment held a fellowship at Oxford; and another who went to Woolwich obtained a sword and a medal. He was in a position to prove that proper instruction in science did not at all hinder literary progress, but, on the contrary, promoted it. He was no advocate for a diminution of instruction in language, but he held that language was better taught when associated with science; and instead of the masters of our public schools saying, "You interfere with our classical knowledge," he said, with reference to the few who were opposed to his system, "Give it a fair trial, and you will find that no such results as you apprehend will ensue." He could point to the City of London School, and other establishments of a similar kind, where many branches of knowledge were taught, in addition to Latin and Greek. That school, five years ago, had the distinguished honour of one of its scholars taking the distinction of senior classic, and another that of senior wrangler.

The Right Hon. H. A. Bruce, M.P., said—I have listened with great pleasure to the speaker who has just addressed you with so much good sense and sound wisdom. I think we may assume such general propositions, as the importance of teaching the sciences as a necessary part of education, and may proceed to consider how the necessary means of education can be supplied, and how education, from the highest to the lowest, can be promoted in the most efficient manner. The resolution embraces all these points, and I think the meeting will be of opinion, after what they have heard, that hard work indeed is cut out for those whose duty it is to give practical effect to these resolutions. Not only will there be practical difficulties of all sorts, such as Earl Russell has alluded to, in making the existing system dovetail with the improvements which we hope to introduce, but we shall be met with questions of principle which are not, perhaps, as strongly debated in an assembly like this as they will be in an assembly like the House of Commons. However, I will assume that the national will is already sufficiently decided to carry some really useful educational measure through Parliament. With respect to the universities, there seems to be a growing opinion throughout the country that they should not only modify their studies, but that they should encourage, by admitting to their highest rewards, those who have distinguished themselves in other branches than classics and mathematics; so much I will assume. The next question I look upon as the most important one, and that is, how to improve our middle-class education. Here we have before us the subject divided into two. How shall we provide for our middle classes the means of fitting them for the highest education which the university can give; or, if they are unable to proceed to the university, of fitting them with sufficient education to carry them through life. For the solution of this question I look very much indeed to the forthcoming report upon education from the commission which is now sitting. I think we are hardly in a position fully to discuss this question without knowing the facts which that report will communicate to us, and the recommendations which the gentlemen upon that commission will make. I do not hesitate to say that whilst I agree with Mr. Dixon in looking to government for aid, I do look to the proper use of the great endowments of this country as a means of solving the greatest part of this difficulty. I am not altogether of opinion that government should so far take the initiative as to provide at once the funds and means for founding technical schools in Leeds, Birmingham, and other towns, but I think it would be their part at once to announce that they would be ready to give considerable assistance to any large town that would undertake that task, and thus to assist the extension of institutions like Owen's College, which have already met with great success, further action being limited for want of means. We want good middle-class schools, at which the middle classes can on moderate terms be educated in all those branches of knowledge which we all know to be essential. The question is how are funds to be provided for that purpose. I think that existing endowments furnish the means. I would ask those who object to the

transfer of local endowments to remember how much circumstances have changed since those endowments were originally made. Let us remark a most important change, which may be called the migration of our population. During the last census there has been a diminution of the agricultural population. If we wish to do good to the descendants for whom these endowments were founded in the rural districts, we must follow them into our large towns. I believe that a good use of those endowments would furnish us with very nearly a sufficient number of schools in all our great centres of population; and combining with this the action of Government in founding a few great schools at a few great centres, as model schools, we shall have in a great degree solved the difficulty with regard to middle-class instruction. I then come to the assistance that the State can give to the instruction of the working classes. Now, I fully agree with those who say that, great as have been our voluntary efforts and their success, still that success has only been partial, and we have no reason to believe that it will ever be complete. There are districts so circumstanced that success under the voluntary system really seems impossible. It is high time, therefore, if it has become the national conviction, that some steps should be taken to remedy the evil, and the only way out of it is by enabling every locality to tax itself, and, not only so, but ultimately compelling it to do so. Then comes the question, To what purpose should these national funds be applied—merely to educate children in the merest elementary knowledge, or to confer upon them such an increased amount of knowledge as will enable them to avail themselves of the superior instruction which is given in the science classes, and also to avail themselves of those endowments which will enable them to gain scholarships, and advance from the middle-class schools to the universities, and so enable the country to enjoy the benefit of the special talents with which individual children in all classes are frequently endowed? Now, the effect of the revised code on our middle-class schools has been in many respects excellent. It has secured the thorough teaching of what is absolutely necessary to all classes of our children, but it has undoubtedly—it cannot be denied—had the effect of rather reducing the amount of education in the upper branches. I saw with great pleasure, during the last session of Parliament, that Mr. Corry, then Vice-President of the Committee of the Privy Council on Education, said something should be done to remedy that defect. I ventured to express a doubt whether the encouragement which has been hitherto given in this respect was sufficient. There is nothing like practical proof. I am furnished with this practical proof, and, as an example of this sort impresses itself more strongly than any general proposition, I will state what occurred in my own school with respect to this particular subject. It is a very large one, but it is in a colliery district, where the temptations to leave school are very great, inasmuch as large wages can be earned at a very early age. I was anxious that the children should be instructed in grammar, geography, and history, and I therefore directed the master to do his best so to instruct them, and to send up as many pupils as were fitted for examination in those subjects. The Minute of Council prescribed these conditions—that one-fifth of the children in average attendance should be presented, and that three-fourths of those should pass, or no grant should be made. The number of my boys in average attendance was 198, out of a number exceeding 300 on the books. It was my business, therefore, to present 40 children, but, unfortunately, by an accident, only 39 could be presented. Of those 39, 30 passed, and I fell short of the prescribed condition by one, and the Committee, interpreting their rule strictly—I am not at all quarrelling with the justness of their act—refused me any grant. I must say, however, that I was greatly consoled when I found that all I could have earned under that Minute of Council would have been 40s. However well meant such an effort to encourage superior instruction must be, in a pecuniary sense it is useless. This standard is called the 7th standard, including the examination in geography and history. We must, however, have an eighth standard, which must provide for the subjects of physics and natural philosophy, so as to enable children when they leave school to take advantage of our scientific schools. Now, how is this to be done? It can only be done by keeping children a sufficient time at school. That point has come very strongly upon me. It is no use having an eighth standard if children do not remain at school till their 14th year at least, and when we talk of the number of children attending our schools, we forget the early age at which they come to our schools. I have, at my school, between 30 and 40 children under three years of age. In Prussia, when the educational census is taken, it is of the population at school—at the primary school from 5 to 14. A child emerging from those schools may attend the scientific classes with the certainty of profit. Unless we take some effective steps, either by offering temptations in the shape of rewards, which are not without their effect, or by introducing a system of compulsory attendance at school, up to a certain age, it would be useless to talk of giving the children advanced instruction, and without that our science classes will be useless. I am glad to see, from the Report of the Committee of Council, that there has been, in the last year, an increase in the number attending the science schools, from, 6,000 up to 10,000. But what is that? In the similar schools in France, according to Mr. Samuelson's statement, you have 268,000 children attending schools quite as good, if not better, than our schools. The City of Paris alone gives £200,000 every year; and wherever you see any account of the sums raised for education, you find everywhere the local authorities contributing large sums, which in this country are altogether wanting. The local contributions will bring local interest. We shall have a larger number of persons interesting themselves in this question. Education will have a higher value; and it is only when we have it so diffused and locally supported that the mind of the country will be so thoroughly penetrated with the importance of education, that we shall have all our schools filled and raised to that degree of efficiency which we all hope to see them reach. I will add no more at present. I have endeavoured to indicate, although very generally, what I believe to be the main object — the improvement of our middle-class schools. I believe that we only want a strong expression of the public will in a proper manner, to secure to this country the immense advantages of developing the natural power of its people in a manner equal to that which is done on the Continent.

Mr. C. S. Roundell, after approving the resolutions before the conference, which seemed to him to express the true principle of all educational progress, proceeded to say that, as a Fellow of one of the Oxford Colleges, he would endeavour to tell them what the University of Oxford had, within the last few years, done in the interest of natural science. The Universities of the country were not stagnant but moving bodies—bodies which were anxious to do all in their power to promote the highest interests of education. As regards the University of Oxford, the light which now pervaded that place was traceable, in his opinion, to that memorable Commission issued by Earl Russell fifteen years ago, the work of which was carried out by the Act of 1854, under the auspices of Mr. Gladstone. What had they been enabled to do for natural science under the legislation of 1854? He thought he might say that every College, or almost every College in Oxford, had entered in its ordinances a provision—not a compulsory one, but a direction almost equivalent to an injunction—that in awarding its prizes each college is to have regard, from time to time, to excellence in the various branches of study—not to confine itself to one. He was a Fellow of the oldest College at Oxford (Merton), and he hoped he might be allowed to say that

that College was the first to offer for public competition one of their fellowships for excellence in natural science alone. In his opinion little or nothing would be done for natural science in the Universities until the Colleges awarded something for the encouragement of art and science, not only in the way of fellowships, but also in the offer of scholarships and exhibitions. He hoped they might look for considerable encouragement being given in this way. The resolution affirmed that the study of natural science and art ought to be put on an equal footing with other studies. He thought, however, that at the University their first duty was to do nothing to degrade the University standard. Let him not be misunderstood, he was not now speaking as one wedded to the classical system. He had got beyond that. He was quite ready to adopt those principles which had been expressed, as Dr. Playfair had said, in a late work, "Essays on a Liberal Education," but he thought that our first consideration must be to maintain the standard. Those who wished to see natural science flourish at the Universities should consider most carefully how they could do that consistently with the duty of maintaining the high standard of university education. He believed that there were certain branches of science which were merely mechanical, and did not contain within them the true educational elements. Therefore he said, above all things, they must be careful, however liberal they were, that they did nothing to degrade the university standard.

Earl Granville said—I feel that there is a great practical object in this meeting. I think the twofold object is on the one hand to express what public opinion is on this great subject of education, and on the other hand to stimulate that public opinion. Lord Russell, in delivering his speech (and I am sure, notwithstanding his long and laborious life, and all his great political achievements, one of the most satisfactory reminiscences he can have is looking back at his consistent labour in the cause of education) stated, and, I thought, with sound judgment, that he preferred leaving it to Dr. Playfair, who is practically acquainted with the whole subject, to introduce to your notice the first resolution. Any diffidence that Lord Russell feels must be felt much more strongly by myself. I think that we, who are in Parliament, shall have opportunities enough of pressing this subject upon both branches of the legislature. I trust that the House of Lords will take a very large and comprehensive view of this question; and I have no doubt that a little discussion there will be necessary as well as in the House of Commons. I certainly hope that my noble friend himself will be obliged to "struggle" there, and I am certain that he will "emerge" from the strife in the most satisfactory manner; but what I do think of the greatest importance is that the gentlemen present, representing so many interests, should have the opportunity of speaking shortly and to the point, with the purpose of influencing not only public opinion, but also the government upon this subject. I have read this morning, with the greatest satisfaction, that portion of Lord Stanley's speech at Bristol—Lord Stanley being himself a most liberal and enlightened friend of education—to the effect that the government are not afraid of this subject, and that they see their way to the introduction of a large, wise, and well-considered measure. Now, I think it of the greatest possible importance, in order to maintain them in that good disposition, and to keep them up to that particular epithet of "large," that men representing the intellectual portion of the public should express their opinions freely on this question. There are only one or two points upon which I should just like to touch. The first is with regard to the universities, public schools, and other existing educational institutions. I believe Mr. Samuelson said, that what is most satisfactory in this respect is, that some move has been made, and that it is to be hoped that further improvements will be made without any compulsion. This can only be done by the influence of public opinion, and I believe that the public opinion which has been expressed this afternoon will contribute to that end. There has always been a great deal of "fashion" in the modes of education. Those fashions have varied at different times. There are some fashions that have existed, from very early times, which perhaps are getting a little worn-out, and which perhaps might be renewed with advantage. But no doubt the fashions set by such distinguished bodies as universities in this country, influence enormously public opinion as to what really does constitute the highest class of education, besides their practical effect upon schools. I think it of the utmost importance that science should hold its proper position in the universities, but I wish it to be clearly understood that those who take that view, at the same time hold to the fullest extent that science properly taught is one of the best means possible of educating the best faculties of the human mind. I entirely agree with what was said so well by the last speaker, namely, that we ought not to lower the standard of our university education; on the contrary, I want to maintain it as much as possible; but I say, that giving these most important subjects their proper share and chance in the race, is the best way of bringing up university education to the highest possible point. I was so glad to hear one remark made by my noble friend, Lord Russell, with regard to the practice of Harrow School. It was certainly of some advantage that they should introduce scientific teaching in any way, but when it is left heavily weighted in the race to struggle against cricket, you do not give it a fair chance. Therefore I am delighted to hear that the recent practice at Harrow, as I know it is at Rugby and some other large schools, is to include science in the regular curriculum of the school. I am happy to say that I do not believe there is a single person present who disagrees with the beginning of this resolution "Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere." I will not trouble you upon that point. Then there is an important addition made at the suggestion of Dr. Playfair, "and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government." I believe that this is most important. I believe that in those science schools one of the great difficulties is that they receive their pupils so utterly ignorant of all elementary knowledge that the scientific school becomes a primary institution instead of what it ought to be. I may mention that I received a letter from the late Inspector of Schools, Mr. Norris, who lately visited a school in Staffordshire, and he told me that he found, with regard to reading, writing, and arithmetic, that invariably those subjects were better taught and better learnt, and by a larger number of children, in those schools where the higher class of education was also given. I now come to one of the most important points, and it is the special institutions that are to give the requisite instruction. On this question we are all deeply indebted to Mr. Samuelson for the information he has given us, both to-day and also in that invaluable letter which he forwarded to the Committee of Council. I should be exceedingly alarmed for these technical schools if they were to compete with the great manufactories by their side, and therefore I would not advocate the addition of workshops to them; but what is wanted is that scientific education should be given with reference to each particular trade—the industry of each locality, and then let it be afterwards applied in the great manufactories. It is most important that we should give unanimous assent to that part of this scheme which provides a certain amount of technical education for the different classes of workmen and foremen and those who superintend the whole work of the manufacture.

Professor J. Thorold Rogers (of Oxford) said that although some of the observations that he had intended to address to the meeting had been already anticipated by Mr. Roundell, he still considered it desirable to call

attention to some circumstances that had occurred in the university to which he belonged. It was by no means the case that during the last ten years that university had been careless, for they had founded a vast museum, upon which they had spent a very large amount of money; they had munificently endowed, out of resources obtained from the profits of successful trade (the printing of Bibles and Prayer Books) the professors of physical science, and they had endowed them upon a more liberal scale than the professors of the old studies. They, therefore, he apprehended, could not be charged with being negligent in this respect. The university had no control over colleges or private corporations. The difficulties at Oxford were considerable. First, the expense of an academical education was very great, and the means of obtaining such an education were yearly becoming more and more the sole prerogative of the rich. The poorer class—those persons who might expect to make their way by the study of the physical sciences—had no opportunity of entering the University. The remedy for this state of things was obvious; it was to throw open the universities to such persons as wished to avail themselves of them without being members of any existing college. This, in his opinion, was the only remedy. They might advise, exhort, legislate, do whatever they pleased, but they would never raise their practical students from the half-dozen or the dozen to the hundreds they should be, till the universities were open in the fullest sense of the word. Then another difficulty was the discouragement shown to physical science by the upper classes of society. It could not be lost sight of, that if there had been a real willingness on the part of the noble and wealthy to have physical science studied in this country, the existing state of things would have been reformed long ago. At the present moment the greatest indifference existed amongst the leaders of public opinion towards the study of the sciences to which England owed its greatness. He was the last person in the world to disparage classical literature—and it would be an evil day for the University of Oxford if there were any degradation of the existing standard of education there—but he was of opinion that no alarm need be entertained on this score, for he was sure that the University would take care of its own. They were endeavouring to get rid of the "pass-man," and he would not allude to the classes from which the pass-men came. He only hoped that those reforms, which were absolutely essential towards the development of physical science in the ancient universities, might be initiated in those places and by those influences through which alone they could be effected. With regard to the means for developing scientific teaching in the country schools, he hoped he might be allowed to remark that there was a vast unknown amount of public charities existing which at present did nought but mischief—he alluded to the dole charities such as those of the city in which he lived. The amount of dole charity distributed annually at Oxford amounted to between two and three thousand pounds, and yet in that city there was not a place of education founded between the college and the school. The sooner these charities would be got rid of the better, and the funds applied to the purposes of education. If it were necessary to discover funds throughout the country for carrying out the contemplated educational measures, he thought there were amply sufficient funds existing in the so-called dole or local charities which are at present only a mischief, but which would then become eminently useful.

Professor Liveing (of Cambridge), expressed his cordial assent to the first part of the resolution, but wished to make a few observations upon the latter portion of it. He thought it only fair to the universities, and only a due encouragement to those who had been making strenuous efforts in them, that it should be publicly known what had been done within a comparatively recent period. When he first went to Cambridge—more than twenty years ago—there was no encouragement for physical science in any way. It was true they had a number of professors of physical science, and he did not wish to depreciate what they had done. He did not wish to depreciate Sedgwick, Stokes, and others, but beyond their efforts there was literally nothing done in the University of Cambridge to encourage science. There were no libraries, no examinations in which the knowledge could be tested; and no rewards, except a few very small ones, in respect to medical science. Now, however, a very considerable change had taken place in that respect. The university had made great efforts, not only to increase the number of teachers, and to supply them with better endowments, but it had done a great deal within the last few years in providing libraries and museums. They had now a very good library for natural science, provided by the university, and four others by the different colleges, and as far as practical chemistry was concerned a very good provision had been made. They had also built some very large and convenient museums for other branches of science, and their museums for natural history were second to very few. More than this, the university had long since struggled to put physical science upon a par with other branches of learning, and before 1850—before any parliamentary interference—the University of Cambridge instituted examinations for honours in that department of knowledge. With regard to fellowships, no doubt, as long as they were given for classics and mathematics exclusively, physical science must be under a disadvantage; but a great change had been introdueed even in that direction, for Trinity and St. John's Colleges had publicly announced that they were giving scholarships for proficiency in physical science.

Mr. Edgar Bowring, C.B., in his capacity of Secretary to the Commissioners for the Great Exhibition of 1851, wished to state in a few words what took place in that Commission 15 years ago connected with this question. At the time when those Commissioners found themselves with very large surplus funds in hand they called special attention in their report to the memorials from the leading manufacturing and commercial towns, which indicated clearly the strong feeling entertained by those well entitled to form an opinion upon this subject, of the importance of establishments for instructing those engaged in trade and manufacture in the principles of science and art on which their respective industries depend. While allowing the injustice of the reproach that this country makes no efforts for the promotion of science and art, they confessed that, though a larger amount of money is spent for those objects in this metropolis than perhaps in any country, this is the only country which has not supplied—in any practical or systematic shape—a scientific or artistic instruction to its industrial population, and they pointed out that the Great Exhibition of 1851 had shown that unless this was speedily done this country would run serious risk of losing that position which is now its strength and pride. The recommendations of the Commissioners were divided into two—one relating to the assistance to be given by the Government, and the other on the nature of private institutions, and the Kensington-gore estate had been purchased for the purpose of enabling a central institution to be founded upon it directing the whole movement. Shortly after the publication of this report, Her Majesty invited the assistance of Parliament in advancing education in science and art. In 1855 the French Government bore the highest testimony to the progress made in those branches of our industry relating to art, such as glass, figured silks, and various other fabrics; but, in regard to the manufacturing and mechanical industries, he (Mr. Bowring) was of opinion that England was very rapidly losing that pre-eminent position which she formerly occupied. He considered it of the highest importance that the Government should give every encouragement to the present movement. He believed that building grants for schools would have a favourable influence, and the requisite diagrams and apparatus should also be supplied. He thought the great Exhibitions of the last

few years had been of the greatest value to this country, especially in showing us our deficiencies.

Dr. Crace Calvert, F.R.S., said a residence in Manchester for upwards of twenty years had impressed him with the great want of technical instruction among the operative classes engaged in the staple manufactures of that district. It was necessary that in all our manufacturing districts technical lectures should be given especially adapted to the class of manufactures carried on in those districts, and they ought not to be confined to one branch of the manufacture only, but should embrace all its ramifications. Thus in the calico manufacture there should be lectures not only on printing, but also on the art of design as applied to calico printing, as well as on the laws of colour. That class of education was now thoroughly carried out on the Continent, especially at Rouen, Mulhouse, and Lyons. It was desirable, in this country, that young men who showed aptitude in any speciality connected with manufactures should have the opportunity of acquiring a theoretical as well as practical knowledge bearing upon that particular branch of manufacture. The greatest facilities in this respect were given in the places he had mentioned, and the Government of France had lately established a laboratory in Paris, where young men who had distinguished themselves, and had obtained special rewards for aptitude in these matters, had the opportunity of following gratuitously for two years laboratory manipulation and instruction under the most able men of the country. He expressed a strong desire to see a similar system of technical instruction established in this country; and he felt the more strongly on the subject from the high sense he entertained of the benefits which he had personally derived from the system pursued on the Continent.

Mr. Field (President of the Birmingham Chamber of Commerce) said—Mr. Samuelson had stated that England was not so far behind, but was still maintaining a great supremacy over the manufactures of other countries. He thought the position of the case was about this—that if the English locomotive on the English railroads was at present ahead of the locomotive in other countries, those who inquired into the speed at which the respective locomotives were going would see that should that same speed be continued much longer, the locomotives of other countries would pass by our English locomotive. He proposed to say a few words with regard to the great falling off in the export of English manufactures to the United States, and to show that, in his opinion, the growth of the manufactures which supplanted the English goods in the United States was due, in a great measure, to the better education which the workmen who produced them received. For more than thirty years he had been engaged in exporting manufactures to the United States, and for half that time he had been resident there, in order to give his personal attention to his business on that side of the Atlantic. He had there struggled to maintain the position of English manufactures against those of the United States, which were supplanting ours. In article after article of American manufacture, as it gradually replaced ours, he had endeavoured to retain the position of our trade. He had sent home descriptions of the articles that were required to be manufactured in order to keep possession of the market. The manufactures of the United States had now largely replaced those of Birmingham and the midland districts of England. Whenever an article produced by American manufacturers was brought into the market, in opposition to those which he dealt in, he almost invariably found it was an article more directly suited to the purpose, and as changes were required the article was produced to fit the new demand. Why could we not follow the same system in England? This supplanting of the English manufactures could not be ascribed to protection. The idea was, that we lost our trade because of the enormous duties that were put upon our goods. He could show that was not the explanation of it. In the first place, our goods had been supplanted, not only by the producers of the United States, but also by those of Belgium, France, and Germany—countries whose productions paid as high a duty as ours. Our goods went into the American market under duties varying from 35 to 100 per cent. If it were high duties which kept out our goods, we should find that those on which the highest scale was levied were those which were most kept out. The contrary, however, was the case. Of the goods which we were still able to export from the midland districts, they were largely those which paid extreme duties of 60 to 100 per cent. And what was the reason? The articles which were paying these high duties were those in which there was the least possibility of applying machinery, and the least opportunity of introducing new shapes and patterns—those in which the lowest class of labour was engaged, and this fact sustained the remark he had made, that it was not the protective duties of the United States which kept out our goods, but the increased and growing education and intelligence of their workmen. Besides residing in one of the States for a very long period, he had recently made a journey of several thousand miles through other States, in the course of which he had frequent discussions of this question with those in his own position, more especially with regard to the diminution of the exports of the midland districts. When he was first engaged in the trade the stocks of hardware goods in the United States stores consisted of Birmingham exports, to the extent of about one-third of the whole contents, not allowing for Sheffield; our manufactures in that branch did not now form one-tenth part of the contents of the stores. It had been his growing conviction during the last 30 years that no cause had operated so much in the diminution of our exports to the United States as the superior educational advantages of which the working classes in that country availed themselves with such beneficial results. The workmen of our own country caused an enormous obstacle to the maintenance of the manufacturing exportsof the country by their rules of trade and trade associations. Those trade unions no one would object to in principle; the workmen were as much entitled to form a union among themselves as the masters, to protect themselves against injury to their own position; but that protection should be had in a way morally right in itself, and with due regard to the public interests. When they were asked to produce a new article from a pattern sent over from abroad it was opposed by some trade rule. In the hardware trade there was for the most part piece-work, and the workmen were paid stated prices for certain kinds of work. Every article which differed from that which they formerly made became obnoxious to a higher charge for producing it. At the present moment there was a case so apposite that he would put it before the Conference. The negro labourer of the United States used a hoe for hoeing cotton, which was a huge and heavy tool. Before the emancipation of the slaves they were gradually improving in education and intelligence, and they were able to use tools of a superior character. Since the emancipation the negro would not use the tool which was formerly put into his hands. He now wanted a light, handy tool for his purpose. This was an article with regard to which they were at this juncture in the throes of competition with the American manufacturers. He had applied to a manufacturer in his own district to make the requisite changes in the implement, but, according to the rules of the trade, it would become chargeable with a price for manufacture which would be equal to that for a tool two sizes larger, so that the workman would earn more money per day in making the new tool. Now, the American workman was too wise to do this. If our workman got 5s. per day for manufacturing an article, he demanded a sum which would yield him 7s. per day by the time he got used to making the new article, while the workman of the United States would probably be content with adding sixpence a day to his

earnings under similar circumstances; but our own workmen fell back upon the strength they had got in their rules of trade. This was a great obstacle in the way of introducing the necessary changes in our manufactures. The principal articles now manufactured in and exported by, the United States, consisted of spades, shovels, axes, hoes, farming implements, sewing-machines, &c. All these the United States were exporting to the common markets of the world. In Canada, too, he not only found these more important articles, but many other descriptions of hardware goods of United States manufacture, produced at a cost of 50 per cent. more than those of this country, and yet they were supplanting our own goods in Canada. He would now say a very few words with regard to the schools of the United States. That system generally was pretty well known to those present. The schools were free as the German schools were, and they were divided into primary, grammar, and high schools: that was a general rule throughout the States. In Massachusetts, where the school system was perhaps better carried out than in any other state, the compulsory law was enforced. Mr. Bruce, at the educational conference at Manchester, stated that inquiries had been made into the working of the compulsory system of education in Massachusetts, Saxony, Prussia, and Switzerland, and that wherever it was attempted to be grappled with, it was found there was in reality no compulsion at all: and let him (Mr. Field) add this prediction—that should we introduce compulsory education in England, and should Prussia send over a commissioner to inquire how it was managed, and what were the punishments, he would go back and say there was no compulsion in England. When he (Mr. Field) was in Boston recently, he spent some time with Mr. Philbrick, the superintendent of the public schools of Boston, who informed him that the Compulsory and Truant Law had been 23 years in operation in Massachusetts, the punishment for truancy or absenteeism being a fine not exceeding 20 dols., or committal to a reformatory school for a term not exceeding two years. The number of committals for eleven years, from 1852 to 1862, varied annually from 21 to 81 for truancy, and the punishment in the reformatory school from three months to one year. In Boston four truant officers were appointed, whose duty it was to inquire into absenteeism. Truancy was the chief cause of punishment, and that for absenteeism was seldom required, because there were but few absentees. On looking into the statistics it was found that the class which was most amenable to the punishments of the compulsory law was that of our expatriated fellow countrymen—the English and Irish population of Boston. The school statistics for the year ending July 31st, 1866, showed that in the population of Boston, of about 200,000, the number of children between five and fifteen years of age was 35,225, of whom the number attending public schools was 27,357, and private schools, 4,246, making a total of 31,603, showing that the absence from all schools between five and fifteen from all causes was only about ten per cent., or 3,622. Of those on the books of the schools the average attendance for the year was 93 per cent. He commended these facts to the consideration of those who stood foremost in the movement for compulsory education in this country. They would speedily understand that compulsion came almost to nothing. We, as Anglo-Saxons, ought at least to do what the younger branches of the race had done; and it was impossible that we could longer neglect to adopt a system of education which alone would enable us to maintain our commercial and manufacturing interests among the nations of the earth.

Mr. Hay (Provost of Dundee) begged to offer a few suggestions. He resided in the midst of a large manufacturing population, two-thirds of whom were of the working class, and he had made it his business to ascertain their views on this important subject. He would read the practical views which had been sent to him by the associated trades and workpeople of his town, showing what they considered was required to fit them to compete with the workmen of other nations. He concurred with Mr. Bruce as to the practical means to be taken to secure this object. The statistics of the present working of the Science and Art School in Dundee showed the necessity of some action being taken in this matter. In 1863, the number of pupils attending the Science and Art Department was 3,156; in the next year the number was reduced to 2,315; and in 1865 there were only 1,952 pupils. Another change in the code took place, and such was the effect of it in the instance of Dundee, that the number of pupils this year was only 493, which plainly showed, to his mind, that the present form of government grants to education did not meet the necessities of the working population of the country, and that something more must be done to provide proper institutions for teaching that class of the people in art and science. Mr. Hay then read the following:—

Suggestions on Technical Education by the Working Men's Association of Dundee.

1. Textile Fabrics.—A knowledge of the nature of the fibrous substances, such as flax, jute, hemp, &c., and the best method of treatment during the various processes of manufacture, with the purpose for which each kind is best adapted.

2. The construction of the machinery used in the different branches of industry in the town, the uses of each part, and its adaptability.

3. The Science of Mechanics and Engineering.—To know more about the elasticity of steam; the strength of material required to hold against a given pressure; the amount of power to be expected from a given quantity of coals, &c.; the adaptability of the present land and marine engines, the construction of them, and the strength required in their various parts for a given pressure or power, and the means of testing and ascertaining the same; also the use and adaptability of the mechanical power of the lever, pulley, plane, screw, &c., and the method of calculation suited to each.

4. The proper finishing of textile fabrics; bleaching and dyeing, including a good knowledge of the various chemical compounds used, and the effects of each; the quantities required to produce the different colours suitable to the different kinds of fabrics, and the method of application. Also, in regard to the carpet manufacture, the principle of arranging the colours, so as to produce any given pattern; and also the art of designing the patterns.

5. Ship-building.—The method of modelling vessels; and how, from a given model and dimensions, the tonnage can be determined. Also, the strength of the material required for such tonnage; and the best means of constructing to a given model.

6. Architecture.—How to ascertain the strength of beams, rafters, walls, &c., required for given purposes and dimensions; how to resist the lateral pressure of arches, couples, &c. Also, a knowledge of the orders and styles of architecture; how best to supply a healthful quantity of air without causing draughts; and a knowledge of sculpture, so as to suit the various classes of buildings.

7. That the best mode of instructing the people in these acquirements would be to establish an institution or college in Dundee, for teaching these various branches of knowledge, so endowed and managed as to suit the great body of the working classes of the town, and so arranged that they could take advantage of it without infringing on their limited means.

The Association are of opinion that if some such system were adopted in our large manufacturing towns, the country would soon, in every branch of its trade, successfully compete with all other markets on the Continent; that, in addition to that, they believe that the more refined taste that would be imparted to working men by such an education would make them desire improved dwellings and greater social comfort, while a higher tone of morality would be infused among them, and destitution, vice, and crime be materially lessened.

The Chairman asked whether, after the discussion that had taken place, it would be convenient that he should now take the sense of the Conference on the first resolution.

Earl Granville remarked that, as many gentlemen had come from long distances to express their views on this subject, it was very desirable they should, as far as possible, have the opportunity of doing so. He, therefore, suggested that the discussion of the first resolution should be now adjourned, and be resumed until a fixed hour on the following day.

Mr. Bruce, M.P., begged to offer the suggestion that the discussion of this first resolution should be resumed on the morrow, and be continued till two o'clock. Probably that would give as much time as was necessary.

Mr. Ayrton, M.P., agreed with the desirableness of adjourning the discussion on this resolution.

After some further conversation, the discussion was adjourned to the following day.

The Conference re-assembled on Friday, 24th January, at 12 o'clock; Wm. Hawes, Esq., F.G.S., Chairman of the Council, in the chair.

The discussion on the first resolution was renewed by

Mr. Harry Chester, who said that, as he had moved in the Council the resolution under which the Conference was assembled, he naturally desired to say a few words before the question was put. Attention had been called to the fact that the first resolution appeared to rest the extension of technical education upon its effects on the interests of Arts, Manufactures, and Commerce. He wished distinctly to state that the Council by no means took a merely commercial view of the question. Those words were used because the Society under whose auspices the Conference had assembled was incorporated for the encouragement of arts, manufactures, and commerce, and it was in defence of these interests that they were entitled to take up the subject of education in the Society; but he hoped a much larger and broader view of the subject was taken by those present. To use the language of a great parliamentary authority, he hoped they looked at it in a "flesh and blood" point of view, and felt a desire to improve and extend the education of the people of this country, not merely because they thought our manufacturers would then be able to carry on their business in a more efficient manner, but because education conferred great benefits on those who received it, and because they desired to do to others what had already been done to themselves. In making these three great demands which the first resolution makes upon the Legislature, the demand for improvement in education in the universities and great schools was put first, because so long as the upper and middle classes of society remained in their present condition of comparative ignorance of the principles of science and art, it was vain to expect that the artisans of the country and the working classes generally could obtain a good technical education. The higher and upper classes being the employers of the lower classes, were the ultimate judges of their labour; and so long as a country gentleman, for instance, knew little or nothing of geology and the principles of mechanics, it was quite impossible to expect that he could be properly served by a skilful bailiff or foreman, and that he would have labourers under him doing their work with a due attention to the demands of science. The same principle was applicable to mines and manufactures. Unless those who are at the head of a concern understood the principles of those sciences upon which the arts in which they were engaged were founded, it was quite in vain to expect that those arts would be carried out in a skilful manner by those under them. The second demand was, "That efficient, &c., everywhere." It was quite ridiculous to think that good technical instruction could be given to people who were ignorant of the simplest rudiments of education. He was not aware whether any gentleman was present representing the mining institution in Cornwall, but a few days ago he received a letter from Mr. Robert Hunt, pointing out how that very useful institution had comparatively failed—how it had been found impossible to give to the working classes the instruction which they desired to receive in the sciences connected with mining, because of the great imperfections of their elementary education. They were not able to read with sufficient facility to master, with any degree of comfort to themselves, the books put before them, and could not write well enough to take notes of the lectures which they heard, nor were they sufficiently familiar with arithmetic to make the necessary calculations of the percentages of metals in the different ores. And this which was true of the mining population was true of the working classes generally. At the last annual conference of the representatives of Institutions in connection with the Society of Arts, he proposed for discussion the question whether the means of primary education at present at the command of the working classes were sufficient to enable them to profit by the secondary instruction they desired to receive in the mechanics' and similar Institutes. A very considerable number of the representatives of such bodies were present from all parts of the United Kingdom, and the response was unanimous that at present the means of primary education were altogether deficient. Having expressed a desire that primary education should be extended and improved, the resolution went on to ask for efficient secondary instruction, facilities for which were altogether wanting in this country. The resolution asked that we should have what exists in other countries, good colleges or schools of technical instruction. He did not think a numerous body like the Conference could discuss the details of this question, but it must confine itself to general principles, and the details should be very carefully and deliberately considered, lest the scheme should be started on a wrong basis, and more harm than good be effected. He did not agree with Mr. Dixon, that it was desirable that those colleges should be originated by Government in the great towns. That would be rather like planting trees without roots. But where there was a local desire and determination to establish a school, Government ought to express its willingness to co-operate liberally with local efforts. When Government expressed that willingness, then it must be for the different localities to come forward and say to Government "We want such and such colleges in a particular neighbourhood; we are prepared to do our part to establish and maintain them; but you must give us very liberal assistance in so doing."

Mr. Acland, M.P., said, he took the liberty in the committee room yesterday, to request the insertion of the word "secondary" after "primary" in the second branch of the resolution. He wished first to say what he meant by secondary instruction. Contrasting it with primary instruction, he thought the best way to define it was, to look at the time boys were likely to stay at school. On the Continent in primary schools it was not uncommon, and he believed in several countries it was the rule, that scholars should remain till fourteen. Practically, in England, primary education was generally limited by the age of twelve or thirteen. Secondary education in England was therefore best defined as that kind of education which a boy obtained who continued at school beyond the age of twelve or thirteen. He would not say a word about secondary education up to sixteen or eighteen, still less would he touch upon the general question of university education, which was discussed so much yesterday. His chief point was secondary education for aspiring artisans, or for the shop keepers with small capital, who must begin to earn their living about the age of fourteen, or a little later. In the very remarkable letter of Mr. Samuelson, already referred to, he stated that the workman on the Continent owed his position above all to two things—the knowledge of elementary mathematics and drawing. Under the operation of the revised code, which he (Mr. Acland) did not intend to attack, all promoters of education were well aware that the advantage of learning the "three r's" correctly was purchased somewhat dearly. It was purchased partly by the exclusion of subjects of secondary education, which might in many cases be introduced, and also by a certain rigid stereotyped system, which had a tendency to increase the fault of the English artisan, by making his mind wooden instead of living. It became, therefore, more important that this country should devote itself in earnest to give a sound fundamental education to the children of those artisans who would save from their own enjoyments in order to give their children the blessings of an upward-looking education. Time would not permit him to refer in detail to a remarkable document put into his hand yesterday, the Report of the French Commission on Technical Education. He would only say generally that he observed that, in speaking of England, they said that one of our great difficulties in the advance of technical instruction was the want of fundamental training as the basis of scientific knowledge. He would now pro-

ceed to state two or three facts, which he had endeavoured to collect for the meeting — his object being to give a stimulus to the English people in the matter under consideration. There were thirteen towns in England having about 100,000 population or more, and in those towns there were two and a half millions of people. Most of them had some kind of secondary or grammar school, but the entire number of scholars in those schools was about fifteen hundred, or rather less. Of those there were only two hundred who were learning any physical science whatever; and even with regard to those who were learning it, he thought it might be very doubtful what kind of science it was, and how far it deserved the name. Of the fifteen hundred, only seven hundred and fifty were learning any mathematics, meaning by mathematics something more than ordinary arithmetic; and of the seven hundred and fifty about two hundred and fifty were in the Manchester school, leaving for the other twelve towns about five hundred scholars. Science was taught to any practical purpose in only two towns—Sheffield and Leeds; and, if he recollected rightly, the total number of boys in the lower grade of education at Manchester below the classical school, in a school that had an endowment of 2,000 a-year, did not exceed fifty. There were twenty-two manufacturing and mining towns of less than 100,000 and over 20,000 population, containing in the agregate 1,000,000 persons, and in those towns there were rather less than 1,500 scholars, little more than three hundred of whom learned any mathematics, and only about fifty, in four schools, were learning any natural science. With regard to the metropolis, there could be no doubt that the great deficiency of London in education was the almost total want of schools of the lower grade of secondary instruction for the upper artisans and the shopkeepers of moderate capital. And to prove that it was not a deficiency owing to the want of demand, at one of the very few lower grade secondary schools in London, there were a little while ago three hundred boys waiting to be admitted, the terms of the school being, he believed, something under £4 a-year, showing, beyond doubt, that if these schools were established they would be largely sought after by the class in question.

Mr. Ayrton, M.P., said that another school had been established, in which the scholars who were waiting had been admitted, and it was as full as the first school.

Mr. Acland—In reference to the central coalfield of England, omitting the extreme north and a portion of the lower end, there were, in 1861, in the west midland division of the Registrar-General, in the north western, including Cheshire and Lancashire, and in Yorkshire, a population exceeding seven and a half millions. There should be at least seventy thousand boys in secondary schools; there were in the endowed grammar schools, the only existing secondary schools of a public nature, fewer than fourteen thousand, and that number included many who were receiving a much worse elementary education than if they were in National and British schools. There were 181 towns in these three divisions, and 76 of them had not any public or secondary school of any kind whatever. By "public" he meant not a proprietary nor a private school; and he wished to point out why he drew the distinction. With regard to the gentry of the country, professional men, and large manufacturers, no doubt a first-class education was to be had in many of the proprietary schools in England; and one of the strong arguments for reviving the grammar school system was, that schools with very large endowments and very eminent masters were not filled, because they were not conducted on a system that met the taste of the present day. He was not attacking proprietary nor private schools, because there was not the slightest doubt that many of the private schools in England were admirably discharging a duty which no public school could discharge so efficiently in the same manner, and for the same class of scholars; but with regard to the class to which he desired to confine the remark—the lower grade of the middle class—he begged to impress one especial difficulty upon the meeting. There were a great number of small private schools, which earned a most precarious living amongst the lower middle class, but the practical working of which was very unsatisfactory, and if they became good enough to be really popular, immediately up went the charges, and they ceased to be schools for the class for which they started. Therefore it was absolutely essential that the legislature, and the educated classes of England who inspired the legislature, should apply their minds to establish public schools, under public control, for the lower grade of the middle class. Otherwise, if there were established by voluntary agency the best school that ever was established in a great town, and determined to charge £2 or £3 a year, inevitably the charges would go up, and pass the limit which the poorer classes were able to pay. It became a sort of speculation. The original founders passed away, or it might be a private undertaking from the commencement. They got into difficulties, or they were anxious to improve their teaching; in short, every kind of motive, including the best, influenced the promoters of these schools, and unless the schools were under legal restraint, they would be sure to pass the limit of charges to which he had referred.

The Hon. Auberon Herbert said it seemed to him of very great importance that they should all combine, if possible, in what they asked from the Government. Nothing afforded the Government a better excuse for not acting in this matter than the fact that so many different things were asked. If some asked that Government should take the initiative, some that it should help local effort, and others made claims of a different kind, the Government at once felt justified in taking no action upon the matter. The more the subject was considered the more unadvisable it appeared that Government should take the initiative, and the more preferable that it should assist local effort. The reasons for that conclusion were these. The Government had never had a regular educational department. They all knew how that department grew, from small beginnings; and the Government had, at present, no knowledge upon technical education at its command; indeed, he believed the opinion of the country was far in advance of the Government. It was our manufacturers, whose interest it was, that were the only persons fitted to deal with it. No opinion, however, had yet been definitely formed in the country as to what was the best technical education. If the opinions of twenty persons in the room were asked, he would venture to say that twenty different opinions would be given; and he could also venture to say that if any one particular method were taken, and stereotyped in the country at the present moment, with our insufficient knowledge upon the matter, our attention having been so lately turned to such an important subject, it would do more harm than good. Local effort should be encouraged in such a way as to test different systems. Any person who came forward with sufficient belief in his own system, within certain reasonable limits, of course, and any towns possessing the rating power, should hereafter be allowed to follow their own system, and the Government should help them liberally. Should the Bill, which formed the subject of discussion the other day at Manchester, hereafter become law, it would allow a great deal of money, which had been applied by benevolent persons, to be free, and those persons who had originally devoted a great deal of money to primary education would, by having the burden taken off their shoulders, be able, by the Bill, which gave the power of rating, to turn those resources to this higher kind of education. He thought, therefore, there would be found in our large towns plenty of resources which would be willingly turned to this object. With regard to secondary or intermediate schools, he believed Dr. Watts, who was well known in Manchester, had proposed that there should be schools of an intermediate kind above the primary

schools, into which boys, on passing an examination, should be free to enter. To a certain degree this corresponded with the American system, where one school formed a step above the other, and the boys who had made the best use of their time in the school below, passed through an examination to the schools above. With regard to primary schools, he thought Mr. Acland had exactly hit that which was most wanted for them. It would be a very simple thing to ask of the Government that they should add drawing to the "three r's," the effect of which would be very useful in giving accuracy to the hand and eye, and bringing the mind to see that there was a thing beyond the idea. And there was this also in its favour, that it had been largely adopted in France. He found, in looking back to a report of Mr. Matthew Arnold, that taking by hazard forty-two commercial schools out of the Haute Garonne, drawing was taught in twenty-three, and geometry in twenty-seven; and that artistic character that pervades the whole of the French people, that power of observation, and the power of feeling what is beautiful, might very probably be traceable in part to their education in drawing.

Mr. Hyde Clarke wished to refer to a remark made on the previous day by a gentleman who called the attention of the conference to the experience of fifteen years ago, when the present question was said to be in the same state as now. He (Mr. Clarke) could look back thirty years, and on one side of the room he saw a few of his remaining colleagues of that time, amongst them Mr. George Foggo, who was one of the committee for agitating the subject then; and on the other side he saw the noble earl, then Lord John Russell, who thirty years ago, on the part of the Government, promised a settlement of this very question. He wished, therefore, to urge upon the conference the desirability of its members not meeting again either fifteen or thirty years hence for the prosecution of this subject, but that they should profit by the experience of the past. A good deal had hitherto been done without any results, and if they wished to avoid the errors of the past, they must profit by its experience. He would merely endeavour to enforce the remark of the last speaker, with regard to drawing, as an essential part of elementary instruction. He held that it should be taught in the beginning with reading and writing, as a means of developing the faculties of the children.

Mr. Brocklehurst (of Macclesfield) said that his own town had suffered like many other towns for want of technical education among the working classes, and he felt the necessity of increasing the amount of education in science and art amongst all classes. They were very much indebted to the Society of Arts for inviting them to attend this Conference. As Chairman of the Committee for Technical Instruction connected with the Chamber of Commerce at Macclesfield, he ventured to say that, as far as their Committee was concerned, and the feeling generally in Macclesfield, they would readily adopt all the resolutions proposed to the meeting. He was very happy to hear that the Government had taken up the subject, and proposed to introduce a large and well-considered measure. He had felt very strongly for some years upon the subject of the encouragement of science in the universities, which was spoken of yesterday, and was glad that some move in the right direction had been made there. Very little had been said as to the way the idea was to be carried out, but with reference to the appropriation of money which had been devoted to the teaching of the dead languages and mathematics, it was a question in his mind whether that could fairly be done. At Macclesfield there was a Mechanics' Institution, and also a school of art, and he regretted that in 1864, when the Government grant was doing a great deal of good amongst the working classes in the school of art, the grant was reduced from £300 a year to an almost nominal amount. They had been going back ever since. With reference to compulsory education, he considered it already existed, magistrates now having the power to send ignorant and destitute children to school.

Professor Huxley, F.R.S., said he ventured to think that the first part of the resolution might well receive some modification. He entertained no doubt as to the position which science ought to take in general education, as the groundwork of all education worthy of the name; not merely instruction in the facts of science, but discipline in the methods of science. If the Conference, or those gentlemen interested in commercial or manufacturing pursuits, imagined that any good would be attained for their ultimate objects by merely teaching boys those branches of science which immediately applied to their particular trades or callings, and which were merely the scum and top surface of science, they were much mistaken. The minds of the young should be imbued with scientific methods and with scientific principles—less than this would eventuate in a miserable failure. It appeared to him, therefore, that when the Conference asked that "instruction in science and art should be, &c., &c.," it virtually made an admission which was an exceedingly unwise one, and one that in the long-run defeated its own objects. If the conference was not prepared to say that practical training in the methods of science formed *the most* important part of the basis of the proposed education, he thought it had not fairly comprehended what it had to do. He was not intending to depreciate the value of other studies, least of all the value of instruction in art; but he wished to urge in the strongest terms that instruction in art and literature, valuable and important as they were, both for the training of the mind and fitting men for particular offices, were altogether subordinate and should be secondary to training in science and scientific methods; and he should be quite unable to agree to a resolution which, in his judgment, put science on a footing which was entirely unworthy of it. The second point upon which he wished to offer a remark was, "That efficient means of primary instruction, &c., &c." He did not propose to offer the slightest objection to the spirit of this resolution, but thought it highly desirable that there should be some understanding that this was not a new thing; but, to the credit of the Government, was a thing already in existence. A speaker behind him (Mr. Herbert) made some remarks upon the propriety of looking to people themselves for exertion in regard to education. In principle he (Professor Huxley) heartily and entirely agreed with him. There was nothing which he had fought for all his life so much, whenever he had anything to do with such matters, as for the principle of spontaneous action, and for the avoidance and putting down, in any way, of everything that can be called over-legislation—the interference of Government in any matters, except matters of police and the like; and he heartily wished the facts of the case would enable him to support the views Mr. Herbert took; but as he (Professor Huxley) was supposed to know something of the case, occupying as he did the post of Government Examiner in the department of Science and Art, and being connected with a great technical school in this country, the School of Mines, in Jermyn-street, he believed you could not look to the people of this country to do anything. In consequence of the utterly defective education of the people, they did not know what was good for them, and had not the slightest conception of the methods that should be taken to improve their present ignorant and imperfect condition. He would take as an illustration the School of Mines. Was that established by the general manufacturing interest of this country? Did anybody imagine the manufacturing and mining interest of this country had sufficient intelligence to see that the great thing wanting was scientific instruction to be given to its artisans and inferior *employés?* That school was established by the energy and determination of a single man, his old chief, Sir Henry De La Beche, who saw the importance of it; "stumped" the manufacturing interest, and persuaded

the manufacturers to join him. He (Prof. Huxley) very much doubted whether even now any considerable portion of them had anything like a clear idea of what they wanted. It was perfectly certain, at any rate, that the mining interest had not taken the advantage of the college that they might have done. It did not occur to them to have their coal viewers and their mining agents instructed in anything more than a mere rule of thumb. He could not say the smallness of the attendance arose from any defect in the teaching—and he could the more readily say this because his teaching did not particularly affect these persons—for there were not fitter and more able men in the country than his colleagues. It was because the great mass of the manufacturing interest did not, even at the present moment, understand that such instruction in the groundwork of technical knowledge was what they wanted to prevent their manufactures from going to ruin. He thought it was very creditable to the Government that it had already spontaneously given encouragement to scientific education in this and in other instances. He referred to the system set on foot in this country some years ago, in connection with the Department of Science and Art. It had a very small beginning. It resulted from a minute by the minister of the day acting *proprio motu*. He did not think that even the House of Commons was consulted; certainly no action was brought to bear on the minister. Payments were proposed to be made to the students in primary schools who showed, by passing primary examinations, that they had received a certain amount of instruction in science. At first there were very few persons examined, but by degrees the number had grown, until last year he had between six and seven hundred papers—fair average papers; and he believed his chemical colleague had twelve or thirteen hundred. Another very important matter was promotion for clever boys. The only body doing anything for clever boys in scientific matters was still, he was sorry to say, the Government; and any such boy in the country, whatever his condition, provided he was not too rich, on passing successfully the examination of the Department of Science and Art, got not only the ornament of a medal, but a solid exhibition, the payment of which was contingent entirely upon his continuing his studies, which he might do at the School of Mines. He might there pass through his curriculum for three years, and at the end of that time, if a clever fellow, he was certain to get a solid and valuable appointment. He believed nobody else said to a boy—"Boy of the dust, work hard, pass a good examination, and a good appointment will be open to you." Until the country was prepared to say it appreciated the efforts of the Government, we must still confess, to our shame, that Government was far ahead of the people.

Prof. Fleeming Jenkin, F.R.S., thought it was clear, from the previous speeches, that it was necessary to provide scholars as well as professors, and some inducement must be given to young men to enter the classes. It was of no use depending on the public opinion of the country to make them do this. On the principle of the universities giving scholarships and fellowships to successful students, manufacturers should offer employment to the scholars who passed successful examinations, either in the old schools, or the proposed new ones. In his own profession, that of engineering, he would suggest that as the Manchester engineers, for instance, did recognise that a theoretical education might be of advantage to them, they should recognise it in another way, and offer as rewards to the successful candidates the entrance of their works, so that after receiving a certain amount of tuition a clever student should enter as a pupil under some eminent engineer, instead of having to pay a heavy premium, and commence his practical studies in the state of ignorance in which many now enter upon them.

The Rev. Arthur Rigg (of Chester) said that thirty years ago he commenced the work of technical education, and had a number of lathes going at one time, with blacksmiths and carpenters' benches, and a whole range of workshops. He had gained wisdom by experience, and abandoned these, being convinced that workshops in themselves for educational purposes were not wise; they were merely a means of teaching handicraftism, and did not convey any mental instruction. In 1853 he wished to send two of his sons from home, to complete a technical education commenced there; and as upon inquiry throughout the country he could not find a school for them, he sent them to Hanover. The experiment had not been satisfactory, although not altogether a failure. The struggle of thirty years had been to him an up-hill struggle; in no degree, except from private friends, had he met with any encouragement, and he had certainly not met with anything like success. Failures were, however, very instructive lessons, and therefore he was dwelling upon them. The workshop system had been a failure; and if the schemes now proposed were tried under the experimental guidance of localities, they would be failures too. There must be some guiding experienced hand. Another total failure was the attempt to popularize science, and the greater proportion of the present generation would pass away before the ill effects of it would subside. The reason was that there was no mental culture in it. There was no attempt to popularize law, or physic; and he could not help thinking this attempt to popularize science had been a great mistake.

Mr. G. W. Clarke (of the North Cheshire Chamber of Agriculture) had, in connexion with the Society of Arts and societies associated with it, enjoyed the benefit of some of the attempts that had been made to popularize science, and had it not been for those attempts he did not think the present Conference would have been so large, nor (in some instances) so intelligent. He rose to call the attention of the Conference to one department that had not yet received special attention, the department of Agriculture. France was, in that respect, as well as in many others, ahead of us; for it had not only elementary, but advanced schools for practically teaching agriculture and the sciences allied to it. With regard to government action, much had been said against revised codes and departments; but, as a manager of schools, he must confess a great deal of gratitude for the painstaking and patient manner in which the educational department of the State had been carried out by the present and the previous administrations. He thought that if there were a little more consideration on the part of provincial school managers, and a little more attention paid by those whose names were nominally on the list of managers, but who left too much to an over-tasked parochial clergy, we should hear fewer complaints of the government, and see better results under any code that might be instituted. He represented one of those new bodies which had sprung up in consequence of the cattle plague, and which now included many thousands of members, from the highest owner of the soil to the most humble tenant; and he thought this was, perhaps, the greatest opportunity the Society of Arts ever had of spreading its influence through the ramifications of these institutions, and reaching those who had been charged so often with being backward in appreciating the advantages of education, whether technical or primary. He trusted his observations upon this subject would not be lost upon the Conference when they came to select the committee, and that it would include representatives of the chambers of commerce and agriculture and mayors of corporations, and not adopt the fallacy, as it sometimes proved, that the smaller a committee was the better.

Mr. Lucraft said that one of the speakers yesterday had given as a reason why commerce was departing from the country that the working classes could not be induced to alter patterns; but the fact was that it was the manufacturers who liked to work a pattern for years, because they knew they could get a certain profit out of it. He believed that he himself would be a much better workman if

he had a technical education. He agreed to the whole of the resolution, as far as he understood it, and he begged to propose an addition, which would meet a present want. What working men wanted in London and in the centres of the manufacturing districts was a South Kensington Musuem, and he would point out a spot in London where one could be very advantageously placed. It was situated about half-way between Finsbury-square and the Angel at Islington. There were in that district half a million of men, women, and children supported by, more or less, artistic labour; and an institution similar to the one at South Kensington would be extremely useful to working men, if it were erected in such a locality. He believed the reason why the upper classes erred in legislating for working men was because they did not go amongst them to know what they really desired. He thought such a museum as he proposed should contain a collection of specimens of food, for there was no doubt the working classes of the country would be all the better if they had only some means of knowing "what to eat, drink, and avoid." In speaking as he did, he did not wish to be considered as advocating the interests of his own class alone; indeed, he was for doing away with class feelings, and wished the whole people to be considered as one, so that what was done should be done for the benefit of all.

The CHAIRMAN read the amendment, "And that national museums of art manufacture be established in the centres of our manufactories, both in London and the provinces."

Mr. GEORGE GODWIN, F.R.S., seconded the amendment, but observed that it seemed to be so much a matter of detail, that it would be taken up by the committee to be appointed. Perhaps with that explanation Mr. Lucraft would waive his amendment, or would agree to the words "special institutions for technical instruction, and museums adapted, &c., &c."

Mr. LUCRAFT assented.

The addition of the proposed words was then agreed to.

Mr. GEORGE GODWIN said he believed all who had thought upon the subject were of opinion that scarcely anything need be said as to the desirability of the general assertions contained in the resolution. Surely no one wanted to be informed that very great ignorance prevailed out of doors; and no one wanted now to be informed that some means of removing that ignorance were needed. The mode of doing it still remained somewhat a difficulty; but it did not seem to him that could be properly discussed within the terms of the resolution. Within a very few weeks he had been more than ever impressed with the very great want, not of technical instruction only, but of instruction at all throughout the masses of the country. Lord Russell spoke yesterday of the caution which even Galileo showed, and of the desirability that we should follow his example; but that caution did not save Galileo; and he thought it was quite time that now we should almost give up caution, and that those who felt the enormous importance of education should call for it strongly, not by-and-bye, but now. There was no time to wait; and really it was almost nonsense to talk of technical instruction in the extraordinary absence of primary instruction. It had been pointed out that there were means of technical instruction already provided by the Government; but it was of no use giving those means, unless the people were prepared to take advantage of them; and he contended that at present they were not prepared, and that we were bound at this moment to call for the putting aside all the caprices of cliques, and the opinions of sects, and insisting upon every child having education;—that if every child had not a *right* to education, it was the *duty* of every man at least to see that he had it.

Mr. JONES would like to know whether it was intended that the proposed schools should be established by law and supported by Government contributions, as in that case he would object. He was engaged in the management of a voluntary technical institution called the British Horological Institution, and it appeared to him that similar institutions would meet the want that was now felt. He would certainly object to any burden for his particular trade being put upon the nation. He was anxious some movement should take place among the old City companies, and that they should interest themselves as they once did in teaching their apprentices their respective trades.

Mr. MEYER (from Hanover) contrasted the state of education in his own country and in England, and urged upon the conference the importance of persevering in the endeavour to improve our educational condition.

Mr. AYRTON, M.P.—My friend in the chair has asked me to address to you a few remarks, and he has probably done so because this Society has done me the honour to print in its *Journal*, and circulate amongst its members, a letter which I addressed officially two years ago to my noble friend Lord Granville, when President of the Council, in which I suggested three propositions: first, that there ought to be science schools of the highest order in this metropolis; secondly, that they ought to be placed where they are most accessible to those who are likely to resort to them; and thirdly, that the great work of establishing them ought to be carried on by the great endowments, which I thought were a primary fund for that purpose; and I am happy to be able to say that Lord Granville himself, as the President, and my right hon. friend, Mr. Bruce, as the Vice-President of the Council, entirely acquiesced in the view, that those were propositions that ought to be immediately considered practically in Parliament for the purpose of being realised. But they know, and I know, that it did not rest with them or with me to make either the House of Lords or the House of Commons take that course. If it had, instead of being now on the threshold of the subject, we should have been so far advanced in it that we should have in our hands the Act of Parliament to carry it out. However strong your opinions here may be, you cannot conceive the strength of antagonistic opinions elsewhere; and I am sorry to say more especially in Parliament. I think we ought to understand the full extent of the opinions that we have come to maintain. We ought to believe in them, and we ought all to resolve to be apostles of them. Now, I make this assertion, that a man who is well educated in the grammar and literature of his own language, and in science, taken in a full and comprehensive sense, is as well educated for every purpose of life, and for every occupation and pursuit in this country, as the best man that is turned out of either Oxford or Cambridge in Latin and Greek. That I take to be the view held here to-day. Anything short of that will not do. But for this scientific education, which we all desire for thousands and tens of thousands of people, I ask myself in vain, "Where are the masters to teach them?" and that is the most difficult point of this question. You are compelled, therefore, to keep your claims for scientific teaching within certain limits. But what we are bound to claim is this—that, in the universities, such an education as we contend for shall receive the same high consideration, and the same amount of actual reward, as education in Latin and Greek. I deny that this is the case at present. But when I say that, I do not wish to blame the universities, for this simple reason—it is the essence of a university that it must be based upon the schools of the country. There can be no such thing as a university-teaching unless there are schools upon which that university is to proceed, and upon which it is based. At present there are nothing but Latin and Greek schools, and therefore you get nothing but a Latin and Greek university. This brings us to the question of the school. It is obvious that a real science school, in the grand view of Professor Huxley, is the pivot on which the whole question turns. It is the means by which you must reform your university teaching, because a good science school throughout the country will compel the universities to do honour to what is taught in

these schools. It is a hopeless proposition, a scientific education in a primary, or even in a secondary, school; that is, a scientific education of the high pretensions of Professor Huxley. But, though you cannot do this, you can find out in the secondary, and even in the primary schools, the latent genius of the country. You can take it out of those schools, and you can send it, at the expense of the great educational endowments of the country, into a great school of science, where it shall be brought to the highest development. That is, I think, the way in which we must understand the proposition, when we speak of all classes of schools getting the benefit of teaching in science and art. We are not to be deterred, because there are half-a-dozen ways suggested of doing a thing, from attempting to accomplish it. It is rather a source of encouragement that there are so many different ways suggested by which you hope to accomplish the end. We leave these ways to a subsequent consideration by a practical committee. Upon this principle, then, I think we may recognise the propriety of the resolution which has been submitted to the meeting.

Dr. Lyon Playfair—Sir, I congratulate this meeting upon the unanimity with which this resolution has been received. I have only one or two words to say with reference to it. One of the points which have been brought before us, and a very important one—one really at the basis of the whole question—is the action which our great universities in this kingdom will take in the matter. The education of the middle classes is exactly what the universities choose to make that education; and I would therefore draw attention to what has been stated by the representatives of the two great universities. It is quite true that the universities have awakened, and are moving, and we congratulate them upon the movement; but they are doing very little in comparison with what they can do, and what we ask them to do, when we say, "Put science upon equal conditions with other branches of learning." Four or five fellowships in Oxford would represent, taking £300 a year for each, about £1,200, which is given. Oxford will, as soon as the new ordinances come into full effect, have 300 fellowships, and expend annually upon them about £90,000; and therefore we say they have made a mere beginning, which we congratulate them upon, but it is nothing to what we expect them to do. Then again, besides these 300 fellowships, they have 500 scholarships. I am not aware whether one is given for science.

Mr. Acland—Several.

Dr. Lyon Playfair—I am glad to find there are several. At all events we should be very glad if we got a due proportion of the 500. Let us not be alarmed about the funds that we require. Many of us are jealous of comparing what France and Germany are doing in this matter, and think it not suitable to our own country. Let us look to what America is doing, in all its troubles. In 1862 America passed an Act of Congress, which has not become very active on account of the war, but which will presently become active. America passed an Act of Congress giving, for the establishment of thirty-seven agricultural and technical schools—one for each state—no less than 9,500,000 acres of land. Only allowing one dollar per acre as the value of that land, America gave, for the foundation of technical schools, two millions of money, not one farthing of which was to be spent in buildings, but for the endowment of the teachers. And we will soon see what an immense result this produces. Then, finally, let me express my entire concurrence in what has been said with regard to endowments. My own city is a remarkable example of these splendid endowments. Those who have visited Edinburgh admire the splendid edifices—Donaldson's Hospital, Heriot's Hospital, and the like. What have these done for education practically? They have pauperised the middle classes, and taken away their self dependence. So far as I have looked into it, they have not produced a man of eminence. They are splendid endowments; they are very jealous in telling us what their annual value is; my impression is they amount to nearly £50,000 per annum. And we produce nothing out of that; whereas we could, by imitating what America has done, produce the greatest benefits. One remark more, and it is this. The general character of our schools represents gradation in education. All of us have pointed to the success of Scotchmen on account of the education that they receive. How is that? Because practically, until lately, Scotch education was compulsory education, and an education of gradation, because the Kirk Sessions, who ruled from the religious influence in Scotland the feeling of Scotland, acted in this way; and if you look at the old records of the Kirk Session you will see it. It is reported to the Kirk Session that A. B., a child, does not attend school. An elder is sent to ask why he does not attend school. "Because he has no clothes." The Kirk Session says, "Supply a suit of clothes to A. B., and force him to go to school, and tell the parents if he does not, church privileges will be withdrawn from them." Then, again, if you look at the records of the Kirk Session you will find it says this:—"There is a boy of pregnant parts. Make a collection in the church for him; send him to the University of St. Andrew's, to Aberdeen, or to Edinburgh, and educate him at the public expense." These are the things that have made Scotchmen what they are. When the public feeling of England and Ireland moves in the same direction similar results will follow.

The Chairman then read the resolution as amended, as follows:—

"That to establish and maintain a system of technical education adequate to the requirements of arts, manufactures, and commerce in the United Kingdom, the three following educational reforms should be effected:—1st. In the universities, grammar schools, and other educational institutions for the upper and middle classes of society, instruction in science and art should be placed on the same favourable footing as other studies; 2nd. Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere, and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government; and 3rd. Special institutions for technical instruction, including museums, adapted to the wants of the various classes of society, and to the industries of the country, should be established and maintained in the United Kingdom."

The Chairman then put the resolution, which was carried.

Mr. Harry Chester said—The resolution which I have to propose is this—"That in such measures as may be desirable for the general provision of the means of efficient primary and secondary education, it would be right to consolidate and improve, rather than overthrow, what has already been done; but that the voluntary principle requires to be supplemented by local rates for education." Now this resolution, although it seems to contain three, only contains two propositions. The first is that we do not desire to overthrow—merely to improve — the action of the voluntary principle; the second, that we cannot consent any longer to forego the existence of rating powers for education. It stands to reason that, where so much is wanted, we ought not to begin by overthrowing what exists, more particularly when that which already exists is good, and is capable of being made much better. It should not be forgotten that from 10,000 to 15,000 of the best primary schools in this country are now existing under trusts settled by the Committee of Council, which depend for their very existence on the maintenance of the voluntary principle. The management of these schools, instead of being vested, as it otherwise would often have been, in the clergyman of the parish alone, is vested in the clergyman and a considerable number of his lay parishioners whose qualification is their voluntary contribution towards the maintenance of the schools. It would be very foolish to begin by throwing those subscriptions aside and alienating all those friends of education, more particularly as they stood in the gap when it was much wider than it is now, and to them we are principally

indebted for such means of education as we already have. If we declare against the voluntary principle, we add greatly to the difficulty of carrying through Parliament that large measure of education which Lord Stanley, in his speech at Bristol, tells us that the cabinet contemplate introducing. But the voluntary principle, although a very good servant, is by no means a good master. I am convinced that it is impossible upon the voluntary principle alone to reach all the neglected parts of the country, either the rural parishes or the great towns, and to supply them with efficient means of education. Moreover, if we throw aside the voluntary principle as an agent for supplying the means of education, we must do so not only in connexion with the primary schools, but also in connexion with the Mechanics' Institutions, which supply both primary and secondary instruction. What I maintain, therefore, is that we should hold out the hand of fellowship to those who will act on the voluntary principle, while we insist upon the power of levying rates in aid. Many persons are afraid of rates, because they think that if you have a rate it will not be possible that a school so supported should co-exist by the side of a school supported by voluntary effort. What we must have, without any more trifling, is a complete scheme of education for the whole of the population of this country. We cannot get that unless we have power to levy rates, and, therefore, I say let us have rates. I believe that schools supported by voluntary subscriptions and schools supported by rates may co-exist in different places, and even in the same place; and that, by good arrangements, the same schools may be supported partly by rates, partly by voluntary subscriptions, partly by grants from the Committee of Council, and partly by school fees; but if this belief should be illusory, if rates should destroy subscriptions, this can only be by the greater strength of the rating principle; and, at any cost, the people must be educated. I am sorry to say that Mr. Göschen, who was to have seconded this motion, is prevented from coming here at this moment, but Mr. Cowper will undertake that office.

The Right Hon. WM. COWPER, M.P., said, in seconding this resolution—I need only say that we have before us a very good and a very great undertaking, namely, that of endeavouring to render the education of this country more suitable to the knowledge we require, and more adapted to the wants of the times; and having so large an undertaking as that before us, do not let us add to it any attempt to enter into an antagonism with any of the existing bodies which hitherto have promoted and supported education. This resolution deals with the education of those classes who are assumed not to be rich enough to provide proper education for themselves, and therefore their education cannot be paid for by the parents. We should not like it to be thrown entirely upon the voluntary principle, but yet do not let us slight those great exertions that have been so successfully made by persons interested in education in the country, by the clergy and by various committees who carry on their work humbly and efficiently. On the other hand do not let us treat lightly the responsibility of government in regard to education. There are many who are rather inclined to think that government need not meddle in this matter; but I do hope nothing will be done which may tend to foster that idea in the mind of those who are likely to influence the affairs of the country, but rather to make them feel that as the education of the middle classes is a matter of immense national interest, so it is a matter in which the national will, and the representatives of the people should also take a most prominent part. Can we for a moment doubt that it is of the greatest national importance at the present time that there should be a large improvement in scientific and technical education amongst all that portion of the working classes, or of the middle classes, who are capable of receiving the education of which we speak? Is it not hard upon our energetic, patient, and skilled workmen, that they should be exposed to competition with the workmen of other countries without having the same advantages which are given in almost every country on the Continent, of schools promoted, as they all are, on the Continent by the government, and receiving a central direction, a central guidance, and a central superintendence. Let us assume in all our future proceedings that we must still have the schools supported by the parents of the children, by voluntary efforts, and by the Imperial Government. But we desire to add a fourth body, namely, the municipal or the parochial organisations. That assistance I am sure is absolutely necessary to the efficient working of the system; it will bring in a force of public opinion to bear upon the subject which is especially wanted now, for one of the main causes why education has not been successfully carried on is the want of the power of public opinion to bear upon it. We all know that the great reason why the schools are not filled is because the parents do not care about it. They require to be influenced by public opinion, by the persons resident in the locality. Let us have all the powers of the nation acting concurrently in this great matter, and there is a hope that this great defect, which has been so fully recognised during the discussion of yesterday and to-day, may be effectually remedied.

The Right Hon. H. A. BRUCE, M.P.—I think I may assume that there is a unanimous feeling in favour of this second resolution, and, if so, I ask would it not be wise to carry it by acclamation, and to proceed at once to the next resolution, upon which an important amendment will be moved by Mr. Chester, which will evoke the opinions of the meeting as to the question of compulsory education.

Mr. CLARKE proposed as an amendment, that the words "aided by Government" be inserted in the resolution, which would then read thus—"but that the voluntary principle, aided by Government, requires to be supplemented by local rates for education."

The amendment was not seconded.

The CHAIRMAN then put the resolution, which was carried by a large majority.

The Rev. W. C. LAKE said—The resolution which has just been put in my hands is this: "That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the legislature ought now to declare that all children between certain ages, employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools." Perhaps the reason why I have been asked to move this resolution is because I have, at various times, expressed a strong opinion that whatever you may do in the way of encouraging education, you will scarcely entirely succeed unless you introduce in some shape or other the influence of compulsion. I am not one of those who would for a moment disparage all that has been done during the last 20 or 30 years in the cause of education. I think that all who have laboured in that cause (and perhaps I, being a clergyman myself, may venture to say that I think my brethren of the clergy have taken a very large share in that work), have advanced education in this country immeasurably, considering the state in which it was at the commencement; but at the same time you must face this fact, that we have at the present time, with all possible means applied to education, one-half the children of the country who do not receive an education worthy of the name. I will not now discuss the question, what is the exact number of children in the streets of London who are receiving no education at all. I think it very possible that there is a very small number of them who never at any time enter a school; but the education they receive is often not worthy of the name. Supposing that most of our children at broken intervals for three or four years, between the ages of, say, three or four and twelve or thirteen, attend for some fifty days in

the year at school, do you think that they really carry off anything worthy of the name of education? What we wish to induce them to do, and what other countries have managed that they should do, is that they should attend with regularity for—I would not ask for any exaggerated number of years, but say for four or five years continuously. That would get something into their heads. How are you to meet this case? You will never really meet it if you are afraid of that word, which sounds so ugly to English ears, "compulsion." I must honestly confess that I wish we could get some pleasanter word. I would very much prefer that it should be "moral suasion" or "inducement." But, call it what you will, you must in some way or other compel a large proportion of the children to attend school. The question is, how is that to be done? I frankly admit that it cannot be done by direct compulsion. I do not believe that if you proposed at this moment an Act which was to say that every parent shall be fined whose child does not attend school, it would have a chance of passing the Legislature, or that if it did it would have the chance of being accepted by public opinion. What would I do, then? I should venture to say, enforce those clauses in the Factories Act with regard to industrial schools—enforce some of the clauses which, I think, were passed last session of Parliament with regard to children employed in bleaching operations, and extend the principle of those clauses to agricultural labour. An immense step that would be. I know it would be a difficult step, but there have been means suggested by which, I think, that step could be taken. If you adopt that plan you get in the thin end of the wedge, and offer a strong inducement to the parents, to the employers of labour, and to every one who has influence over the children, and you, in fact, compel large sections of the children to go to school, and you cut off that small section which belongs to parents indifferent or vicious, and who, when once there is something of public opinion established with regard to other classes of children, may be dealt with as being really fit subjects for direct compulsion. This, then, is the course I would take. I would not be in a hurry. I would not lay myself open to any charges of acting rashly or harshly, or appearing in any way to force foreign methods of compulsion upon our people; but, nevertheless, I hold that education will not take root, nor that it is not sufficiently loved by the English mind—that for various reasons the feeling of a great number of classes of Englishmen is not an educational feeling, and that, on all those accounts, unless you go firmly to work, and bear in mind that compulsion in some form must be used, you will not have done your work effectually. I beg to propose the resolution which I have read.

Mr. Antonio Brady, in seconding the resolution, said that having taken great interest in the subject of the education of the poor at the East-end of London, he considered it a lamentable fact, that notwithstanding all that had been done in that locality, a very large proportion of the children of the poorer classes received no education at all, in the sense in which it was understood by the meeting; and they might depend upon it, that unless they educated the people for good, the devil was educating them for evil in the alleys and courts of our crowded cities. The great problem seemed to him to be how are we to get the little Arabs in the streets trained in our schools. As a churchman, he was afraid he must confess that with our present organisation we had not achieved that end. He saw no remedy for this state of things except some means of compulsion, which might almost be interpreted by the word persuasion. For several years past he had been asked to distribute the prizes at a large school at Poplar; he was going to do so again that evening; and if any gentleman felt an interest in knowing what was being done at that school in the shape of education, under the careful training of Mr. Holmes, the Incumbent of St. Michael's, Poplar, he would invite him to accompany him thither. He was, however, afraid that the only hope of getting the children to school who did not attend, was by some measure of compulsion. He thought that the parents of these children had yet to learn the benefit which was to be derived from attending school; and he was perfectly sure that magistrates, as well as Poor-law Guardians, would say that it was much better to educate children than to coerce them by punishment after they had committed crimes. He believed it was the duty of the State to educate children, and instruct them in well-doing; and that there was no greater curse to the land than the way in which children, in all our large towns, were being educated in crime, for want of being taught better. He did not believe the children were inherently bad; but inasmuch as from force of circumstances they were tempted to crime, it was the duty of the people of this country to teach them to earn their bread in an honest manner. He thought the best means to that end was, in the first instance, to give them an education in our primary schools which was worth having. He did not think, from his late experience, that any difficulty would be found in persuading parents to pay for the education of their children. He did not think that our ragged schools met with as much support as they ought to receive, for the managers of them were obliged, in his neighbourhood, to bribe the children to come to school, by giving them clothes or meals as an inducement to attend. He confessed that he felt very strongly the necessity for some better means of coercion or inducement than was at present possessed, but how that was to be carried out in this great and free country he was afraid his experience did not enable him to point out. Again, he did not think there was any way of making schools thoroughly efficient for their purpose except by putting them under the inspection of competent Government officers. He had had a great deal of experience of schools, both under inspection and not under inspection, and he attached very great value to the inspection given by her Majesty's officers. The University of Cambridge middle class examiner, Archdeacon Emery, lately examined one of the primary schools in his (Mr. Brady's) neighbourhood, for the purpose of ascertaining to whom prizes were due. The boys in the upper classes answered with such extraordinary accuracy, that it was difficult to determine which were the best. In some cases every boy answered every question correctly. He attributed this success not only to the skill and care of the efficient master, but also to the care with which her Majesty's inspector had also done his duty. Now what he (Mr. Brady) desired to point out was, that the same examiner in the case of the middle class and grammar schools found a lamentable deficiency, both as regarded accuracy and extent of knowledge. The inference was, that unless the grammar schools improved their teaching, which he submitted could be best accomplished by inspection by an independent officer, the middle classes of this country would soon lose their position, for, as he had shown, the lower classes were already treading very closely on their heels.

Mr. Trelawny Saunders said that by the resolution it was provided that all children between certain ages employed in remunerative labour should receive education for at least a minimum number of hours in each year. He asked how was this to be done? He was answered, "By means of the legislature." What had the last speaker told them? Why that, under the superintendence of the legislature, national schools at the present moment were really giving a superior education to that which the middle schools in his own neighbourhood give. He (Mr. Saunders) would tell them more, namely, that the operation of the Government in a neighbouring county, not far from our own, in directing the administration of the education of the lowest classes, had had the effect of practically destroying the means of education of the middle classes, and had left, as a result, the necessity of considering whether higher education should not be taught in the primary schools—whether, if Ireland is to

learn mathematics and classics, she must be taught in the national schools of the country. Was this the condition to which England was to be brought? Were we to go on legislating for the poorer classes, and were we ourselves as employers or proprietors to neglect the very advantages which we saw telling with effect upon the lowest stratum of society? Could they be surprised when they found these men rising up in arms against them, and claiming privileges which were likely to affect the political condition of the country? If we had eyes to see, we must see that that which had produced such an effect upon the lower classes of society ought not to be neglected by ourselves. How was that which was mentioned in the previous resolution to be done? He believed that the course to be pursued was the one enunciated in the following propositions, which he was about to submit to the meeting, and he wished it to be understood that he used the word "practical" as a wider term than "technical" when he spoke of instruction. His propositions were:—

"That to secure the benefit of practical instruction for all classes in the various pursuits of life, and to provide a wise adaptation of schools to the general wants and personal incidents of national training, it is necessary to place all universities, colleges, and schools —technical, upper, middle, and primary—under the supervision and control of a Minister of State responsible to the Crown and Parliament.

"That the various officials, conductors, and teachers of every grade, should be constituted as a branch of the public service, be appointed by the Minister of State, and through that authority derive those advantages of promotion, honours, and rewards which are found to be essential in other professions.

"That attention to local interests be secured by the contributions and superintendence of the ratepaying public in counties, townships, and boroughs.

"That, besides the contributions from local rates and the fees of students, the revenues of the department be provided from the property now in possession of the universities, colleges, foundation schools, and other funds of the like nature, with such further sums as Parliament may vote for the purpose."

He asked the meeting whether they were prepared to go the length of affirming these propositions. If not they were only prepared with half-measures. If they were not prepared to go as far as this they must be prepared to play second fiddle to France and Germany. A poor lad from the agricultural districts of France, for instance, attracted the attention of a gentleman in the neighbourhood, who sent him to school. The schoolmaster said, "You must do more than send him to school; he is talented; don't send him to the plough, send him to get a student's education." And the boy was properly educated. In the next grade of school, whatever it might be, there was still a higher position to which he could be carried, and at last you perhaps got a lad showing a capacity for art, and he was sent by the government to complete his education. He (Mr. Saunders) had been told in that room that such a thing might be done here. Who knew it? Nobody knew anything at all about it. The government was at the head of the people in the matter; the people were slow, and the thing was new to them. They were slow in progressing with new ideas. Public opinion must be stirred up, and he hoped it would be seen that the course he had suggested was the right one.

Mr. HARRY CHESTER said—Before I move the amendment, of which I gave notice yesterday, I wish to say, in reference to what has fallen from the last speaker, that I agree very much in many of the things which he has said, but that in my opinion they are not proper to be brought forward as an amendment to the resolution now before us, which aims at one particular point. If we are to debate the question whether we are to have a Minister of Public Instruction in this country, I, for one, am perfectly prepared to vote for that. I submit, however, that we cannot do justice to that matter now, but I have no doubt that at a future time we might discuss it with advantage. The question before us is this—Whether the educational clauses of the Factories Acts shall not only be carried further than they have hitherto been carried, but whether the compulsory powers of education, which the mover and seconder of the third resolution both desire, and I believe the meeting generally desires, shall be made universal in respect to the children of all classes.

The Rev. W. C. LAKE said—I especially guarded myself against any wish that they should *now* be made universal.

Mr. CHESTER—I understood you to say that we could not educate the people without compulsion, and that compulsion we must have.

The Rev. W. C. LAKE—Ultimately.

Mr. CHESTER—We, doubtless, all agree that the principle of compulsion is an unpopular and unpleasant principle. We do not desire to see that principle applied unnecessarily, but I am perfectly convinced that it is absolutely necessary to apply it for the education of the people; and that it is of the utmost possible importance that in applying it we should leave no doubt whatever that we are not legislating against the poor and in favour of the rich. I am perfectly convinced, from communications which I have had with working men, that this principle is becoming very popular with them; that directly they understand what is meant, that we desire not to legislate against the parents but in favour of the children, that the right, which Lord Russell called the "moral right," of every child in this country to receive education, should also be made his legal right, the working men are on our side. I am perfectly ready to acknowledge, with gratitude, the benefit conferred on the country by the operation of the clauses of the Factories Acts, but I contend that it is altogether vicious in its principle, in affecting only those who bring up their children in industry, and who endeavour to employ them in remunerative labour. This is a mistake, and the sooner we give up the principle, and lay down the true principle of justice, that *all* children, no matter to whom they belong, are entitled to receive education, the better it will be for us, and the more popular will the measure be with the working classes. Let us not go on enacting that the industrious child must go to school, but the idle and depraved child need not, but may remain in the gutter. Let us pass a law that will operate on all classes, and not merely on the industrial poor. In every other country where compulsory education is established by law this is the case; and this ought to be the law in England. Let us lay down at once this principle, and if we do not do that I am thoroughly convinced that the first Parliament that meets under the new Reform Act will pass a bill to that effect. Of course I am aware that the principle, when laid down, must be applied gradually and cautiously. I move that the words that stood in the first draft of this resolution, "that all children between certain ages, *and not those only who are* employed in remunerative labour of a certain character," &c., &c., shall be inserted.

Prof. THOROLD ROGERS said—I have great pleasure in seconding the amendment which has been proposed by Mr. Chester. I think that the necessity is urgent, and that no time is so good as the present. The facts, I believe, are pretty much as follow:—There are in Great Britain 5,000,000 children between the ages of five and thirteen. Of those 5,000,000 children about a million and a quarter are under the inspection of the Government. There may be a million and a quarter more educated in private schools not under inspection. The remaining two millions and a half, or thereabouts, go absolutely without education. At the present time, undoubtedly, a great many children who receive assisted education through the operation of the Government grant would get that education equally, perhaps, by means of voluntary action and through the system which prevailed before the Government grant was given, and more so, as persons are generally convinced of the necessity of giving this education at the present time. But those persons who do not receive any education under the Government system, and who would not receive any education by any voluntary system, are left to grow up paupers—to become of the criminal class and gaol-birds. It is our duty, if we look

at the state of the case from the simplest economical point of view, to consider that the first obligation and first act of wisdom on the part of a State is to provide education. No man, whatever be his condition, should hesitate to give evidence to the State that his children are being properly educated. As far as I am concerned I must say that I should feel myself just as much bound to submit my own children to the Government test as the children of the poor. It is only by all classes acting up to the obligation which shall be laid on all, that any proof can be given that we are really in earnest in demanding that education shall be given to the poorer classes. It is said that there are difficulties in the way of this—that you must have evidence of the proficiency of the teaching. I see no reason why we should not have examinations for governesses, the same as we have for school-mistresses under the revised code. There is no reason, I think, why this system should not be extended to girls as well as to boys, and why the demand should not be made from the parents and guardians of children that the same evidence which is required from the poorest should be demanded from the richest. I think that the evil is urgent. It is not merely with reference to that point which we are debating—technical education—but education altogether. Any scheme will be little better than a waste and an expense, unless we look the difficulty fairly in the face—unless we acknowledge that education is as necessary to a child as food and drink, and that therefore the community shall demand that all children, in whatever state of life they may be, should be properly educated. I am exceedingly glad to second this amendment, and I hope the Conference will accept it.

Mr. Bruce said—Mr. Chester has told you that the word compulsion is a word which is not popular to English ears, and I quite agree with that remark. In rising, as I do, to object to the adoption of this amendment, I hope it will not be understood that I am at all averse to the principle of compulsion, but the resolution is that we shall *now* proceed to do this. Those who will have charge of the bill in the House of Commons have already a heavy task—heavy enough for their powers, in carrying in Parliament the principle of a compulsory rate. My fear is, that if we try for too much at once we shall endanger the great good which I think is fairly within our reach. I do not agree with Lord John Manners when he says that it is not the persuasion of the birch, but the fear of imprisonment, that drives the Prussian to school. I have not the same objection that Mr. Baines has to penalties. I see nothing un-English in forcing a parent to do his duty; but I ask myself as a practical man, have I a scheme which I could offer with reasonable expectation of its being accepted by Parliament, and which I could assure Parliament, in my belief, would be workable throughout the country? I ask myself, first, what is the experience of countries that have tried compulsion? Under what circumstances have they tried it? Are our circumstances the same, and what has been their success? The subject has been inquired into in Prussia by Mr. Watson, who states as his deliberate opinion that if the compulsory laws were withdrawn the attendance in the Prussian schools would be every whit as great as it is now. The fact is, that, before the law of compulsion was applied in Prussia, they had had for nearly two centuries a national system of education providing for all. Nearly the whole public feeling of the country was in favour of education, and compulsion was only applied to bring in the small residuum. In Switzerland a similar state of things prevails. But yesterday we were told, by a speaker to whom I listened with very great interest (Mr. Field, President of the Birmingham Chamber of Commerce), of the admirable working of this system in Massachusetts. The fact of which he informed us, namely, that there was a very large attendance—more than 90 per cent.—is undoubtedly true. At Boston there is a very fervent desire in favour of education, and the attendance is large, but I have looked at Mr. Fraser's report, upon the subject of this law of compulsory attendance, even in a country infinitely more prepared for such a law than we are at the present moment. He says:—"As far as regards enforcing attendance in the schools, the laws of Massachusetts are as precise and peremptory as could be desired, but to no point does the remark of M. De Tocqueville's Pennsylvanian friend more forcibly apply:—'In America the law is powerless when it is not supported by public sentiment.' In spite of legal enactments and penalties, 'absenteeism and truancy' continue to be the great, and indeed the increasing evil of American schools." Mr. Field quoted several times the evidence of Mr. Philbrick; I will also quote from Mr. Philbrick. This is quoted by that gentleman from the report of his agent:—"No fact connected with those schools has impressed me so sadly as the extent of truancy and non-attendance, and the strange apathy of the public as to this fruitful form of juvenile crime. This great evil calls loudly for a remedy. In a few townships the laws in reference to truants and absentees from school are faithfully executed, and with the happiest results; while in others, these laws are overlooked or utterly disregarded. School committees can render no more important service to the public than by combining their own efforts and enlisting the co-operation of their constituents to repress this alarming evil." Mr. Fraser also states the law as it exists in Massachusetts upon the subject of compulsion, and he then adds:—"The law, as will be observed, is emphatic enough, but I believe that its provisions are nearly, if not quite, inoperative. Public sentiment, so omnipotent in America, is not with it; and it stands, therefore, a dead letter upon the statute books." So much with regard to experience in other countries—countries advanced far beyond us in point of education—because this law that you want to apply is limited to boys, 50 per cent. of whom are not at school at the ages under which, by a compulsory law, it would be necessary to have them at school. Would you have them at school from 5 to 13, as in Prussia? Last session Lord Shaftesbury introduced into the House of Lords (and I hope he will introduce it again) a bill which provided that, with certain modifications, the Factories Acts should be extended to agricultural labour, but he felt the difficulty of applying those Acts. He laid down some general broad principle such as that children of a certain age should not have more than a certain amount of labour, and that a certain minimum of education should be given to all, but he proposed to leave it to the quarter sessions in each county to lay down the manner in which that education should be conducted, so as to interfere as little as possible with the labour of the children. The law of Prussia and Massachusetts is, that every child between certain ages shall be at school not half his time, but the whole of his time. ("No, no.") That is the law in Prussia, that is the law in Massachusetts; I do not know what less stringent law you would have. My objection is, not to the principle of compulsion, but I do ask you to pause before you impose upon those who are working with you—who want to make this country so educated that the principle of compulsion shall be adopted, and adopted with the full and hearty consent of the people—not by using the words that the legislature ought "now" to introduce such a measure, to fetter us, and to limit our means of usefulness. Believe me, that those out of Parliament know not the difficulties with which we shall have to contend in carrying simply the rating principle. I know that the great majority of members out of Parliament, or anywhere, if they were asked whether they were opposed to it would probably say they were not, and that if the school was not provided by the voluntary principle, some compulsory means should be adopted. They would admit that readily, but when you came to ask the means they would make difficulties. I appeal to the meeting again not to press upon "willing horses" the adoption of this amendment.

Mr. Dixon, M.P., said—I am quite sure that there is

no one in this room who wishes to interpose any difficulty between Mr. Bruce and the good work which he has in hand; and if I thought that the passing of this amendment would be any obstacle to that good work, I certainly should not be in its favour; but I would submit to that honourable gentleman whether, in reality, it will not considerably strengthen his hands that we should here, not as members of the Legislature, but as outsiders, tell Mr. Bruce what is honestly our opinion upon this matter, and then leave it to the members of the Legislature to make such use as they may think fit of that expression of opinion. We ought to be encouraged greatly to give a unanimous vote in favour of this amendment by the words that have fallen from Mr. Bruce himself, because he tells us, as other members of the late government have told us, that he is in favour of compulsion, and that the only difficulty is as to the manner and the time wherein we shall give effect to it. Mr. Bruce goes on to say that he objects to the amendment in consequence of the word "now;" but, of course, it must be understood that these compulsory laws would form only a portion of a great measure which would take care to provide for all the proper means of education, besides removing every obstacle that stands at present in the way of the children frequenting the schools. All that we ask is that when this great measure is brought into Parliament it will not be considered a complete measure unless it provides the means of education, and takes care that those means are made effective. Mr. Bruce has told us that in Prussia and in America the compulsory laws which are supposed to have done so much good, are, in reality, inoperative, and that the high state of education at which those countries have arrived cannot be considered to be due to those laws. Surely Mr. Bruce must have forgotten that when these compulsory laws were instituted in Prussia, they were passed because the state of education was so defective, or the use of the means that existed was so imperfect, that these laws were necessary, and that, in reality, the present state of education in Prussia is to be taken as a measure of the value of those laws which have produced so wonderful an effect as now to be no longer necessary. In America, it is perfectly true, as Mr. Fraser says, that the law which has been upon the statute-books so long, has been to a certain extent inoperative, because it is not in accordance with the sentiments of the people, but it must be remembered that that law applies to truants and to absentees, and as regards truants it must be applicable. It has now been applied, and, as we were told yesterday by Mr. Field, in one city alone the number of commitments under the Truant Laws amounted to between twenty-five and seventy-five per annum; therefore that portion of the law has been, and is still, effective; and as regards that portion of it which applies to absentees, we must remind Mr. Bruce that, in the native-born Americans, the number of absentees is extremely small, and those who are so are the children of the emigrants into the United States. I do not think we can say, with propriety, that either in Prussia or in the United States, these compulsory laws have not been efficient. What we have to do, I think, is to pass these laws in such a manner as shall not press upon the people too hardly—not to act as if we were angry with them, but out of kindness, in a paternal character; and depend upon it, it is only to a residuum of the whole that these laws will have any force whatever, and to that residuum we can apply no other means.

Sir J. Kay-Shuttleworth, Bart., said—I should not rise at all to take any part in this discussion if I did not think I could do something towards procuring a unanimous vote upon this question. I have ventured to suggest to Mr. Chester, in private, the insertion of some words which I think would enable Mr. Bruce to agree to this resolution. Speaking generally, I conceive that Mr. Bruce would be desirous, at the earliest practicable period, to procure the attendance of all children for a reasonable time at school. Upon that subject, I apprehend, there would be no difference of opinion. The point of dissension will be as to the best measures by which that result can be secured, and as to the period within which it can be secured. Now I rather disagree with Professor Rogers as to the statistics which he put before us. If we take the population of this country to be over 21,000,000 at the present time, allowing for increase since the last census, and taking the number of children whom it is desirable should be at school to be as high as the Prussian standard, we should have 3,500,000 children at school. We have, at the present time, schools inspected by the Government for only 1,300,000.

Mr. Bruce—That is the number the schools will hold.

Sir J. Kay-Shuttleworth—We have schools built for that number. The number in average attendance in the inspected schools is a million and a quarter, 1,200,000 on a day of examination. I quite agree with the estimate which Mr. Bruce gave that in schools the number of children receiving education worth the name is not above 50 per cent. The number of schools aided could not have more than 1,600,000 children within them. We are asked to pass a resolution with the word "now" in it. "That this meeting is of opinion that the Legislature ought *now* to provide that all children between certain ages, and not only those employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools." Now I think that the last clause of the resolution is an absolute barrier to the carrying out of this resolution now. I therefore suggest that if Mr. Chester would agree, we should insert instead of "now," "as early as practicable." I think that then the resolution would be carried unanimously. We are all of opinion I think, that we ought no longer to dally with this question, but, in my opinion, it is an exceedingly dangerous thing to accustom people to the enacting of laws which you find to be unworkable; it induces throughout the whole country a disrespect for the law, whereas this is a law-loving and a law-obeying country, and there is, in my opinion, nothing so important as that we should show the people that we exercise the most wise caution in carrying through the Legislature laws, but that when they are carried they must and will be enforced by a strong executive. I therefore would urge that whilst I entirely agree in the feeling which Mr. Chester and Professor Rogers have expressed, that it is important that the will of the Legislature and the will of the executive should be directed to bringing the whole of the children of this country to school, and that for a proper period, and to giving them an efficient education, I think we should be very careful as to the words that we employ, for undoubtedly the difficulties in the way of carrying such a law are so great at present as to render it almost impracticable. I would, therefore, suggest that instead of "now" the words "as soon as practicable," should be inserted in the resolution.

Mr. Chester—As far as I am concerned I have no objection to that if it meet with acceptance on the other side.

The Chairman then read the amendment in its altered shape.

Mr. Godwin, F.R.S., said he was very sorry that Mr. Chester had been induced to consent to the omission of the word "now." It surely could not weaken the efforts of members of Parliament to be able to say, that out of doors a hundred men who had given most attentive and serious consideration to the subject had said that what was proposed in the resolution ought to be done *now*, which meant that it ought to be done as soon as it possibly could be. The objection to the word compulsion seemed to him to be perfectly childish. They had no objection whatever to compel people to keep the law; why therefore should they not compel those who had authority over them, to teach them what those laws were. He sincerely

trusted that Mr. Chester would reconsider his determination, and not agree to withdraw the word "now" from the resolution.

The Rev. W. C. Lake said, as the proposer of the motion in which this unfortunate word "now" occurs, he wished to say, that he for one entirely consented to its withdrawal; his object would be entirely answered by the substitution of the words suggested by Sir James Shuttleworth. It was a very moderate motion, insisting upon the ultimate necessity of something like compulsion, but for the present he was content with it in a very modified form.

Sir Walter Stirling, Bart., said he wished to give his humble support to the very moderate views which had been expressed by Mr. Bruce, and he was firmly convinced that the time had arrived when the question of education ought no longer to be dallied with; at the same time the people of this country were not to be educated at the point of the bayonet. Everybody who had been in Berlin knew that that city was nothing but a barrack for soldiers. The whole government of Prussia was established upon military principles, and what the people were there used to from their earliest infancy would never suit the people of this country. Here, on all occasions, we had free liberty of speech and action, and the people would never endure any educational measure that threatened them with the application of the compulsory principle.

The Chairman—The resolution, as amended, now becomes a substantive motion, and will read thus, "That while this Conference acknowledges the benefits which have ensued from the Educational clauses of the Factory Act, it is of opinion that the Legislature ought, as soon as practicable, to provide that all children between certain ages, and not only those employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools."

Dr. Ellis said—The term compulsory education was unpleasant to the people's ears, but he thought another mode might be suggested than that of fines or imprisonment to induce the people to educate their children. In the agricultural districts he had ofttimes inquired why the labourers did not educate their children, and the reply had been, "we should like our children to be taught to read and write, though we cannot do so even to our soldier boys or emigrant girls; but we cannot afford to keep them from working at lace, straw-plaiting, or field labour. The wages of the father alone would not support us and our children." The town inhabitant said, "What's the use of educating? what shall we get by it to make up for what we lose by keeping the children from factory and other works?" The suggestion Dr. Ellis would make, was, he thought, important. If the Legislature rendered it imperative that no public remunerative office could ever be gained without the production of educational certificates of qualification, it would protect the public from the consequences of unqualified officials getting employed, both in the highest posts of responsibility, such as naval ship-building inspectors, the army, the civil service, as well as the onerous though humbler offices of registrars, parish clerks, and even constables. Thus actual coercion, so distasteful, would be avoided, and inducement substituted in its place. The initiative had already been introduced by the Society of Arts, in its system of examinations. Every year the claims for prizes, offered to the successful candidates, gradually increased in number. Attraction was preferable to compulsion. If manufacturers and others were to institute openings for those who could show the best state of preparation for commencing operations in their works, &c., merit would soon be brought into competition, and the means of preparation for the various artistic, mechanical, and mental occupations would be anxiously sought. Men might then be expected to efficiently and honourably sustain their official stations.

Mr. Paterson said it appeared to him that the resolution before the meeting was an extremely loose one, but he thought they should assist the Legislature by pointing out the difficulties in the way of technical education, and the way in which they should be met. There were a great many questions which ought to be discussed before perfection upon this subject could be arrived at. In fact, before a resolution similar to the one before the meeting was passed, some definite view ought to be arrived at in respect to the kind of education to be provided. The machinery for compulsion had not been stated by any of the speakers, although a certain number of propositions had been made to the effect that compulsion should be resorted to. If he might be allowed to speak of the mode of education in existence, he might say that at the present moment they had not arrived at the commencement of a technical education. They had not the text-books which should be used in classes if the university plan were adopted; they had not a single library in England where they could find a collection of technical books, or an institution where art could be taught. They were told that such was the apathy of the working classes that compulsory education might become necessary. He would appeal to Professor Huxley why his lectures were so well attended by working men in the evening. He (Mr. Paterson) could state that there was no want of appreciation of technical education on the part of workmen, for when it was offered to them they were always ready to pay for it, and to listen to the instruction with seriousness and attention. He would refer to a fact of great importance with regard to technical education. The Society of Arts, about eighteen years ago, brought into existence a system of exhibitions. He would ask whether that system of exhibitions had grown—was there any systematic action—was there anything to be compared with the action of our universities, with the action of our Royal Academy, by which they should find out who had executed a certain work in order that the honour that attached to that man should be awarded him. As matters stood at present the meeting had, he thought, brought out no new facts or valuable practical suggestions, and, with the exception of the speech of Professor Huxley, he had heard nothing of a practical character from any one. If they wished to discuss general education let them do so, and if they wished to discuss technical education, let them also do so, and let them not talk about fear of Prussia, for they had other reasons why they should wish to develop the great strength of England, besides fear of Prussia. He begged of them, before they committed themselves in the eyes of the public, who were watching them, to arrive at some definite conclusion in respect to their future mode of action.

Mr. Connolly said that perhaps it might not be out of place if he expressed his own views, and what he took to be those of the large class of working men to which he belonged, upon the subject of compulsory education. He believed that the working people of this country would agree to any resolution that would compel their children to be educated. According to his view, no man had a right to make use of the labour of his child to the destruction of that child's mind; therefore it was that he was more in favour of the resolution before it was amended than he was of the amendment, because, although Mr. Bruce might be a great authority upon education, he (Mr. Connolly) was afraid that he was not as great an authority upon agitation; and that gentleman must know that all agitators invariably asked a great deal more than they ever expected to get. He disagreed with some of the views put forward by Mr. Paterson; they had affirmed general principles, but they had not come there to arrange details. He agreed, however, that in their anxiety to provide for future generations, they were overlooking the present. They took alarm because the educated Prussians marched through the Austrian empire like a bullet through a sheet of card. The nations of Europe became alarmed at that, and every nation looked

at its defences. What did the Government do upon that? They did not start a new rifle, but they converted the Enfield rifle into the best weapon they could. They were now threatened with a greater innovation — the destruction of that commerce upon which they prided themselves, and it was under that fear that they had come there to discuss this question. They had an army of 6,000,000 workers in the field, and why could they not improve them (as they had done their rifles), until the rising generation became educated. He conceived this to be a most important question, and one which ought not to be overlooked. In his opinion all law was compulsion —all law was restraint—and surely no man could find fault with what every man was ready to agree to for the benefit of himself and his children. He had the greatest possible pleasure in supporting the resolution.

The Chairman stated that Mr. Connolly was one of the men who were sent by the Society of Arts to report on the Paris Exhibition. He had written a very good report upon a particular branch of industry—masonry—a report which did him much credit.

The following resolution, as altered, was then put by the Chairman, and carried :—

That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the Legislature ought, as soon as practicable, to provide that all children between certain ages, and not those only who are employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools.

Mr. Samuelson, M.P., said—I rise for the purpose of proposing the fourth resolution, which is this :—

That the Council of this Society be requested to appoint a standing committee to take such steps as may give effect to the foregoing resolutions, to support all such well-advised schemes for technical education as may be brought before it, to send such deputations to the Government as may seem expedient, and to re-assemble this Conference when desirable.

Now, I think, that if any body is entitled to take the initiative in this matter, it is the Society of Arts, because it is owing, in a great measure, to the efforts of this Society that education has been advanced. I believe the great step that has been initiated of conducting examinations into the efficiency of evening classes has given a greater impulse to education than almost anything that has been done during the present generation. I think there can be no question whatever that this Society is a body which is well qualified to proceed further in this matter. When I was requested to propose this resolution, I was told that the intention of the Council was that the committee to be appointed should not consist solely of its own members, but that it should include all those gentlemen, both in London and in the provinces, who can bring any light to bear upon this subject. Under these circumstances, I think we may expect that an amount of information, both as to what ought to be done, what are the existing means of effecting the object, and also what further auxiliary measures may be required, will be elicited by this committee, which will be of the utmost value. I have already given notice that I shall move for a Select Committee of the House of Commons to inquire into this subject; but at the same time a committee here will be of the greatest value, and will accelerate the operations of the other committee if it should be appointed. Under these circumstances, I move that a committee be appointed in the terms of this resolution.

The Rev. Henry Solly said—I have much pleasure in seconding this resolution. I must say one word in reference to what was just glanced at by Mr. Paterson, namely, that one of the most important things that can be pressed upon the attention of the committee which is proposed to be formed here is that they should remember the enormous power which is exercised by the parent in this matter which we have under discussion. I was speaking to a gentleman who is well known as an earnest promoter of education, and I asked him to take it up in reference especially to adults. He said he was so busy with the children that he could not do that. He further said, "It is my opinion that unless we educate the parents we shall never educate the children. I am quite satisfied that whatever value there may be in compulsion—and I believe there is a great deal—we must have it if we cannot attain our object without it, but it is infinitely better that we should enlist the sympathies of the parents upon our side, and get what we require to be done through their co-operation than that we should get it in spite of their resistance. I believe that this Society in establishing local examinations has advanced a very great step in this direction. I have lately noticed the valuable results produced by parents coming to witness the distribution of prizes to their children, and it is my opinion that if you follow that up, by getting the holders of prizes and those who have distinguished themselves, good situations, you will very much assist in the good work of education. If we stop where we are, I think we shall be making a very great mistake. What we have to do is to induce the parents of the children to value education for its own sake, and for its effect upon the whole character of the individual.

The resolution was then put and carried.

The Right Hon. H. A. Bruce, M.P., said—Before we part, allow me to move that a cordial vote of thanks be given to Mr. Hawes for his conduct in the chair. We have gone over a very large region of discussion, and it has been impossible to confine every speaker within the narrow limits of any one particular subject. Complaints have been made that this meeting has not been sufficiently suggestive in respect to details, but it has set many minds working, and I have no doubt whatever that the result will be most beneficial. Perhaps we shall some day be called together to consider the practical details. I am sure you will unanimously accord your thanks to the Chairman for his able conduct in a position which was sometimes one of considerable difficulty.

Mr. Alderman Salomons, M.P., said—I have much pleasure in seconding the motion. Nothing can be more useful to the public than this meeting, and it would be impossible to have a better or more courteous chairman.

The motion was carried by acclamation, and the Chairman having acknowledged the compliment paid to him, the meeting separated.

Cantor Lectures.

The second lecture of Dr. Letheby's course "On Food" was delivered on Monday evening, the 27th inst. A full report of these lectures will be given in the *Journal* during the vacation.

Eighth Ordinary Meeting.

Wednesday, January 29th, 1868; Sir Charles Nicholson, Bart., in the chair.

The following candidates were proposed for election as members of the Society :—

Allen, J. H., 2, East India-avenue, E.C.
Clarke, David, Mayor of Macclesfield.
Clarke, George W., North Cheshire Chamber of Agriculture, Macclesfield.
Davenport, George, 45, Ludgate-hill, E.C.
Fitzwilliam, W. S., 28, Ovington-square, S.W.
Gourley, E. T., Mayor of Sunderland.
Van Abbott, G., 5, Princes-street, Cavendish-square, W.

The following candidates were balloted for, and duly elected members of the Society :—

Bell, Arthur George, 4, York-st., Covent-garden, W.C.
Boyle, Edwin, 10, John-street, Adelphi, W.C.
Dalziel, Alexander, Cardiff.
Davis, Valentine, Furnace-house, Carmarthen.
De Lavigerie, Alfred D., 11, Sussex-street, Warwick-square, S.W.
Hollond, Edward, M.P., Dumbleton, Evesham, and Union Club, S.W.
Hooper, Frank, 24, Russell-street, Covent-garden, W.C.
Klein, Julius, Ph.D., 176, New North-road, and 3, Wilton-square, N.
Limbert, Edward Harvey, 5, Hercules-terrace, Upper Hollway, N.
Marr, James, 19, Bessborough-gardens, S.
Mort, William, 155, Fenchurch-street, E.C.
Pilling, Jonas, Manchester and Liverpool District Bank, Stafford.
Reveley, H. J., Bryn-y-gwin, Dolgelly, North Wales.
Richardson, J., 13, Savile-street, Hull.
Round, Edwin, Tudor Works, Sheffield.
Rudkin, Thomas, 17, Newgate-street, E.C.
Smith, John, 22, Russell-street, Covent-garden, W.C.
Tappen, G. C. W., Horley-villa, Horley, Surrey.
Venables, Benjamin, 253, Camden-road, N.W.
White, J. Ludford, 111, St. George's-road, S.W.

The Paper read was—

ON THE CLIMATE AND INDUSTRIAL PROSPECTS OF THE COLONY OF NATAL.

By Dr. Mann, Superintendent of Education and Special Commissioner of the Colony.

On the south-eastern edge of the great African Continent, 800 miles beyond its southern promontory, and half as far from the southern tropic; looking to the expanse of the sunny Indian ocean, and wooing the soft sea breeze that is still, in those latitudes, almost a trade wind, there lies a small land, which in the year 1497 was at once *terra incognita* and *terra natalis*, the newly-sighted shore of the Portuguese adventurers, who were opening out the ocean route to India; which in 1820 was a desolate and depopulated wilderness, held by the alligator, the sea cow, the lion, the panther, the buffalo, and the elephant; which in 1838 was the seat of a colony of Dutch Boers, who could not live upon less than 8,000 acres of land per man; which in 1850 was a British colony and a "land of samples;" but which in 1868 presents the very remarkable spectacle of sugar, coffee, arrow-root, tobacco, maize, cotton, the pine-apple, the banana, and the orange, growing almost side by side with wheat, turnip, and the beet-root, and almost under the gaze of cattle, sheep, and horses; all these most valuable productions being comprised within the limits of a territory that has not a larger extent than one-third the area of that portion of our own island which is south of the Tweed.

It is my purpose on this occasion briefly to explain to the Society, which "encourages Arts, Manufactures, and Commerce," why it is that this young colony of Natal, so recently a desolate wilderness, has rapidly become a land of bright hope and of high promise; why it is that the South African "Land of the Nativity" of the old Portuguese, of Zulu Kafir savagedom, and of Dutch Boer-dom, now confidently claims for itself recognition and welcome at the Society of Arts, and looks to have a place henceforth accorded it in the records and regards of this venerable and distinguished patron of social movement.

In carrying out this purpose I must of necessity begin with that which underlies the effects that have to be spoken of, namely, the natural conditions which bring about one of the most remarkable climates in the world. Let it be conceived that, in some suitable spot, a large conservatory is established, where a high temperature can be maintained throughout the greater part of the year, where mechanical contrivances are provided for regular periodic waterings, rendered most copious at the season when they are most needed, and lighter when they are least required; where an elaborate system of blinds is furnished for the period of most scorching sunshine, and where the blinds are withdrawn, and free exposure to sunshine secured, when the sun is least vigorous; and in this conception there is pretty much the sketch of what nature herself has done for at least one large portion of the region that is the theme of this communication.

In the first place, in relation to the high temperature of this natural conservatory, this is obviously provided for by the general situation in which it is established on the earth. The central portions of the colony are within 400 miles of those parallels of latitude where the sun shines down vertically upon the ground; this necessarily secures a great heating power during a considerable portion of the year. But the sunshine of Natal has been also in some measure supplemented by a hot-water apparatus. The in-shore sea-current of the Indian Ocean, on this part of the African coast, sets steadily down from the lower latitudes of the tropics and brings with it some of the superfluous warmth of those regions. It has not yet been determined on a scientific base how much the coast climate of Natal is indebted to this ocean influence. My own impression is, that the influence tells in a negative, rather than in a positive way; that the warm sea-current protects the coast lands from occasional chills, rather than actually raises their degree of warmth. The mean temperature of the six hottest months of the year, 50 miles inland, and at an elevation of 2000 feet, where my own researches have been chiefly made, is 69 degrees. The mean temperature of the coolest month in this summer series is that of October, namely, 66·6°; the mean temperature of February, the hottest month, is 71·8°; the mean temperature of the coast range itself, near the level of the sea, is about four degrees and a half above this; the air temperature in the shade very rarely indeed rises above 85°, unless upon chance occasions when a hot land-wind, or sirocco, is blowing in force; upon those occasions it mounts for a short interval some degrees higher; the highest temperature registered by my instruments on these exceptional occasions was 97·6 degrees.

There is quite enough in these figures to indicate that the heating power is very considerable. It is great enough, indeed, to convert the land at this season into a scorched desert, if there were no counterbalancing agency in play. That the land is not such a scorched desert is due to the additional fact, already glanced at, that nature has made her own arrangements for watering as well as heating. The heat is tempered by cloud-screens, and softened and vitalised by rain, poured down at frequent and convenient intervals. The precise physical conditions by which this periodic watering is secured, have then next to be indicated.

The general surface of the country is one broad slope, stretching down from the edge of the great central table-land of the continent to the sea. It is, so to speak, the bevelled rim of the continental table, looking out to the Indian Ocean, and towards the south-east; a rim from 120 to 160 miles broad. Now when the nearly tropical sunshine falls through the day on this land-slope, the air gets so far warmed that it acquires a tendency to rise along the slope. In other words, it is driven in and up by the superior pressure of the cool sea-air; and in this way a strong and steady sea-breeze is established. This, too, is a power superadded to another that is already at work in the same direction accomplishing the same end. In the parallels of Natal there is a general tendency of the air to move from the south-east during the period of summer under the great trade wind influence. From the combined operation of these two causes, it is found that during the course of one year the wind is blowing 820 times from the sea, for 145 times that it is blowing off the land. A sea wind is, of course, a moist wind, in the sense that it comes in to the land laden with as large a load of moist

vapour as it is able to sustain under the circumstances. If it blows in upon yet colder land, it at once deposits some considerable portion of its moisture; but if it blows in upon warmer land, as in the case of Natal, it acquires increased powers of sustaining its invisible burden. Nature has therefore had, in this instance, to adopt a still further expedient to complete its watering provision.

As the day advances the landslope gets more and more hot under the strong sunshine, and the upward movement of the air becomes proportionally more and more energetic, until at last it is converted into an actual upcast, like the upcast of a strongly-heated chimney. A large volume of the heated air is then rapidly and suddenly transferred to elevated regions of the atmosphere. As it mounts it expands, under the relief from superincumbent pressure, and as it expands it becomes rare and cold, and for both reasons is unable longer to sustain its full watery load, which is therefore in part precipitated to the earth with manifestations of concomitant electrical disturbance. A thunderstorm is developed, and heavy rain falls.

The operation of the agency which has been here described is so constant and steady that in any one place rain falls on almost every second day, on the average, during the six months of greatest heat. Most probably it falls somewhere every day. But it is the nature of these thunderstorm disturbances to confine themselves to a certain range, and to burst now here and now there. Nature's waterpot, like that of the skilful gardener, is swept from place to place until the soil is moistened and refreshed everywhere. About 24 inches of rain are thus scattered on the ground in Natal at an elevation of 2,000 feet above the sea, during the six months of summer. At this season anything like drought is entirely unknown, and the rivers are always full. From October to March an average fall of four inches per month, and the occurrence of rain on 15 days in every month, may be looked for.

The actual distribution all over these months, for an average of eight years, is:—

For October	3·60	inches.
„ November	4·58	„
„ December	5·04	„
„ January	3·92	„
„ February	4·41	„
„ March	3·29	„

It will be readily imagined what the immediate consequence of this combination of abundant and never-failing watering with high temperature must be, so far as vegetation is concerned. All vegetable growth is stimulated into most energetic activity. The coast and lower regions are clothed with tangles of luxuriant evergreens, and during the summer the land is verdant from the sands of the sea to the summits of the mountains. But it must be added that this abundance of rain, during the hot season, performs another most beneficent and essential service for this favoured colony. It tempers and softens the heat almost every afternoon. Very soon after the mid-day period the cloud-screen is drawn between the sky and the earth, and kept extended over the land until the sun has plunged beneath the horizon. And, as soon as the cloud-screen is withdrawn, vigorous evaporation from the saturated earth carries on the tempering and cooling work. This, in reality, is why it is that a land, lying mainly within the 30th parallel of latitude, boasts a yearly mean temperature of 64·71 degs. at an elevation of 2,000 feet, and of little more than 69 degs. at the sea-level. The heat is, so to speak, transmuted into vegetable energy, instead of being inflicted as free and accumulative caloric upon the land. In this approximately tropical country there are not more than fifty days in the year in which the temperature rises, at the city of Maritzburg, to 84 degs., and not more than twelve days on which it rises to 90 degs. There are only about eight nights in the year on which the temperature does not fall to 70 degs., and there are 200 nights in the year in which it falls to 60 degs.

It is somewhat to be regretted that time does not allow this analysis of the climate of Natal to be pursued on this occasion through the opposite half, or winter season of the year, when nature's chief aim seems to be to encourage and use sunshine, and to elevate the temperature. All that it is possible here to say is, that the same natural agency is carried on, but in a much less energetic degree. The landslope is warmed, the moist sea-breeze maintained, and in the late afternoon cumulus clouds are heaped together over the higher hills and mountains; but the atmospheric upcasts are not established, and the thunderstorms not fully developed. The rainfall at 2,000 feet of elevation, for the six months intervening between April and September, is six inches, in the place of twenty-four. During each of the two mid-winter months only one-fourth of an inch of rain may be looked for, and rain may be expected to fall on only three days. In the months of April, May, August, and September rain may be expected to fall on eight days, and nearly one inch and a-half may be looked for. The exact rain-fall for these months, taken from the mean of eight years at an elevation of 2,000 feet, is as follows:—

April	1·44	inches.
May	0·95	„
June	0·26	„
July	0·23	„
August	1·14	„
September	1·32	„

The months of May, June, July, and August are periods of almost unbroken genial sunshine. The mid-winter June of Natal very nearly indeed resembles an exceptionally fine mid-summer June in England, excepting that the longer nights, of 14 hours' duration, are fresh and cool. The mean temperature of this season is 60° at a height of 2,000 feet, and nearly 65° on the coast. The temperature commonly rises above 70° each day. There are only eight days in the year on which the temperature does not rise to 60°, and scarcely 20 nights in the year in which it falls below 40°. The self-registering thermometer only marked a freezing temperature, at a height of 2,000 feet, five times in a period of eight years, and the greatest cold recorded in that period was 29°.

During the mid-winter season the grass gets coarse and dry, and the face of the country would be russet and brown, were it not that it is made black instead by the prevalent custom of burning the dry herbage. The rivers and water-courses, however, never dry up. There is always enough mist on the hills, in addition to the lessened rainfall, to secure this result, and make all but the smallest streams perennial. Deciduous trees, like the white mulberry, are not more than six weeks bare of leaves. The gardens are kept full of bright flowers all winter long, and food crops can be reared, even in these months, by the judicious practice of irrigation. Indeed, crops that require dry harvesting, like wheat, thrive best when grown under this management in winter.

Sufficient reason has been given, in the preceding statement, for the presence of sugar, coffee, arrowroot, the banana, the pine-apple, and the orange in the plantations of Natal. The approximately tropical position of the colony, and the provision made by nature for abundant and frequent rainfall during the season of greatest heat, amply explain the successful cultivation of those productions. But it yet remains to show how it is that wheat, the root-crops of temperate climates, and cattle, sheep, and oxen are also at home in a land which is thus suitable for tropical produce. The key to this seeming anomaly is found in the physical configuration of the country.

It has been already intimated that the colony of Natal is, properly, merely the bevelled or sloping rim of the great table-land of the African Continent. This table-land is, in the main, reared more than 6,000 feet above

the sea. At the north-western frontier of Natal, this table-land dips by a sudden precipitous fall, or step, of a few hundred feet, and so forms a kind of land-ward bulwork for the colony. From the lower grounds of the colony it is not possible to perceive that this is merely a ledge, or the perpendicular face of a step. It looks like a true mountain ledge, and is distinguished by the name of the Drakenberg mountains. On the north-west the frontier of the colony is a jagged and precipitous mountain bulwark; on the south-east it is the sea. A strip of country, about 150 miles long, and varying from 130 to 160 miles broad, between the edge of the high African table-land and the Indian Ocean, is thus the territory of Natal.

From a salient point in the southern stretch of the mountain frontier, there issues a great spur, which crosses the entire midland region of the colony, from side to side, and forms there a central upland, or hill region, which, for the greater part of its course, has scarcely an inferior elevation to the Drakenberg mountains themselves. The high road from the port to the interior crosses this central upland at a height of 5,400 feet, 70 miles from the sea, and the hills which surround the pass rise several hundred feet above the road. Seaward, this central mountain region subsides to the coast by parallel but somewhat sinuous fingers, or ridges, that have distinct water-channels or river-courses lying between them. But in the opposite direction it dips into a broad depression or basin of large extent, which is drained by a single river system, and which will again claim attention, for a specific reason, presently. As, therefore, the traveller leaves the port, to make his way into the interior of the colony, he begins to climb, and his climb is so sharp that he is more than one mile high when he is seventy miles on his journey. Here, then, is the explanation of the sheep, the horses, the cattle, and the temperate productions of the colony. The influence of rise above sea-level in lessening temperature, is too familiar a phenomenon to need special exposition here. Everyone knows that all the lofty mountains of the earth are capped with eternal snow. The sugar, the coffee, and the luxuriant evergreen vegetation in Natal are confined to a breadth of some sixteen miles of land bordering the sea. In advancing inland, at a distance of about 16 miles from the shore, and at an elevation of 800 feet, the bananas, the pine-apple, the sugar-cane, and the luxuriant tropical vegetation disappear, and hills covered with rich open pasture, or occasionally clad with a thinly-scattered bush of the thorny *mimosa*, take their place. It has been seen that at Maritzburg, which is 2,000 feet high, and something more than 40 miles in a direct line from the sea, the mean annual temperature is 64 and a-half degrees, instead of 69. Further inland and upland the mean temperature, of course, falls still more. In a letter printed in the *Field* newspaper, of the 26th of December last, an old colonist, who has been long settled on the higher slopes of the great central hill region, thus writes of the climate experienced there:—"The climate here is most agreeable and bracing. In the winter we have occasional snow-storms, and I have once or twice seen the snow more than a foot deep. We have frost almost every night for three months, more or less. Even during the summer the heat is seldom, if ever, oppressive. I have never known a hot night; and during a period of ten years I have never been more than twenty nights without a fire in the grate of an evening."

The midland districts that lie about the city of Maritzburg are very agreeable, and are well adapted to the general purposes of mixed farming. But the most valuable grazing grounds are found still further inland, and at yet higher elevations. The general range of the country in these higher regions is open and unsheltered pasture. The forests of the country are confined to the coast, and to the sides and tops of the higher mountains, where a considerable abundance of large trees of the genera *Oreodaphne*, *Pteroxylon*, *Podocarpus*, *Olea*, and of other valuable timber-yielding evergreens are found.

In now passing on from causes to effects, and glancing at the industrial prospects of this very remarkable land, so far as time and present circumstances allow, it may be necessary to premise that the task of speaking of the industry of a young land is always a delicate, and, in some degree, a difficult one. The country is so thinly occupied, and the results attained by settlers are yet in so experimental and early a stage, that it is not easy to strike an altogether safe balance between conflicting statements. There is yet no statistical science to fall back upon; and personal testimony is of no use, because it may be collected to prove just anything you please. It relates quite as much to the qualities, tempers, temperaments, abilities, and defects of men, as to the character and capabilities of the country. One man will tell you that his lambs will not skip; another that they all have weak legs; and another that they all die; while another man will state that he has no trouble with his sheep, that he scarcely ever loses an animal; that his sheep are highly remunerative; and that his lambs dance all day long. And so with each other branch of industry or pursuit. Perhaps the surest ground to take a first stand-point upon in dealing with this theme, is furnished by a series of facts which are patent to every one, and which can admit of no misconception. Twenty years years ago there was not a blade of sugar-cane in Natal, nor a single plant of coffee. The yearly export of sugar from the colony is, at the present time, nearly 6,000 tons. Several hundred acres are planted with coffee; hundreds of thousands of fresh plants are being put in the ground every year, and the oldest plantations are yielding 800 lbs. of berry per acre. Fourteen years ago there was scarcely a sheep in the colony; there are now considerably more than 200,000 sheep upon the hills; and the annual value of the export of wool, partly derived from the plains beyond the mountains, is £71,000 sterling. Horses are now being shipped as military remounts for India; and, after a period of fatal lung-sickness, the cattle of the colony are again multiplying by thousands yearly on the upland pastures.

Sugar was first experimentally grown in Natal in the year 1849. There are at the present time 10,000 acres under cane, and over 60 mills in operation, crushing the cane and manufacturing sugar. There seems to be no doubt that sugar can be as well grown in Natal as in the West Indies, or the Mauritius, provided the planter has the requisite capital and skill. Much of the soil is eminently suited for its production. The cane is occasionally touched with frost on low-lying plains, which seems to be more due to moisture than to actual cold, for the canes on the hill sides are not so affected. Many of the early planters in Natal have come to grief, not from any unfitness of either ground or climate, but because they have borrowed the capital with which they have carried on their work, at extravagant rates of interest. The best authorities I have spoken with, all seem to agree that careful, clever men may borrow a capital at £12 per cent., and grow sugar in Natal remuneratively and successfully; but that they must not expect the same success if they undertake to pay £20 or £25 per cent. for their capital. No doubt it must be a really able and capable man who can ensure success with even £12 per cent. to pay for capital.

Coffee is perhaps now the favourite object of industry upon the coast. It was first planted experimentally near Durban, twelve years ago; young plantations are now to be encountered everywhere, and there are a few fine plantations already in full yielding. The quality of the produce is very fine, and the average yield large. The Mocha variety thrives to perfection. The one thing which has militated, more than anything else, against the rapid extension of coffee plantations, is the unwelcome fact, that for four years the planter has to meet outlay without return; in other words, that he must have considerable capital to invest in his work. Some men of small means are, however, now gradually making their

way into coffee, by clearing and planting small plots only, each year, and making a return at the same time from the cultivation of other common crops, such as Indian corn, tobacco, and oat forage. The coffee is chiefly planted on the slopes of the sea-hills, where there is suitable soil and exposure, and where the primeval bush is cleared away to make room for the plantation, artificial shelter being provided for the young plants by establishing rows of orange trees at convenient distances. It is estimated, by competent authorities, that 500,000 acres of land in Natal, at least, are suited for the growth of coffee, but, in all probability, it will be yet found that it is possible to extend the plantations much further inland than was at first conceived, and that in this way another 500,000 acres will become available. It is confidently anticipated, that one day the entire so-called coast region of Natal will be one vast stretch of almost uninterrupted coffee plantation.

The tea-plant thrives in the same region of Natal as coffee. It grows and flowers readily and vigorously, but whether it will ever be found worth while to plant it largely for commercial purposes remains yet to be determined. Up to the present the experiment has been confined to a few hundred plants.

Arrowroot was one of the first exports from Natal. It was a great favourite with the early colonists, on account of requiring but little capital, and care rather than high skill, for its growth and preparation; and also because it flourishes in soil not equal to the support of tropical produce of greater delicacy and value. The great abundance and purity of the running water in the colony also have proved eminently favourable to its manufacture. Farina, of the value of nearly £6,000 sterling, is still occasionally exported from the colony in a single year. The chief consideration that keeps its production within narrow limits, is the uncertainty of the English market, and the readiness with which this becomes over-stocked.

Cotton has been grown again and again in the colony, but for various reasons has not yet firmly established itself among the accepted staples; at the same time the further statement must be made that it has not yet been cast aside. In the first place it requires for the collection of the fibre labour that is at once abundant, cheap, and certain. There is cheap labour in Natal, but it is of an uncertain character. It must also be added that nearly all the early experiments on its growth were made near the coast, and that there it proves to be very open to the ravages of insects, and inclines to lengthen out and fritter away its period of flowering, so that the harvest becomes tedious and difficult to deal with. Within the last few months it has been grown much more successfully in higher ground; in once instance, at between 2,000 and 3,000 feet of elevation. In this position the coolness of the night in the winter season seems to apply just the corrective that is required for the evil habit of desultory flowering. The value of the export for the last three years for which there are returns was respectively £2,646, £3,984, and £4,699.

Nothing has yet been done with silk, excepting in the form of small experiments. But the white mulberry plant is now at home everywhere in the colony, being very generally used for garden fences; and it grows with surpassing ease and luxuriance. It is indeed almost impossible to prevent fragments of the tree from vegetating. The general promise for silk in Natal is so great and obvious, that after a careful consideration of the entire bearing of the question, a gentleman, who has been long used to the management of the worm in China, has just sailed to give it an exhaustive trial in Natal, having made arrangements for the direct introduction of an adequate supply of the best Japanese seed. The only enemies that this gentleman at all fears are predatory insect life and thunder-storms, both of which he believes may be circumvented by judicious management. My own opinion is that silk under fair management will succeed. If it fails it will be due to some vexatious and trivial difficulty that it is not within the sphere of forethought to anticipate, and that only experience can discover, and not to any, at present, ascertained condition of climate or circumstance.

Tobacco will certainly some day be an export from Natal. It is already grown extensively, and of unexceptionable quality; and no other difficulty appears to attend its production excepting that it requires a good soil and skilful preparation. It would appear even now among the colonial exports, but for the fact that there is a very large demand for it within the colony. It flourishes both in the coast district and in the uplands. One of its cultivators, writing from the coast, within twenty miles of the port, says, "Tobacco is doing so well for me that I feel constantly an ever present dread that it must shortly fall off. I continue to find a sale for all I can make, that is about 320 lbs. a week, and it pays me a good profit. Besides cavendish, which I manufacture, I sell about 100 lbs. per week of the leaf." A second successful cultivator carries on his operations 80 miles above Maritzburg, and 130 miles inland from the coast.

The sheep of Natal at the present time constitute a very important part of its quadrupedal interests. They have, of course, no place amidst the plantations and pineapples of the coast. But they have certainly already managed to establish themselves on the hills. Before the year 1855 the woolly fleece was not seen in Natal pastures. The only sheep known was a brown hairy creature, belonging to the natives, a variety of the Siberian goat, or Mouflon, of no value excepting for its mutton. In the year 1855 the Dutch farmers suffered so severely from the occurrence of epidemic lung disease among their herds, that the bright, and, as it has proved, fortunate, idea occurred to them of endeavouring to have a second string to their bow, and they accordingly brought down flocks from the old colony to mingle with their herds. There is scarcely a farmer in the uplands now who is not more or less a flock-master. Some of these complain of frequent losses and deficient profits; others are loud and constant in their reports of prosperity and success. The real truth of the matter seems to be that sheep only do well in Natal at a tolerably high elevation, but that elevation of the land is not the only thing that is required. There must also be good drainage, good unretentive subsoil, and suitable grass. The rocks of Natal, like those pretty well of all the South African continent, are tumbled about in a perfect chaos of confusion. Hence the precise mineral and physical characters of the subsoil vary exceedingly within very limited range. But in addition to this, on account of the peculiarity of climate, which has been already dwelt upon, the natural grass is so luxuriant during one portion of the year that it is capable of feeding many sheep to the acre; while during another and more limited portion it is so dry and coarse that it takes many acres properly to feed one sheep. The inference is obvious, that sheep farming in Natal will ultimately consist of the rearing of comparatively small flocks in connection with general tillage of the soil, as is done in England, rather than in the possession of unlimited flocks roaming wild over the prairie. There is now no doubt that where this system is pursued, artificial food provided, and due skill and care exercised in the selection of the farm, and in the management of the stock, sheep will prove a most marked and important element in the Natal settler's prosperity.

There are certain farms in the uplands of Natal where horses are bred in considerable numbers, and with marked success. They are liable to fatal epidemic disease on the low-lying lands of the coast. An export trade is at the present time in process of establishment with India, where the Natal horses are in great favour as cavalry remounts and chargers. The Natal horse is a descendant of the Cape breed. He is plain about the head; but, as a rule, hardy, courageous, gentle, and full of endurance. The horses in military service readily carry 17 stone 35

miles a day, upon an allowance of 10 pounds of Indian corn and what can be picked up from the open pasture. In one instance, in the year 1865, a company of the Cape Mounted Rifles, on service in Natal, marched 90 miles in 25 hours—seven hours through a heavy thunderstorm—with only one halt, each horse carrying 17 stone, and there was not a case of either sickness or injury, the horses all coming on parade the following day quite fresh.

The cattle of South Africa have so long been an institution and a power, as well as a name, that, fortunately, it is not necessary to say much about them. Natal in this particular more than equally shares the good fortune of its neighbours. The luxuriant grass of the Natal pastures is eminently adapted for the creation of beef. The old colonist, whose letter has already been alluded to, bears a very emphatic and noteworthy testimony upon this point. He says:—"This country"—24 miles from Maritzburg, and 5,000 feet high—"is eminently healthy for sheep, horses, and cattle. A draught ox, worked a dozen years in the yoke, and nothing but skin and bone, turned out in our pastures for a summer's run, shall, in the autumn, be sent to the butcher's as fat and heavy as any stall-fed ox at home; and, what is more, he shall not cost his owner one shilling in the process. He is simply turned out to grass, and let alone till the day he is driven to market." The only drawback to the feeding and rearing of cattle is that they are now liable, as in England, to occasional visitations of the epidemic lung disease.

It is not possible upon this occasion to say much that might otherwise be told of various food crops that are reared from the Natal soil. The Indian corn is the grand food staple of the colony, and grows everywhere in the utmost luxuriance. It is indeed a most valuable grain, being literally good alike for man and beast. Wheat grows readily in the uplands. It is somewhat liable to rust when harvested in the hot summer, but may be easily and certainly ripened in the sunny winter by the practice of irrigation. On account of this difficulty of season, enough is not yet cultivated for the home supply of the colony; but there is no doubt that some day, as agricultural hands multiply, it will form a large export. Oats and barley grow even more readily than wheat. The former constitutes the principal forage of the country. The turnip makes a very good appearance on the hills. The beetroot is entirely at home; and on some of the rich bottoms of the upland valleys swells into almost Brobdignagian proportions. In one instance recently reported by Mr. Shepstone, the Secretary for Native Affairs, some Silesian sugar beetroots, belonging to a gentleman named Landsberg, in unmanured ground, but under winter irrigation, produced at the rate of not less than 170 tons per acre.

There is still one other important feature that I must present to notice before I can be said to have fairly placed before the Society the "industrial prospects" of the young colony of Natal. It will be remembered that allusion has already been made to a broad basin drained by a single watershed, lying northwards, or beyond the great central elevation of the colony. Now for a considerable time it has been known that there are large deposits of coal in this basin. The rivers cut through coal in certain places, and in others fine seams, three or four feet thick, are seen running into the faces of the hills. The waggon-drivers fill sacks as they pass along the roads, and carry them to the towns for the use of the blacksmiths. Now it has been thoroughly ascertained that there are very large quantities of this coal; it has been traced through a wide extent of country. It is also certain that for some purposes it is of very excellent quality. The blacksmiths use it continually in preference to anything else they can get. It burns well on the domestic hearth. It yields a brilliant and pure gas. The only practical question that has not yet been decided regarding it is—whether it is really good coal for the purposes of steam machinery. No sufficiently large trial has yet been made of it to determine this point. The simple reason for this is, that the locality where the coal has been hitherto chiefly procured is 130 miles away from the city, and 180 miles away from the port. Now, transport of a heavy material, in a land circumstanced like Natal, for one hundred and eighty miles, means a payment of something like ten shillings per hundred weight! The Government has now made arrangements, nevertheless, to bring down some twenty tons of the coal, and have it fairly tested on board the Government steam tug and the mail steamers; and a careful geological survey of the district will most probably be carried on simultaneously with such trial. Traces of carboniferous deposits are found in other more easily accessible parts of the colony. Among them, in two or three places on the coast, within a few miles of the port. In all these instances, however, the find is more of the nature of a carboniferous slate than of a true coal. Very thin seams of coal are enclosed in thicker layers of earthy matter, and the whole may be made to give out considerable heat under a strong blast, but does not burn freely and readily. The fact seems simply to be that there is a good *à priori* case for the anticipation that the upland coal will be found to be honestly allied to the valuable upper coal measures of England, and that the broad basin of a single watershed is a coal basin in the proper and technical sense of the term, but that it is equally probable that the coast deposits are allied to the older and lower carboniferous slates, which are useless commercially and economically. As a general rule, in South-eastern Africa the older rocks are prominently developed along the coast, and sandstones of younger geological age are found inland. But this rule, in the present instance, can by no means be entirely relied upon. Throughout South Africa the foundation rocks of the earth have been so rolled and tumbled about that there is no certainty anything geological may not be found anywhere. Granite and gneiss and old silurian sandstones form the shore-rocks along the coast of the newly-annexed county of Alfred, once known as Nomansland. But, at the extreme limit of this region, between the boundary river, the Umtamfume, and the next stream the Umzumbe, and also a short distance within the Umtamfume, there occurs along the shore a limestone deposit filled with organic remains of comparatively modern age. At low water the surface of the wave-worn rock may be seen to be sculptured in relief with these remains, and the caves hollowed in the sea cliff have them also embossed in their walls and ceilings. Among these remains the most abundant and characteristic forms are a giant muscle, or pinna, three feet long, ammonites, terebriœ, trigoniœ, and a very beautiful spiral shell, apparently allied to the chemnitzia. The formation is obviously of the age of the oolite, or perhaps even of the more recent chalk formation of Europe. No one, therefore, can yet undertake to say that fragments of the upper coal measures cannot be found in the coast district of Natal.

In the meantime it is obvious that the work immediately under the hand of the colonists is to see what they can do with the coal which is, rather than to enter upon what may prove a wild goose chase after the coal that may be. The country lying between the port and the coal-field is difficult, on account of the steepness of the gradient, and the presence of the great central highlands; but it certainly is not inaccessible. What the colony needs is a cheap railway, of the nature of the lines that carry slates in a similar country, from the quarries, to Port Madoc in North Wales, made and worked with great economy, and purposely limiting its rate of transport to something like twelve miles an hour. A railway of this character from the port to the city, if made by the government itself from its own resources, without outlay for promotion and other collateral expenditure, would not entail a yearly cost upon the community of more than some £8,000, even if it yielded no revenue. But it is not possible to doubt that the revenue

between the port and the city would, even at the present time, exceed this estimate. If railways of this character can be carried into Natal, they will extend themselves, and the coal will soon be reached through their own inherent vitality. But their primary and most immediate function will obviously be to open out the country, and to create their own traffic and profit. Expensive systems of railway, with fast traffic, could not for some long time to come be carried out and supported by this young colonial community; but cheap and slow railways, of single line and narrow guage, constructed and worked with the most rigid economy, could be made even now, and extended, too, from year to year. The immediate growth of the prosperity of this interesting colony, indeed, more depends upon the accomplishment of this object than upon anything besides. The attention of the colonial government is, at the present time, well fixed upon this consideration, and the lines of country most available for railway traffic are being carefully examined and surveyed.

It is matter of old and familiar knowledge that there is a fine land-locked harbour at Natal, readily accessible to vessels of moderate burden, but inaccessible to larger ships, on account of the presence of a sand-bar across its outlet. A considerable outlay has already been made to improve the accessibility of this fine natural harbour by engineering works. But difficulties have been encountered which were not at first anticipated, and modifications of the original plans of work have had to be made. A railway has been carried from the works to a stone quarry within easy reach, and it is expected that within a couple of years a permanent opening and deepening of the outlet of the channel will have been effected. Vessels in the inner Bay of Natal lie in smooth water, protected from the sea by a splendid range of hills, 300 feet high, and terminating in a fine sea-bluff.

In conclusion, it must be stated that in addition to a fine and varied climate, good soil, and a convenient physical configuration, abundant rain, deposits of coal, and a useful natural harbour, Natal has yet one other advantage, that could not be left altogether without allusion, even in this brief sketch;—it has a numerous native population, to a large extent available for cheap labour. There are at the present time only 17,000 white colonists in Natal, yet there are nearly 200,000 blacks, or Zulu-Kafirs. These people live in a rude way, under native chiefs, who are amenable to the magistrates and the Government. They are, in the main, a gentle and orderly race, although as yet, for the most part, barbarous, and pay taxes to the Government, for the protection and advantages that they receive. They are not essentially warlike. The martial development of the Zulu era was a mere accident in their history—the impress of the life of one energetic and ambitious chief upon the tribes around. They do not take readily to hard work, but many thousands of them now engage themselves in daily toil, under the resistless inducement of English silver and gold; and more will continually do so as artificial wants are created by their contact with civilisation. These Kafirs are properly not negroes, but a mingling of negro organization with some higher type, most probably derived from the Highlands of Abyssinia. They are superior to the pure negro, both in character and capability. They can be trained into excellent mechanics; they make excellent herdsmen and ploughmen. Some of them are acquiring property of their own, and taking to civilized life in upright, square houses of European form. I know one man among them, named Nembulo, who has purchased a steam sugar mill for himself, and who works his own machinery.

Although there is this abundant reserve of cheap native labour to draw upon, it must be understood that it is not entirely available for colonial enterprise, nor as constant and reliable as is to be desired. Those Kafirs who do engage in work, work fitfully and uncertainly, and for limited periods, and many will not work at all. They do not yet feel that dire necessity which says ruthlessly to the labouring class in older communities, "labour or starvation." A very few days or weeks of work gives to the Kafir enough means to live in what to him is luxurious idleness for the rest of the year. On account of this unreliability of the Kafir, where steady and laborious operations have to be carried on, some 6,000 Indian coolies have been imported, under contracts for fixed terms of service, on the plantations; still, allowing to the utmost for this unquestionable drawback, there yet remains the underlying truth that there is, in the colony of Natal, a very great deal of very cheap, and at the same time valuable, native labour, which every employer may draw upon to a larger or less extent, according to his own tact and management. People who have been servants all their lives in England, at once employ native servants of their own in Natal. Artisans not uncommonly have Kafir attendants to carry and even to lift their tools for them. Many planters and farmers complain, and no doubt truthfully, that they cannot find labourers. On the other hand, there is at the present time in England one of the oldest and most successful of the sugar planters of Natal (Mr. Lewis Reynolds, by name), who states distinctly and unreservedly that he has at the present time 200 Kafir labourers employed upon his plantation; that he could double the number if he required to do so; that he has never had occasion to employ anything but native Kafir labour; and that, during fourteen years' experience, he had never, even for a passing occasion, been in want of a man.

It is a noteworthy fact, requiring a passing word of explanation, that a land possessing the virtues and attractions which have been here described has, nevertheless, only 17,000 European inhabitants, after 24 years of British occupation. The explanation is simply this. In the early period of its colonial history its land was given away to almost any applicant in large sweeps, and much of the land thus distributed was acquired at almost nominal prices by those who purchased it as a speculation, and who now hold it for sale at prices which it cannot yet realize. At a somewhat more recent date, the Imperial Government of Great Britain, ascertaining what the result of the first land grants in the colony had been, suspended all further grants; and so, during eight years, no land has been given away, and the most powerful inducement to immigration and settlement during that time has been kept in complete abeyance. It is now, however, among the industrial prospects of Natal that this has been changed. The Colonial Government has recently completed a well-considered arrangement with the Emigration Commissioners of the Imperial Government, which has for its base the granting of assisted passages and allotments of crown land to well-selected men who have some little means to begin with, and special training for agricultural and pastoral pursuits. In carrying out this plan of immigration and land-settlement, the colonial government is showing itself scrupulously, and even sensitively, anxious to introduce only men who are fairly sure to succeed, and to give every possible assistance and countenance to such men. In short, it aims at a slow, gradual, and organised, rather than hasty, promiscuous, and haphazard introduction of settlers. The operation of such a plan of careful selection must necessarily be gradual and slow; but there is every probability that it will be sure, and that as many good and capable men will now be attracted to Natal by these inducements, as will suffice to utilise the great natural advantages of the region, and to quicken and establish the commercial prosperity of the colony.

DISCUSSION.

Mr. Gillespie (who was announced by Dr. Mann as having just returned from Natal, and as being one of the oldest merchants there) said—having been appealed to by Dr. Mann, he might say he endorsed all that had been

said by that gentleman with regard to the climate and other physical features of this colony, which had been so well described in the paper. He had resided in Natal for eighteen years, and, with regard to the temperature, the highest he ever saw was 96 degs. of heat in the shade, and the lowest was about 35 degs. On an average the temperature in winter was 55 to 60 degs., and in summer, 75 to 80 degs. Of the up-country he knew very little, but he was able to state that the cultivation of sugar was now being carried on to an extent that would enable the colonists shortly to become exporters of that article instead of importers. Coffee was also largely cultivated, and the produce was superior to any that had been imported into the colony. Arrowroot was also taking a high place among the productions. The cost of the sugar was from £9 per ton to £12 per ton, considerably less that formerly. At the Cape, the Natal sugar fetched as high a price as that of Mauritius. Formerly the Cape would not take the Natal sugar because they said it was full of bees, which arose from the accidental circumstance of a large swarm of bees having on one occasion got into one of the sugar mills, and they were smothered in the sugar. Dr. Mann was mistaken in stating that coffee had been exported from Natal. This had only been done in sample, because the colony had yet a good deal to do before it could furnish its own supplies of that article. A large field was opened for its cultivation, and he had no doubt in a few years it would be exported. He was happy to bear his testimony to the general character of the climate, and he ventured to refer to himself as a pretty fair specimen of health after an eighteen years' residence there. He had had only one day's illness. Dr. Mann had scarcely done full justice, he thought, to the present state of Kafir labour. That gentleman left the country two years ago, and during that period a great change had taken place for the better. What had been stated with regard to the natives not staying long in one service was true, but he had never heard complaints of the want of continuous labour. Owing to the present scarcity of money, a great many Kafirs might not be able to obtain work, because there were so many coolies at hand, but he thought a person requiring a large amount of Kafir labour would have no difficulty in getting it, the wages being from 7s. to 10s. per month, and about the latter sum for food—making, on an average, £1 per month for wages and food. The Kafirs, he said, were very good labourers if they were well looked after. A great trait in the Kafir character was their extraordinary honesty. Anyone wanting to send money, on telling the Kafir what it was, might be certain of its safe delivery at its destination; and he knew of instances in which personal injuries had been received in defending property which they had in their charge. Unfortunately, civilization, in this case, as in others, brought some evils in its train, and the most dishonest among the Kafirs were those who were the most civilised. With reference to sheep rearing, especially, it was remarkable that one man was highly successful, while another followed that occupation at a loss; he could, however, only attribute the difference in the results to the want of that practical ability by which success could alone be secured.

Mr. Ryde said, from all he had heard of this colony from relatives who had gone out there, the great want was labour, and it was that want which kept Natal in its present comparatively stagnant condition. If English agricultural labourers were sent out there, before many months they found they could become farmers on their own account, and could make more profitable use of their time than employing it for the benefit of the capitalists by whom they had been sent out. The Duke of Buccleuch sent out 40 labourers and their families from the New Forest, in Hampshire, to Richmond, and before they had been there two years the whole of them had become Natal farmers, and most of them were now well-to-do people. In speaking of the healthy character of this colony, no mention had been made of the water. He had been informed that, although the water was plentiful, there was something in it which was not altogether conducive to health; and on so important a subject as that he should be glad to have a little information from Dr. Mann. He would also be glad to hear that gentleman's opinion as to the feasibility of making a railway from the Cape to Natal; he thought that was what was wanted to promote the success of Natal. He was afraid the harbour works were at a standstill just now. He would be glad to know which bank Dr. Mann would recommend people who were going to this colony to send their money to; and he would also be glad to be informed what was about the price of land in this colony at the present time.

Mr. G. J. Symons remarked that to an observer in these matters, the picture that had been presented to them of this portion of the African continent was an agreeable contrast to the old descriptions of that country, in which it was spoken of as a sandy desert, unproductive, with scarcely any traces of water. The more that continent was opened out by exploration the more those descriptions were falsified. With regard to the temperature of Natal, according to Mr. Gillespie, the maximum heat was, on an average, 96°; Dr. Mann gave it at 97°, which was a temperature not higher than was frequently experienced in England during the summer months. He presumed the higher temperature obtained at the higher altitude of the country.

Dr. Mann said, as a rule the higher temperature was at the higher elevation.

Mr. Symons said that was what he should have expected, partly in consequence of the diminished atmospheric pressure, and partly because the humidity of the air in the high regions would be less, and the amount of radiation greater. It was a remarkable meteorological fact, that in a country lying within 20° of the equator, they had a temperature which was not very much higher than in England. In the paper before them they had a very full, clear, and useful synopsis, not only of the climate, but also of the natural productions of one of our colonies. He had no personal interest in any of them, further than related to their meteorological conditions; but he would say there was at the present time a great demand for information of a thoroughly reliable character as to the climates of different colonies, as also of their products. There were but few means of comparing Natal with the Cape in these respects. He thought in a country like England, it was desirable there should be some central place where the records and observations of the meteorological conditions, &c., of our various colonies sent to the Colonial Department of the Government, could be consulted by those who contemplated emigration to, or opening commercial speculations with, one or other of them; and he thought the Council of this Society, in originating, if possible, something in the way of a series of reports on the climates of our different colonies, would be doing valuable service.

Mr. P. L. Simmonds, while bearing testimony to the importance and interest of the paper by Dr. Mann, quite agreed with the last speaker in the want of some central accessible depository for information on the climate and resources of the several British colonies, where all published works, maps, statistics, &c., could be referred to. Great ignorance as to the geography, meteorology, revenue, ratio of wages, &c., in our colonies, prevailed, not only in this country, but especially on the Continent. While officially engaged last year at the Paris Exhibition, he had been continually applied to by different learned societies, journalists, and individuals of all classes, for recent statistical details as to the meteorology, population, and production of wool, gold, cotton, and other staples in the colonies. Recent maps and atlases from the colonies were especially sought after. Many years ago, when the colonies had not attained to that wealth, importance of production, and extent of population which they now presented, they had in London their Colonial Society, Colonial Club, *Colonial Gazette*,

and *Colonial Magazine*. Now, when all these were more essentially necessary, there was no general organ of publicity for the colonies. The Society of Arts did what it could by inviting papers on colonial topics and opening the columns of its *Journal* for discussion, but the sphere of the operations of the Society embraced a wide range of other subjects, which had to be dealt with from time to time, and hence full justice could scarcely be done to colonial interests. Passing from this subject to the colony which had occupied their attention this evening, he might state that it was one in which he had always felt great interest, and in which he had many friends. Even in the four or five years which had elapsed since the paper on Natal, by Mr. Robinson,* had been brought under the notice of the Society, the colony had made great progress, looking at its limited European population. Its sugar production was remarkable, and at all the International Exhibitions, in London, in 1862; in Dublin, in 1865; and in Paris, 1867, Natal had made a most creditable display of its varied resources, and received due honours from the several juries.

Mr. Mackenzie apprehended that one purpose of the present paper was to make known to the public the great advantages which Natal possessed for the emigration of the surplus population of this country. With regard to the remarks which had been made as to inducing the English labourer to go to our colonies, he entreated those who took an interest in that subject not to restrict their attention to those persons who possessed small means of their own. At present there were not sufficient inducements to the agricultural labourer who had not £10 or £20 in his pocket to emigrate to our colonies. As regarded some of those colonies, the restrictions that were imposed made it impossible for the class of labour which would be most valuable to emigrate to them, because it was required that persons should have £5, £10, or £15 in their possession, or else that they should pay part, at least, of their passage-money, while America imposed no such restrictions, which he believed had been the cause of drawing so many of our English and Irish population to that country. He had no doubt our colonies would have enjoyed the advantages of the great tide of labour which had been poured into America if we had held out the same advantages as that country had persistently done. He submitted it was desirable to hold forth the most liberal inducements for emigration to our colonies, even if it were done by a self-imposed tax by the colonists themselves, to furnish means for bringing in several hundreds of our labouring population every year. He went entirely with those who thought the introduction of the railway system was essential to the progress of a colony like that under consideration. He did not mean an expensive railway, at a cost of £25,000 a mile, but a mere tramway, of a light description, narrow gauge, and single line, as a means of intercommunication at low speed between the highland and the coast, both for passengers and produce. His opinion was that until a railway afforded a means of inter-communication, the prosperity of this colony would not be commensurate with the great natural advantages it possessed; and he believed if the colonists could obtain a government guarantee upon English capital for that railway, for every pound that was so expended there would be a return tenfold. Mr. Mackenzie then averted to the desirability of establishing in the City of London a Colonial Hall of Commerce, where gentlemen could meet together for the interchange of opinions and information relative to all our colonies, and as a rendezvous for those colonists who occasionally visited this country. An endeavour, he said, was made some time ago to establish such an institution for the colonies of British North America, but it did not meet with sufficient support, partly, he believed, because it was restricted to those particular colonies.

Mr. W. C. Sargeaunt (Crown Agent for the Colonies) said he fully endorsed what had been said by Dr. Mann with regard to the Kafir character, as also what had fallen from his old friend Mr. Gillespie on the same subject, and it was with a feeling—if not of surprise, yet akin to it—that he had heard this confirmation of the opinion he had always entertained with regard to the Kafir as a labourer; because, when he left Natal, in 1857—and, in the life of a young colony, ten years was a long epoch—he recollected the unfavourable manner in which his opinion was received, that the Kafir labour would be found very valuable to the European colonist. One gentleman had asked about the water, and assumed that there was something the matter with it. He (Mr. Sargeaunt) had travelled in Natal a great deal, and he always drank the water from the natural streams without experiencing any ill-effects upon his health. With regard to another question, viz., to what bank in the colony people would send their money, he could only say, in his official capacity, that if anyone went to him, he should be willing to give him all the information on that subject which his experience of the colony enabled him to do.

The Chairman, in closing the discussion, said he had listened, as all present must have done, with great interest to the paper. There were, however, one or two points on which he should have been glad if Dr. Mann had been a little more explicit. All who knew anything about colonization were aware that the great want was labour. It appeared there was a certain amount of indigenous labour to be obtained, of that inferior character which was furnished by a semi-barbarous people, but still useful to a certain extent; but, notwithstanding this, there was a great demand for European labour. He should be glad to hear the rate of wages which were paid for European labour, because in the Australian colonies, where meat was so cheap that a leg of mutton might be bought for a shilling, ordinary mechanics were paid 10s. or 12s. per day for their work. Then with regard to the land regulations, he should like to know the price of the land, and the terms on which it was obtained. In Canada and the American and Australian colonies there was a competition between the administrations of the different colonies who should furnish land on the best and cheapest terms. He was satisfied, unless they organised a good system for the acquisition of land in these colonies, they would never induce emigration to them to any great extent. With regard to railways, he knew the general opinion was in their favour in our colonies; yet, in almost every instance, railway enterprise in these regions had been a failure. Look at Canada, with its three millions of population; look at Victoria, exporting ten millions of gold annually; there the railways, excepting in the larger centres of population, did not pay, whilst those in New South Wales barely paid the working expenses. They had expended three or four millions of money, and the colonial government had encumbered itself with a debt which it would take years to pay off. He was afraid, if the development of this colony was to depend upon the establishment of railways, it would be long postponed; but he did not think it was dependent upon that, nor, apart from the other industries within it, did he look for much results as a sheep-rearing and wool-producing colony. With regard to the present stock of sheep—calculated at 200,000—there were individuals in Australia who themselves possessed more than that number. Neither the climate nor the physical features of Natal appeared to him to be adapted to extensive or successful sheep farming, experience having shown that, instead of flourishing best in wet and mountainous countries, low, flat, dry plains were most congenial to sheep. There was one species of industry which he thought was promising, viz., the cultivation of tea. It had been successfully cultivated in various parts of India, and it was a sort of labour which might be supposed to be not distasteful to natives. He never heard of these great colonial dependencies without feeling deep anxiety and regret that the capabilities of these magnificent regions were not more

* *Journal*, vol. xi., p. 424.

generally known and appreciated in this country, because there was in them every material for furnishing happy homes, prosperous lives, and the means of subsistence to countless numbers of our fellow-creatures. It was evident that the growth of population in England was greater than the means of their support, and emigration appeared to be the only present resource for the relief of much of the agitation and political excitement by which the country was now disturbed; those people now struggling with want, and pining in a state of discontent, might be transferred to those beautiful regions which are the property of the British nation, where they would have the means of being useful to themselves and to the generations which followed them. He quite agreed that it was worth an exertion on the part of the colonies to furnish the means of free emigration to that class of labour which they most stood in need of. The Australian colonies had spent millions in providing free passages to their emigrants; and if their friends in Natal spent a few hundreds a year in that way, it would, in his opinion, be more profitable to them than railways, and would better develop the resources of the country. He would conclude by proposing a vote of thanks to Dr. Mann for his admirable paper.

The vote of thanks having been passed,

Dr. MANN, in acknowledging the compliment, said so many topics had been touched upon in the discussion, that he could only refer to the more important of them. With regard to the water of Natal, in his personal experience no country could have finer water as a general rule than was there met with. The fact of rain falling every other day showed that there could not be much stagnant water, which would be injurious to health. He believed what had been alluded to was that in some districts worms were produced by the use of stagnant water; but that was very exceptional. With regard to metalliferous deposits, he might state that some veins of copper ore had been discovered, and he had no doubt it existed in considerable abundance. With respect to the present price of land in the colony, it was regulated by what was called a government "up-set" of £4 per acre for the upland; on the coast it would command a higher price. The public revenue of the colony was, at the present time, about £140,000 a-year. It had been considerably above that, but the reduction of the revenue was due to the stoppage of imports, owing to the merchants having traded considerably beyond the immediate requirements of the colony; consequently the public revenue had fallen off. The reason why more had not been done by the colonists hitherto in the way of importing European labour, was the want of the necessary funds for the purpose; but he was happy to inform the chairman and the meeting generally, that the sum of £5,000 had been placed by him, on behalf of the colony, in the hands of the Emigration Commissioners for sending out that class of labour which was most wanted there. He (Dr. Mann) came to the conclusion that the only way of dealing with the case was, for the colony to provide a floating capital of £20,000 or £30,000, to be employed in sending out selected labourers and their families, furnishing the passage money and the necessary requirements for twelve months after their arrival, the advances by the State to be repaid by instalments. In that way it was hoped slowly but surely to supply the want to which reference had been made. The wages of mechanics generally were from 7s. to 10s. per day, and, for the most part, they had full work. The artisans drank pale ale at 18s. per dozen; many of them had two Kafir servants to carry their tools; and some rode on horseback to and from their day's work. He had himself paid £420 for building a small library at his own house. The cost of living for artisans in Natal, for the ordinary necessaries, was somewhat less than in this country, meat being from 4d. to 7d. per pound, and flour was a little cheaper than in England. Luxuries were somewhat dearer. Reverting to the question of the sale of land, Dr. Mann added that it might be bought under the Government regulations in freehold allotments of 200 acres, and 400 acres more were reserved for four years, which might be purchased during that period, at five shillings per acre; smaller allotments were disposed of to persons of more limited means. With regard to railways in this colony, he agreed in the main with what had fallen from the Chairman; at the same time an expensive class of railway was not contemplated. He had gone into the matter with practical engineers, and he had sent out plans for a railway to be made at the cost of about £2,000 per mile, for a speed not over twelve miles an hour, which would answer the purposes of the colony. With regard to tea, the cultivation of it had been commenced in several different parts of the colony, and he had no doubt the anticipations of the Chairman in that direction would, before very long, be realised.

SULPHUR AND ITS REFINING.

By CHARLES N. ELLIS, F.C.S.

Sulphur mines abound nearly all throughout Sicily, but, as the Sicilians have neither roads nor railways, those only are worked situate in the neighbourhood of a port, that is, in a radius of 40 miles, because the transport comes too dear. The transport is generally carried on with donkeys or mules as far as a high road, and then by small carts, which hold from 10 to 14 cwt., or direct to the port, the carriage of which costs from 1-8 tari per cantaro of 175 rottoli (= 1·75 cantaro ordinary).

Sulphur mines are generally situated in the hills, being found and worked in the crudest manner possible. If, from indications of sulphurous water or other appearance, a man supposes there is sulphur, he begins to dig a hole. If he is successful in his search and finds sulphur, well and good; if not, he gives it up. Should he be successful, he hires a capomaestro (*i.e.*, a master who has apprentices under him, or young workmen), a sort of small contractor, with some five or seven lads, who digs out the hole, and the boys carry away the thrown-out material in small baskets on their shoulders (containing from 30 to 40lbs.). The ore is dug out, and when a sufficient quantity is thus obtained a ring of stone is first built, from 20 to 50 feet in diameter and ten feet high, with a slanting floor. This is then filled up with a very high cone with ore. It is then thatched with earth outside. This is termed a "calcarone." It is then set fire to at the top and burns downwards. When it has burnt for about a fortnight they then tap it at the bottom, and let the sulphur run out into forms made of wood—rinsed out with water (the water answering like buttering a pie dish, &c.), and you can turn it out when cold without sticking to the mould—called "battate," of about one to two hundredweight each.

There are, of course, large mines, where seventy to one hundred capimaestri are employed with their boys.

If water is met with, a drain is either built under the mine (which is very expensive), or it is pumped out with drums, which is very inadequate, consequently most mines with water are given up.

Some mines there are with steam pumps, which have seldom done well, for the following reasons:—

1st. The English drivers were drunken fellows.

2nd. The proprietors would not sink shafts.

3rd. If there is the least thing wrong in the machinery, repairs cannot be done on the spot. If sent for repairs to ———, much delay is caused by the dilatoriness of the foundry officials, and when the things do arrive they do not fit. They have then, at last, to send to England, consequently nearly a year's time is lost.

But most of the mines are worked by people without means, who, of course, cannot afford to buy machinery, and, what is very extraordinary is, that the richest mines contain water. This water does not appear to rise from

wells, springs, &c., but is chiefly caused by the heavy penetrating rains of winter.

It is but rarely that mines can be bought, as nearly all the land belongs to nobles, who reside in Palermo, and who let their mines at the rate of from 15 to 45 per cent. of the produce.

Thus, as things are carried on, it requires but little capital; but, with a good capital, I am convinced a very good business would be done, so as to net not 10 to 20 per cent. on the outlay, but a good deal more.

Let us suppose a man with a capital of £100 takes a mine, and engages some capi-maestri with their boys; he pays them, perhaps, once a month, or more seldom, and according to the number of "casse" of ore they have worked out; he then at once sells sulphur for delivery, either at once, one month, three, six, nine, or twelve months, and receives perhaps one-third, half, or the whole price, but of course suffers heavily, for the merchants won't lay out their money for nothing. The sulphur is then deliverable at the port, where there are stores which receive it, where the carriage is advanced, for which he pays again from 2 to $2\frac{1}{2}$ per cent. in sulphur.

This is a brief sketch of how the Sicilians carry on sulphur mining. As a profitable investment I should recommend boring to ascertain where the greatest quantity of ore was to be found—if a mine not already in work be obtained. A company with a capital of £20,000, with part paid up (or private firms for their own consumption in England, with overplus for sale), would be amply sufficient, at all events for a commencement. The great thing would be to have pumps that do not easily get out of order. There should be a blacksmith's forge, with a fitter, a man who thoroughly understands the working of pumps, and could do all repairs when out of order, and a general manager who has a good general practical knowledge. Steam engines of 10-horse power, or even less, where the work cannot be done by mules, I should think would be the best. The engines should be of such a kind that they can be easily transported and put together; no part should weigh more than $3\frac{1}{4}$ cwt. or thereabouts, as perhaps they would have to be transported to their destination on the backs of mules, depending entirely upon the situation of the mine; these things managed, all the rest is easy.

There are hundreds of mines ready for work, and there would certainly be a good dividend the end of the first year. Here I should observe (Girgenti) that the mining goes on all the year round, but the burning only from the beginning of June, when the harvest in the neighbourhood is over, to the end of October, when the sowing season commences, else one has to pay damages. A mine with water would be let at from 15 to 25 per cent. for a number of years. "Calcarone" are generally made of from 200 to 600 "casse" of ore, and a "casse" weighs (more or less) about six tons, and produces from 12 cwt. to 16 cwt. of sulphur; the fusion of such a calcarone lasts about two months.

There are, of course, preliminary expenses, such as finding veins, building calcarone, making of passages or sinking shafts, engines, coal, &c. For other charges the following may be taken.

Say a mine, producing 25,000 cantari (175lbs. per cantaro)—about 1,154 tons, at 13 cantari to the ton, would require for administration as follows:—

1 Administrator, paid at the rate per ann. ..	£75
1 Capo maestro (species of mining engineer) ..	40
1 Accountant	40
2 Measurers, each £30 to £35	65
1 Policeman	25
Total	£245

The miners with their boys are paid according to the situation or richness of the mine, at the rate of 45 to 60 tari per casse (or even less, a taro = 4d.), but this includes all charges, as follows:—

Administration	£240
2,500 casse of ore at 50 tari	2,083
I assume for general expenses, such as finding, building calcarone, &c.	500
	£2,823

From 25,000 cantari* deduct 25 per cent. for proprietor; this would leave 18,750 cantari, or worth 9 tari per centaro; at the mines for best seconds, about 18 tari.

But, of course, one must make allowances for many other expenses, and for accidents, such as part of the mine falling in, &c., calculations differing at every mine, as also the qualities. There are, however, a mine or two which might be got close to the sea-side, which would produce 50,000 cantari of best seconds, where the sulphur could be embarked without charges, and might be got by good parties for 22 per cent. for nine or eighteen years, and no damage could be done in the neighbourhood. No doubt they would require pumps, but in other respects they are in working order. I have been informed that close to Girgenti there is a coal-mine, or rather a mine of schist, containing a kind of tar (it smells like petroleum), which might be made useful, with knowledge and means; it is not worked, and is close by a sulphur mine, which has water, and might be had cheap.

* Produce at least of 2,500 casse, at 10 cwt. per casse, at 18 tari per cantaro, leaves a handsome profit of 100 per cent. under market price.

DEARNESS OF BREAD IN FRANCE.

In consequence of the scarcity and consequent dearness of wheat in France, the Government has decreed that the protective duty, established by the law of 1861, against wheat imported in foreign bottoms, shall cease until further notice; wheat brought into France by foreign vessels will therefore now only pay the same duty as if introduced in French vessels, namely, 50 centimes the quintal, with the additional war-tax of 10 per cent. on the amount.

The authorities of Paris have put in action a special enactment relative to the price of bread. In 1863 the bakers' trade was thrown open, and the price of bread left to be regulated by the cost of flour, and by competition only; a certain portion of the import duties on corn and flour was set apart to form a fund, entitled the Caisse des Boulangers, the object of which was to meet the case which has just occurred. This *caisse* has now been called into service, to keep down the price of bread to 50 centimes the kilogramme for fine wheaten bread, and 42 centimes for seconds. Those bakers who accept the arrangement are to exhibit these prices in their shops, and to receive from the fund in question the difference between those prices and the present actual price of bread. A very large number of bakers, 680, have accepted the proposal in question, but many still hold out, objecting to the terms on which the calculation is made. The compensation is calculated in the following manner:—To the cost of a metrical quintal of flour in Paris is added 9 fr, for the expenses of conversion into bread, and the number is divided by 130, for the number of kilogrammes of bread produced, and of course a register is kept at each baker's, showing the quantity of flour employed and bread produced.

Of course such averages must give rise to considerable question; and consequently the agricultural press is filled with counter estimates and objections. Amongst the calculations and estimates which have a general interest, the following may be selected. An experiment in co-operative bread-making was made recently, by order of the Maire of St. Omer, and under the direction of the managers of certain charitable institutions. The result was as follows:—

	Frs.	cents.
100 kilogrammmes (220 lbs. English) of seconds flour cost	54	50
Leaven (or yeast)	1	12½
Fuel	1	25
Labour	1	50
Hire of oven	1	0
Total	59	37½

The quantity of bread produced was 136 kilogrammes, and the cost was consequently just below 43½ centimes per kilogramme.

The *Echo d'Agriculture*, taking the bakers' side of the question, makes the following calculation:—

	Francs.
The average cost of flour of first quality is, per 157 kilogrammes	90
Octroi duty	2
Cost of making it into bread	14

This brings the cost of the 2 kilogramme loaf (4⅘ lbs.) up to 1 fr. 6c. the kilogramme, while it is sold at 1 franc. As in London, the bakers of Paris are compelled to weigh all bread, except the fancy kinds, when required to do so, and the poorer class, as a rule, demand it; but the bread delivered at the houses of the consumers is generally considerably under weight; the gain in the latter case, and the profit on fancy bread, have therefore to be set against the asserted loss in the former case.

Another authority on such matters, the *Bulletin de l'Agriculture*, protests against the estimate of the former journal, as exaggerating the cost and diminishing the amount of bread produced.

The policy of the whole arrangement respecting the regulation of the price of bread is a subject of serious contention. On the one hand it is regarded as a happy method of obtaining a reserve during times of plenty, upon which to fall back in times of scarcity, the fund in question being the result of the whole or part of the octroi duties levied on wheat and flour in Paris, these duties being one centime per kilogramme in the former, and 1⅓ centime on the latter.

It is objected, on the other hand, that the abolition of these octroi duties would be a far greater boon than the application of the *caisse* once in four years (this is the first time since the new law was passed that a demand has been made on the *caisse*, which contains a large sum); that if such an arrangement be good, it should come into force before bread has arrived at such a high price as 10d. the 4 lb. loaf; and that if the system be sound, it should be applied not only in Paris, but all over the country.

Lastly, in order to record as many facts as possible, it is important to state that the application of the law in question has already had the effect of raising the price of flour one franc per sack.

Fine Arts.

Great Art Exhibition at Berlin.—A grand exhibition, which means, we presume, an international exhibition of art, is announced to take place in Berlin in the months of September and October, in the present year; the management is in the hands of the Royal Academy of the Beaux Arts, and full particulars are promised shortly.

Manufactures.

New Extract of Madder.—The chemical committee of the Society of Mulhouse has awarded a medal of the first-class to M. Pernod, of Avignon, for the introduction into the print-works of a new madder dye. M. Schaeffer, the reporter of the committee, says that he has made many trials of the extract in question, and that it is a paste containing ten per cent. of dry matter, its dyeing power being four times that of the preparation called *fleur de Garance*. Mixed in fitting proportions with alum and iron mordants, it produces, after steaming, washing, and soaping, dark reds of rich and brilliant hues, and unusually beautiful violets.

Commerce.

Production of Tobacco in Bavaria.—The following table, compiled from a return recently published by the Agricultural Society of Bavaria, shows the extent of land planted with tobacco in each of the six provinces of Bavaria in which this description of crop was grown in the year 1866, the total quantity of tobacco produced in each province, and the average price at which the crop was sold:—

Provinces.	Land planted with Tobacco.	Total produce (leaves in the dry state).	Average price per English cwt. of dried leaf.
	English acres.	Eng. cwt.	s. d.
Palatinate	10,323½	115,742	14 9
Upper Pfalz	10¼	185	15 1
Upper Franconia	5¼	35½	12 4
Central Franconia	1,613½	16,400	11 10
Lower Franconia	105½	1,202	21 2
Swabia	2	28½	7 10
Total	12,060	132,593	—

The aggregate extent of land planted with tobacco in 1866 was somewhat less than in the previous year, and in proportion to the ground cultivated the total produce was also rather less. The yield per acre of the crop of 1866 varied, as usual, very considerably in different districts of the same province. In the Palatinate, the most productive land yielded at the rate of 14¾ cwt. of tobacco (when in the dry state) per acre; the poorest land only 3¾ cwt.; whilst in Central Franconia the yield per acre varied from 10 to 2¾ cwt., and in Lower Franconia from 11 to 3¾ cwt.

Silk Trade between France and Italy.—The following are the exports and imports of silk between France and Italy during the five months from 1st June to 31st October of the past year:—

Exports from Italy to France.

	Quantity. kils.	Value. frs.
Grains (eggs)	1,300	100,750
Cocoons	99,000	2,047,320
Raw silk	136,300	12,575,250
Thrown silk	700,300	66,528,500
Floss silk	611,200	11,338,400
Total francs		92,590,220

Exports from France to Italy.

	Quantity. kils.	Value. frs.
Foulards	17,718	1,346,568
Plain stuffs	88,685	12,149,845
Damask stuffs	5,875	863,625
Mixed stuffs	25,919	2,177,196
Tulle	7,168	896,000
Fringes with gold	1,739	513,005
Fringes of silk	2,141	289,035
Fringes mixed with silk	12,459	872,130
Ribbons	13,147	1,485,611
Total francs		20,593,015

IMPORTS OF ORANGES TO FRANCE.—The importation of oranges, citrons, lemons, &c., into France from Spain and Italy has increased since 1830 fivefold, when 5,943,022 kilos., to the value of 2,791,511frs. (£111,660), were imported; in 1866 the imports of these fruits amounted to 25,923,700 kilos., to the value of 7,413,840 frs. (£29,673). The port of Marseilles figures for the greater part of this trade. The following are the amounts received at this port for every tenth year, beginning in 1836:—1836, 2,217,589 kilos.; 1846, 7,133,758 kilos.; 1856, 9,214,537 kilos.; 1866, 9,592,120 kilos. The exports of oranges, &c., from Algeria to France have increased considerably since 1836, during which year only 8,100 kilos. of fruit from this colony were landed at Marseilles. In 1856, 350,537 kilos. were received, and in 1866 upwards of 962,694 kilos. In a good season upwards of a million of kilos. of oranges, as in 1864, have been sent from Algeria to Marseilles.

Notes.

PRIZES OFFERED BY THE SOCIÉTÉ D'ENCOURAGEMENT OF PARIS.—A grand medal, value one thousand francs, for the application of the fine arts to industrial purposes. A prize of five thousand francs for the employment of boracic acid and borax. Prizes of the value of one thousand francs each for the following subjects:—Water power motor for small workshops; gas jet regulator; a new application of any abundant mineral substance; the disinfection and clarification of sewage water; the application of endosmose of liquids; the application of the endosmose of gases; heating and ventilation of rooms; preservation of food; improved method of making vinegar from wines; and a memoir on the state of industrial art as shown at the late Universal Exhibition in Paris. A detailed programme is to be had by application to the Secretary of the Society, 44, Rue Bonaparte, Paris, and all models, plans, and documents are to be sent in on or before the first day of March.

SHOEING HORSES.—The Imperial Society of Agriculture of France has just awarded its gold medal to M. Charlier, veterinary surgeon of Paris, for his new system of shoeing horses, which has recently attracted much attention, and which has been described in the columns of the *Journal*. The shoe is a narrow rim of iron or steel let into a groove, about three-eighths of an inch in width and depth, cut round the edge of the hoof, thus leaving the whole of the frog and centre of the hoof free and capable of natural expansion. These shoes have been partially adopted in the French cavalry.

PUBLIC VEHICLES IN PARIS.—The number of public vehicles now in the streets of Paris is given as follows:—Common cabs, 2,967; *remise*, or superior cabs, 3,533; *grande remise*, or carriages for hire by the day, week, or month, 2,000; omnibuses, 678; omnibuses belonging to the railway companies, 140; vans (licensed), 800; omnibuses running to the suburbs of the city, 230; total, 10,348. During the time of the Exhibition there were three thousand more vehicles in the city; the vans alone at one moment amounted to 2,300. Of the cabs common and *remise*, 2,793 belong to a company, and 3,707 to private masters, who number in Paris nearly a thousand; of these, six hundred probably are possessed only of the one cab which they drive themselves. The largest private establishment does not possess more than sixty or seventy cabs. In 1853 there were not more than 1,580 ordinary cabs, 2,400 *remises*, 600 superior carriages for hire, and 340 omnibuses. In 1864, before the business was thrown open, the cab company had between 2,400 and 2,500 vehicles, and private owners 2,043 *remise*, and only 64 ordinary cabs. Since the change in the law, the numbers, it will be seen, have increased to the extent of 1,800. In order to be able to drive a cab, or any other public vehicle, it is necessary to be provided with a certificate from the Prefecture of Police; the number of drivers at present inscribed on the police list is 25,000. During the last twenty years the system of charges for public vehicles has been changed half-a-dozen times. The tariff at present in operation does not give satisfaction; and it is said that the plan of charging according to the distance passed over, which has been for a considerable time under consideration, will be adopted very shortly.

LIGHTHOUSES ON THE ITALIAN COAST.—The lighthouses on the coasts of Italy have of late received the special attention of the Government. The sum of 1,750,000 francs (£70,000) has been expended in the construction of new lighthouses. Previous to the year 1860 the Italian lighthouses, not including those belonging to the Venetian and Roman States, were fifty-eight in number. Since then thirty have been constructed and eight are now building.

COAL IN ITALY.—In spite of the assertions to the contrary of many geologists, it now is fully proved that Italy possesses many deposits of coal and excellent lignite, some of which are at present explored with most satisfactory results. Among these may be mentioned the mines of Borgotaro, situated in the valley of the river Taro, in Parma. The quality of coal obtained from these mines is excellent. From experiments that have lately been made at the Milan gas works with Borgotaro coal, 24 cubic metres of gas per quintal of coal were obtained (847·60 cubic feet per 1 cwt. 3 qr. 24½ lb.). But the gas produced was of little illuminating power, and the coal gave little or no coke or tar. A second experiment with coal from the same pit, but obtained at a greater depth, gave most satisfactory results. With this coal, which resembles cannel, a gas, with an illuminating power of 25 per cent. superior to that at present used at Milan, was obtained, and producing 52 per cent. of good saleable coke. The quantity of gas produced per quintal of coal was 24 cubic metres. From the geological aspect of the Appennines, and the analysis made of its coal, it may be justly supposed that the deposits of mineral fuel are most extensive and deep. The construction of the proposed railway from Parma to Chiavari, in the valley of the Taro, will contribute greatly to the developement of coal mining in the Appennines, and will tend to diminish to a great extent the immense tribute which the Italians pay to foreign countries for fuel only.

MEETINGS FOR THE ENSUING WEEK.

MON......Society of Arts, 8. Cantor Lecture. Dr. Letheby, "On Food."
Society of Engineers, 7½. Dr. Cullen, "On the Surveys of Proposed Lines for a Ship Canal between the Atlantic and Pacific Oceans."
R. United Service Inst., 8½. Capt. J. H. Selwyn, R.N., "Further information on the Employment of Mineral Oils as Fuel for Steam Ships."
Farmers' Club, 5½. Mr. C. S. Read, M.P., "On the Sale and Transit of Home and Foreign Stock."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8.
Asiatic, 3.
Victoria Inst., 8.
Social Science Assoc., 8. (Economy and Trade Department.) Mr. Thomas Webster, Q.C., F.R.S., "On the Industrial and Profitable Employment of the Casual and Destitute Poor."

TUES ...Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Civil Engineers, 8. 1. Mr. A. C. Howden, "Floods in the Nerbudda Valley; with Remarks on Monsoon Floods in India generally." 2. Discussion upon "Fresh Water Floods of Rivers."
Pathological, 8.
Anthropological, 8.

Syro-Egyptian, 7½. Mr. Bonomi, "On an Alabaster Fragment brought out of the Tomb of Oimenepthah by Belzoni."

WED ...Society of Arts, 8. Dr. Forbes Watson, "On the Extension of the Commercial Relations between the United Kingdom and India, &c."
Geological, 8. 1. Duke of Argyll, "On the Geological Structure of Argyllshire." 2. Mr. C. Babbage, "Notes on the Formation of the Parallel Roads of Glen Roy." Communicated by the President. 3. Mr. D. Mackintosh, "On the Origin of smoothed, rounded, and hollowed surfaces of Limestone and Granite." 4. Mr. D. Mackintosh, "On the Encroachment of the Sea in the Bristol Channel." 5. Mr. D. Mackintosh, "On a Striking Instance of apparent Oblique Lamination in Granite."
Pharmaceutical, 8.
R. Society of Literature, 4½.
Obstetrical, 8.

THUR ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Mr. Murray, "On a new light-giving Coleopterous larva." 2. Mr. Rich, "Specimens of *Anodonta* and *Unio* from the neighbourhood of London." 3. Mr. Barber, "On the Structure and Fertilisation of Liparis *Bowkeri*."
Chemical, 8. Dr. W. J. Russell, "On Gas Analysis."
R. Society Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."

FRI.......Geologists' Assoc., 8.
Philological, 8.
Royal Inst., 8. Professor Huxley, "On the Animals which are most intermediate between Birds and Reptiles."
Archæological Inst., 4.

SAT ......R. Botanic, 3¾.
Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

Patents.

From Commissioners of Patents' Journal, January 24.

Grants of Provisional Protection.

Alimentary substances, obtaining and preserving—105—J. Somervell.
Ammunition boxes, &c.—2630—T. C. Clarkson.
Bags—75—R. Girdwood.
Bale fasteners—52—J. Maury.
Bale fasteners—56—J. B. Dunn.
Blind cords, holding and releasing—92—J. Lewtas.
Boats, lowering—54—J. Granville.
Boats, &c., propelling—4—G. A. D. Goodyar.
Books, sewing—98—J. G. Tongue.
Buildings, warming and ventilating—3682—J. W. Lewis.
Buildings, &c., warming—117—J. M. Kirby.
Cards, playing—66—M. Grant.
Carpets, &c., sizing the backs of—109—J. G. Tongue.
Carriages, landaus, &c.—3600—J. Cockshoot, jun.
Cartridges—12—C. W. May.
Cattle food—95—J. Fawcett.
Clog soles and patten boards—104—J. and W. Hirst.
Coins, &c., receptacles for—77—S. Benjamin.
Copper, &c., calcining—64—P. Spence.
Cord, &c., manufacturing—3520—F. Vita.
Cotton, &c., spinning, &c.—103—J. Pilling and R. Scaife.
Cruet frames, &c.—113—G. Ireland.
Engines—108—N. Hodgson.
Fabrics, &c., folding—107—J. C. Ellison.
Fire-arms, breech-loading—121—W. E. Gedge.
Fire-arms, &c., breech-loading—70—M. Walker and G. H. Money.
Flax, &c., twisting and untwisting—67—J. Tomlinson.
Fuel, artificial—96—J. M. Rowan.
Furnaces—112—T. Whitwell.
Gymnastic apparatus—74—G. W. Bacon.
Hammers, steam—102—A. Budenberg.
Iron tubes—22—J. S. Cockings and F. Potts.
Lamps—91—J. Vivez.
Levels, spirit—123—C. W. Lewis.
Liquids, evaporating—3721—R. Tooth.
Liquids, projecting in the form of spray—45—J. Gardner.
Looms—76—J. Dawson and J. Howorth.
Looms—125—J. C. Ramsden.
Malt liquors, unfermented—86—C. H. Newman.
Mangles—60—G. Warsop.
Metals, removing sulphur, &c., from—48—C. D. Abel.
Mineral and rock drilling apparatus—116—P. Pittar.
Moulds for hollow castings, &c.—99—H. Cochrane.
Needle cases—58—W. Avery.
Nuts and bolts—3381—E. H. Bentall.
Optical illusions—46—F. W. Hartley.
Paper, manufacturing—83—J. Tucker.
Pens, self-supplying—97—G. Davies.
Pens, &c., device for holding—115—M. A. Hamilton.
Presses for expressing wort from spent hops, &c.—72—C. Pontifex.
Railway carriage breaks—3658—P. Demeure.
Railways—3704—A. M. Clark.
Railways—47—E. Myers and G. A. Cannot.
Railways, laying fog signals on—38—G. Platts, W. Tate, and W. H. Bailey.
Roads, &c.—3705—A. Grainger.
Sash fastenings—88—G. A. Heath.
Sewers, purifying—78—W. E. Kenworthy.
Ships' signals, &c.—106—W. W. Hooper.
Shirt fronts, &c.—101—C. S. Lemon.
Silk, &c., for spinning—80—T. Greenwood.
Skates—114—T. S. Ellin.
Skins, tanning—85—C. J. B. King.
Tobacco pipes—111—J. H. Johnson.
Vessels, propelling—79—W. E. Newton.
Waistcoats—69—S. Goldstein.
Walking-stick and lamp combined—40—E. Gourdin.
Washing machines—62—G. Warsop.
Wearing apparel, &c., ornamenting—100—W. Champness.
Wood mouldings, cutters for forming—84—W. R. Lake.
Wool, &c., combing—94—S. Mortimer.
Wool, &c., conveying out of or into washing machines—81—J. Petrie, jun.
Yarn, &c., winding—43—J. Combe.

Inventions with Complete Specifications Filed.

Book covers—179—H. A. Bonneville.
Boots and shoes—198—W. R. Lake.
Coffins—174—H. H. Lloyd.
Fuel, charcoal—211—T. V. Lee.
Wood rings or washers—197—W. R. Lake.

Patents Sealed.

2095. J. Schofield and J. C. Dawson.	2193. P. G. B. Westmacott.
2157. W. Howes and W. Burley.	2324. B. F. Sturtevant.
2170. C. Silvy.	2402. T. Sault.
2173. E. Smith.	2551. D. C. Brown.
2175. E. A. Rippingille.	2913. C. S. Lynch.
2178. E. T. Hughes.	2915. O. C. White.
	3016. R. M. Letchford.

From Commissioners of Patents' Journal, January 28.

Patents Sealed.

2063. T. Berney.	2223. R. B. Boyman.
2198. A. Watt.	2239. E. A. Kirby.
2200. J. Jones.	2261. C. de Negri.
2201. W. Gadd and J. Moore.	2263. G. Schneider.
2204. A. Murray.	2275. E. Cornely.
2205. C. Mayo.	2277. A. J. Paterson.
2211. M. J. Fearnley & C. Smith.	2335. A. M. Clark.
2213. G. Gordon.	2439. W. Muir.
2215. J. C. C. Azémar.	3211. T. Wilson.
2216. C. E. Brooman.	3248. I. Swindells.
2218. W. Snell.	3278. R. A. E. Scott.
2219. F. A. Calvert.	3465. J. Adams.

Patents on which the Stamp Duty of £50 has been Paid.

186. J. H. Wilson.	226. A. A. Croll.
188. J. Snider, jun.	230. C. Falck.
234. W. Clark.	257. W. Foster.
191. C. Brakell, W. Hoehl, and W. Günther.	232. G. Dibley.
209. W., R., J., and A. Woodward, jun.	298. W. Vale.
	243. J. Twibill.
	250. W. E. Newton.

Patents on which the Stamp Duty of £100 has been Paid.

198. J. Vero.	206. C. Lungley.
289. J. Abraham.	

Registered Designs.

4919—Jan. 6th—Hoe adze—Rabone, Brothers, Birmingham.
4920—Jan. 10th—The Livingstone brace buckle—W. Blenkiron and Son, 123, Wood-street, E.C.
4921—Jan. 16th—A hoop skirt—W. S. Thomson and Co., 97, Cheapside, City, E.C.
4922—Jan. 18th—A trigger guard—J. Hollis and Son, Birmingham.
4923—Jan. 27th—A brooch and scarf pin protector—F. Potts and Co., Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 7, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

February 12.—"Report on the Art-Workmanship Competition, 1868."

February 19.—"On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it." By Wentworth Lascelles Scott, Esq., F.C.S.

February 26.—"On a Daily Mail Route to India." By Hyde Clarke, Esq., D.C.L.

Cantor Lectures.

A course of lectures "On Food," is now being delivered by Dr. Letheby, M.A., Professor of Chemistry in the College of the London Hospital, and Medical Officer of Health, and Food Analyst for the City of London, as follows:—

Monday, February 10.—Lecture IV.

Adulterations of Food.—Conclusion.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Institutions.

The following Institution has been received into Union since the last announcement:—

Chatham—St. Mary's National School Science Classes.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Saturday, January 18th. Present—Mr. W. H. Michael (in the chair), Sir Robert Montgomery, Mr. E. C. Tufnell, Mr. J. T. Ware, and Mr. Ludford White.

Mr. William Charles Joseph West attended the Committee for the purpose of giving information with regard to the improvement of metropolitan markets.

Mr. West, in reply to the interrogations of the Committee, stated he was an architect, and partly from the interest he took in them, and partly in connection with his profession, he had made many observations with regard to the London public markets, and also several provincial markets. From what he had observed he thought markets generally had established themselves in a very casual manner at first, till necessity had shown such things to be desirable in a better form; and he had observed that the most successful markets—speaking of the metropolis, for there was a great distinction in this respect between London and the provinces—were those which had been established in the poorest and most crowded parts of the town. It was astonishing how so large an amount of business was done in such confined and crowded localities. New markets in new localities did not succeed so well. He, therefore, thought the best course to be adopted, with a view to success, was to increase the facilities of the existing markets; that was, to open them out more and give more room for the business, more especially, if possible, either to have them by the side of a leading thoroughfare, or to convert the locality where they are situated into a leading thoroughfare. There was the instance of Farringdon Market being removed from where it was formerly held, in the main thoroughfare, to a situation where it was almost shut out from observation. The market was not frequented by the same class of persons as before its removal, and it was very far from being a success. Not having investigated the Farringdon Market question, he could not say how far the levying of tolls by the City, or the rents charged for the use of the building, might have militated against the success of the new market.

The Chairman asked Mr. West if the committee were to understand him as being favourable to the continuation of the existing street-markets in leading thoroughfares?

Mr. West replied—Not exactly in thoroughfares, but by the side of them, and quite open to the view of the public, so that persons passing and repassing would see them, and be aware of their existence. The market should be open to the thoroughfare, at least, on one side of it. If the markets were properly arranged in this respect he thought it would tend to do away with what might be regarded as markets by sufferance. They were not actually markets, but answered as such by the congregation of people with stands and stalls. He thought they might, under proper arrangement, be accommodated in the markets in a different way to what they were at present. Mr. West would, if possible, have the market on one side of the thoroughfare, with avenues leading from the thoroughfare through it, either as centres or at either end; and if a secondary thoroughfare were obtained at the other side it would be all that is required. Mr. West added, he was acquainted with Whitecross-street market (so-called). There was a large market in the street itself on Saturday nights. In that case, if the retention of the market was considered desirable, the thoroughfare might be considerably widened for the purpose, by taking in some of the side streets. It might not be so important in the case of Whitecross-street, because it was not a

leading thoroughfare for traffic. Any experiment in that market would involve certain streets being taken for the formation of a regular market. Taking in the small side streets would increase the width of the thoroughfare, and give room for the market. He had not entered into a calculation of the expense attending the carrying out of such a plan as that, but that was a thing contingent upon all improvements, more or less. In some instances the expense would be borne by the locality in which the improvements were made; in others, the shopkeepers might contribute to that which would probably improve their own business. Mr. West believed that, as a rule, shopkeepers were favourable to it. The large number of people brought together in a market contributed to the increase of their trade. Such a plan as he proposed would, he apprehended, remove the present class of costermongers and itinerant vendors from the street market, and give them the convenience of a market proper. That would of course involve a small payment for standings or shops. The great bulk of those who constitute the successful markets were itinerant vendors of articles who pay neither tolls, nor rents, or any other charge. He had been led to think more on the subject by the operation of the recent Act for the regulation of the streets, &c. Previous to that Act being passed there was a considerable costermonger market at Strutton-ground, Westminster. The people were driven away from there without any other provision being made for them; and it was to be presumed that they dispersed themselves to other localities. Whitechapel was another locality which suffered considerably in this respect, by the operation of the Act. The costermongers and people carrying on miscellaneous trades in the street were driven away, and were at a loss how to get a living. They were a class of people of whom many were perhaps but one remove from the "roughs." He thought a great many would be willing to pay a small toll or rent for proper accommodation in a regular market, where conveniences were provided for them, and by that means they might become respectable tradesmen.

The Chairman remarked that Mr. West's observations on that point were at variance with those which had been previously laid before the Committee. It was the opinion of some people, he said, that it was hopeless to expect to improve the social status of the present race of costermongers.

Mr. West observed that he had seen instances in which persons had risen from costermongers to be tradesmen in large businesses. If their lives were traced it would be found they began as girls and boys—for the former were quite as numerous as the latter in the costermonger class—with baskets or other small stocks of what they sold. From that they some of them got to barrows, with an increased stock of articles; others formed small connections of their own and set up a horse and cart, from which they vended their goods in neighbourhoods which they daily traversed; others got to occupy small shops, and added to their business that of dealing in coals and coke, and the removal of furniture with the carts or vans they possessed. There were several instances of this kind which had come under his own observation, but he could not say whether they were numerous.

The Chairman called Mr. West's attention to the fact that in those streets in which markets were held there were tradespeople's shops on both sides. If he understood the proposition, it was to widen the thoroughfare so as to give more room for the market, by taking in the side streets on both sides, by which means the existing shops would be cleared from any obstruction complained of.

Mr. West replied that would be preliminary to providing better accommodation subsequently; so with regard to the itinerant dealers, they would not object to pay a small rent for a stall or pent-house. He considered it very desirable to accommodate the costermonger class, who were really an industrious class, in these markets, because there were many people who would not go to a shop for such goods as they were accustomed to obtain from the stalls and barrows; and he thought it desirable to give all possible encouragement to a class which was highly beneficial to the poorer portions of the community in the cheapening of the articles they mostly consumed. Supposing any form of market were adopted, he suggested that the centre part should form the better portion of the market, and the itinerant class of dealers could be accommodated at the outer portion.

The Chairman suggested that Mr. West would be good enough to follow out his first idea of markets in leading thoroughfares, and widening the side streets as avenues to them. To take the case of Farringdon-market, the committee would be glad to hear Mr West's ideas as to how it might be rendered more available to the general public.

Mr. West said he had not seen the market in operation lately, but last time he was there the centre portion was almost unused, except for standing goods. He explained how he proposed to widen out the approach to Farringdon-market, so as to bring it more into public view from the leading thoroughfare. The same remarks, he thought, did not apply to Oxford-market, which was a steady, quiet affair, principally supported by the inhabitants of the neighbourhood.

The Chairman said, so far as he understood Mr. West, Oxford-market exactly carried out his ideas, as it opened directly into the main thoroughfare; and on that principle they might expect that market to be one of the most successful in London.

Mr. West replied, in that case there was room for the market without obstructing the thoroughfare, but in Great Titchfield-street, a short distance northward, there were stands of barrows every day, on Saturday nights especially. Mr. West attributed it to custom, which it was difficult to break through. People often went long distances to a street-market. He was not able to state how Oxford-market was managed with regard to rents of shops and stalls. He understood that market had been purchased by a private individual. In the case of any new market being established he should expect the occupants of stalls to pay rent for them, to meet the interest upon the capital expended. The principal objection to the existing street-markets was, the obstruction of the thoroughfares in which they were held. As he had already stated, these sufferance-markets were rather encouraged by the tradespeople in some localities, on account of the large number of people they were the means of congregating together, which added very largely to their own trades; so that the inconvenience in one way was compensated by an advantage in another. It was very seldom, he believed, that the regular tradespeople complained of a market being held in the streets in which they resided, although the noise and confusion were necessarily very great. As he had already remarked, the circumstances of London markets and provincial markets were very distinct from each other. The latter were held only on certain days of the week, and on those days the inhabitants laid in their stock of provisions till the next market-day—the market-day being the only day of the tradesmen in the town—the country people attending the market purchasing from the tradesmen of the town what they required till next market-day. Mr. West instanced the New-cut and Lambeth-walk markets as being largely attended by the lower classes, especially on Saturday nights, and he never heard of any objection being made against them by the tradespeople occupying the shops. To a certain extent a market was always going on there, which was attended by different classes of people at different periods of the day. In the forenoon it was attended by the wives of the better classes of artisans, and in the evening by the poorer classes. He readily bore testimony to the great value and importance of the costermongers as a

class, as also to their industry. If the costermonger system were abolished, the poor would unquestionably be deprived of many things which they now got. Due provision ought, therefore, to be made for the accommodation of that class in any new markets that were established or in the improvement of those existing, and, by way of encouragement, they might be allowed to have their stalls and barrows free of any charge for standing, until they had the means and opportunity of bringing back to themselves the trade they had lost in the localities they had been accustomed to frequent. It was his opinion that space might be found in the markets for the costermongers. He had no further knowledge of the habits of that class, and of their mode of doing business, than he had gathered from casual observation and reading. On the subject of the late Hungerford Market, Mr. West expressed an opinion that, if the plan had been carried out with the view of establishing it as a retail market only, it would have been successful, and his own impression was that success was beginning to set in just about the time when it was swept away for the purposes of the railway.

Ninth Ordinary Meeting.

Wednesday, February 5th, 1868; Sampson S. Lloyd, Esq., Chairman of the Associated Chambers of Commerce, in the chair.

The following candidates were proposed for election as members of the Society:—

Baker, William Procter, Clifton, Bristol.
Byatt, Horace, St. Mary's School, Chatham.
Chapman, Henry, 41, Boulevard Malesherbes, Paris.
Harington, Sir John, Bart., 58, Eaton-place, S.W.
Pembridge, James, The Academy, East-street, Hereford.
Scott, W. B., C.E., St. Pancras Vestry, Edward-street, Hampstead-road, N.W.
Westerton, Charles, 27, St. George's-place, Hyde-park-corner, S.W.

The following candidate was balloted for, and duly elected a member of the Society:—

Hogarth, Alexander P., Aberdeen.

The Paper read was—

ON THE EXTENSION OF COMMERCE BETWEEN THE UNITED KINGDOM AND INDIA, AND ON THE DEVELOPMENT OF THE RESOURCES OF BOTH COUNTRIES BY MEANS OF TRADE MUSEUMS.

By J. Forbes Watson, M.D.,
Reporter on the Products of India to the Secretary of State for India in Council.

On the present occasion I propose to bring under your notice the question of the extension of the commercial relations between this country and India, by means of collections of manufactures and products, so arranged and distributed as to facilitate the operations of trade.

The details connected with this scheme will shortly be laid before the Secretary of State for India in Council. Among the measures to be submitted are some the success of which will depend upon the reception accorded to them in this country, and it is this fact which makes it so desirable that the subject should have the benefit of the ventilation and discussion which will be given to it this evening under the auspices of this Society, to which Britain owes so much of her advancement in commerce and in the arts.

It will probably be known to many of my hearers that this subject has attracted the attention of the Indian Government, and that an important step in the direction indicated has already been taken. The suggestions about to be submitted being indeed little more than an extension of those measures which, with the sanction of the Secretary of State for India in Council, have already been adopted, it may be well, in the first place, to state what these have been, and to point out the principles which have been kept in view in carrying them out.

Specimens of many important textile manufactures existing in the stores of the India Museum have been collected in eighteen large volumes, of which twenty sets have been prepared, each set being, as nearly as possible, an exact counterpart of all the others. The eighteen volumes, forming one set, contain 700 specimens, illustrating in a convenient manner this branch of Indian manufactures. The twenty sets have been distributed in this country and in India—thirteen in the former, and seven in the latter—so that there are twenty places, each provided with a collection exactly like all the rest, and so arranged as to admit of the interchange of references when desired. Each sample has been prepared in such a way as to show the character of the whole piece from which it was cut, and thus to enable the manufacturer to reproduce the article if he wishes to do so. In other words, the eighteen volumes contain 700 working samples or specimens. The twenty sets of volumes may thus be regarded as twenty industrial museums, illustrating the textile manufactures of India, and, in so far as these are concerned, promoting trade operations between the east and the west.

With reference to the disposal of the work, the original intention was that the whole of the twenty sets should be distributed in this country. Further consideration, however, pointed to the expediency, as well as the fairness, of placing at least a certain number of them in India, and this has accordingly been done. The interests of the people of India, as well as those of the people at home, were concerned in the matter, and it is clearly just and proper that both interests should be considered.

About two hundred millions of souls form the population of what we commonly speak of as India; and scant though the garments of the vast majority may be, an order to clothe them all would try the resources of the greatest manufacturing nation on earth. It is clear, therefore, that India is in a position to become a magnificent customer. She may yet be this, and still continue to seek her supplies in part from herself, for to clothe a mere percentage of such a vast population would double the looms of Lancashire.

To this country, therefore, these collections of samples are of importance, because they fairly exhibit the textile manufactures which suit the Indian market, but which have hitherto received too little attention in this country; and they illustrate the principles which must be observed in any attempt to introduce into India designs which will please the tastes of a people whose appreciation of art, as applied to textile decoration, is of a high order.

So high, indeed, is this taste, that one of the benefits which will be conferred on Britain by this and all like efforts to extend our knowledge of Indian art, will arise from the lessons in taste thus presented, enabling the home manufacturers not only to produce such articles as will suit India, but also articles which will be admired and thus obtain a ready sale in Europe. Our manufacturers, therefore, have a double interest in the scheme, because it will not only afford them the means of becoming acquainted with articles suiting the Indian market, but will help them to secure customers in their own and in other European countries.

To India, on the other hand, it is of importance in several ways. First, it is clearly to her advantage that every facility should be given to the introduction from this country of such manufactures as can be supplied to her people more cheaply than by hand-labour on the spot. The many will thus be benefited, and the hardships which may possibly fall upon the few will not be serious or long felt, since their labour will soon be diverted into new and, in all probability, more profitable channels.

It is impossible to say what the extension of the mill-system in India may ultimately lead to; and her friends would most unwillingly see its development fettered by

restrictions of any sort; but this is clear, that it will be a benefit to the mass of the people of India to be supplied with their clothing at the cheapest possible rate, let this be done by whom it may. Measures like the present, calculated to increase the range of competition, are therefore likely to benefit them.

Again, this scheme is of importance to India, because it will increase the number of her customers in other markets as well as in those within her own territories. There are certain fabrics which will probably always be best and most cheaply manufactured by hand. It is found to be so even in this country, where the powers of machinery have been pushed to their utmost. The hand-loom weaver still exists amongst us, nor is it likely that he will ever cease to do so. Less likely still is it that machinery will ever be able to drive him from the field in India. The very fine and richly-decorated tissues of that country will probably always require the delicate manipulation of human fingers for their production. In such manufactures, the foremost place will be taken by that country which can most cheaply supply labour, intelligence, and refined taste—all three combined; and this being the case, it is not likely that England will ever be able to compete successfully with the native manufacturer in the production of fabrics of this sort, for which, eventually, there may be a large foreign consumption.

But in addition to the facilitating of the introduction of cheap and suitable manufactures from Europe, and the extending of the knowledge of the productions which she is prepared to sell to other countries, India is directly interested in another respect. The distribution throughout India of a certain number of these sets of textile manufactures will serve to show one part of the country what is produced in others, a point of much importance, for the ignorance existing in India itself regarding the products and manufactures available for the purposes of commerce within her own borders is very great, numerous articles suitable for exchange and circulation within the country itself being unknown beyond the place of their production.

From this last point of view alone the work already accomplished is of value, and its extension cannot fail to affect advantageously both the internal and external trade of India. Although India may never resume her old supremacy as an exporter of manufactured goods, still there can be no doubt as to the right which the Indian manufacturer has to participate in the advantages of all measures like the present, so that he may be placed on an equal footing with the manufacturer of this country, and have the opportunity, if he has the power, of competing for the trade of his own and of other countries.

In assigning the sets of specimens of textile manufactures in trust to the chief commercial authorities in the selected places in this country, it was agreed that not only should those connected with the districts in which they are deposited have free access to the collections, but that similar facilities should be afforded to non-residents, or even to foreigners, practically interested in the subject, or to the agents of such persons. The interests of India require that nothing should be done to prevent her receiving the benefits which may arise from competition between different sources of supply, or to interfere with the extension to other countries of the knowledge of the products and manufactures which she is prepared to sell; and this makes it clearly desirable that the management and control of all such measures should remain with the Secretary of State for India in Council, in order that they may be so directed as to benefit India, and be above all suspicion of doing the opposite.

It is admitted to be for the mutual advantage of India and of this kingdom, that the most intimate commercial relations should exist between them. The tie is of a nature which makes this an object of paramount importance to both countries, and nothing will conduce to this more certainly than a full and correct knowledge on both sides of what each produces and each requires. The means of acquiring this information, in so far as the textile manufactures of India are concerned, have, in the sets of volumes alluded to, been to a considerable extent afforded. The twenty sets already distributed may be regarded as twenty trade museums placed here and there in the two countries, and the information already received shows that they are being largely consulted by merchants, manufacturers, and others interested in the trade with India. The British manufacturer has it now in his power to become acquainted with a large class of goods likely to prove saleable in India, while the British merchant may find, among some of the delicate or elaborately-decorated fabrics, articles which it may be profitable to import.

Each set of samples being, as much as possible, an exact counterpart of all the others, it is easy for merchants, agents, or manufacturers in either country to refer their correspondents to the samples of the goods they wish to order. In this way merchants are enabled to give orders, and manufacturers to execute them, more readily and more accurately than they otherwise could. This facility of reference constitutes a special feature of this work, and renders the distribution of other manufactures and products by a similar method very desirable.

Collections of specimens arranged in the manner described become trade museums in the true and full sense of the word. Nor will their functions be confined to the facilitating of the operations of trade. Such museums, wherever situated, will become schools where youths intending to follow, or others actually engaged in, commercial pursuits, will have collections of manufactures and products presented for study precisely in that manner which is best calculated to impart the required information; and they present a field for technical education of the most practical description, the importance of which need not be dwelt upon.

Such, then, has been the nature of the action already taken in the subject which we are here to consider.

It will, I think, be admitted, that it is undesirable that this scheme should stop with the present effort. A large amount of information has been drawn together in the department of the Reporter on the productions of India, regarding all classes of Indian manufactures and of Indian products; and it would clearly be of advantage to this country and to India that this knowledge should be so disseminated as to prove practically useful—in other words, so as to influence the interchange of commodities.

Again, in this country, there exist now many productions which it is of importance to make known in India, and in no way, we think, could these two great objects be more effectually accomplished than in the one which, with the sanction of the Secretary of State for India in Council, has been chosen in the case of the textile manufactures of India. We shall accordingly proceed to present an outline of the further measures which it appears to be desirable to take in the same direction, and to indicate under what conditions similar efforts should be made.

In the division of the subject which has now to come under consideration, it will be submitted, in the first instance, that it is expedient to secure for the textile manufactures of India a more complete representation even than that already afforded; and, secondly, that steps should be taken to make India better acquainted with the corresponding manufactures of this country already available for the purposes of exchange. It is proposed, therefore, that these two great and important groups should first receive attention; for, although it is not expedient—nor intended—that the scheme should stop with simply the representation of the textile manufactures mutually produced in the two countries, it will be found that the methods and principles which apply to these are equally applicable to the case of a vast

number of articles which it is most important to make extensively and practically known.

Turning now to the question of a fuller representation of the textile manufactures of India, the series of samples already distributed—although very extensive, and allowed to be of much value—are not nearly so comprehensive as the resources at the disposal of the department are capable of effecting. In addition to numerous admirable examples of India textiles still existing in the stores of the India Museum, the collections forwarded from all parts of India to the late Paris Exhibition were of such extent that it was found impossible to exhibit more than two-thirds of the whole; and the result is that there now exist the means of getting up additional sets of specimens, which would completely illustrate the whole subject.

In the sets of collections already distributed, attention has been mainly directed to the illustration of the common articles of wear in India. The means now available will not only permit of the introduction into the proposed new series of many articles of the same class, but will also exhibit an almost exhaustive series of the finest examples of Indian art in textile decoration—the importance of the knowledge and of the appreciation of which in this country it is impossible to over-estimate.

The study of Indian art, as displayed in the decorated tissues of the country—the observation of the manner in which the two co-related forces, form and colour, are used in India to produce those beautiful combinations which are to the eye what chords in music are to the ear—may impart a power which, in numberless ways, will leave its stamp upon the everyday-life articles around us. But Indian art is not confined to textile decoration, although in this it stands without a rival. It is to be seen in hundreds of other instances—in almost everything the hand of the artisan touches; from the fan with which he cools himself, or the vessel from which he drinks, to the grand old buildings which, throughout the country, stand as monuments of a skill which is not dead nor even sleeping. With the decay of the ancient religions of the country, and with the downfall of her rulers, the demand for temples and palaces has passed away; but it is still the same power which we see exercised in other things, and it is this power which it is our duty to foster and to promote in India herself. Let us cherish this power, and be careful that we do not attempt to foist upon her people a style and state of art inferior to their own. And this leads me to remark, that the scheme which we are now considering would help to conserve and extend in India the knowledge of her own art. The distribution throughout India of the best specimens of her manufactures could not fail to have an important influence. The student in our Indian schools of art should first have presented to him all the best examples of his own country. Intuitively their superiority and perfection will be revealed; and, when he sees that we have realized this fact also, it will give that impulse and encouragement which hitherto have been wanting. Once show the native artisan or student that we, the rulers of the land, respect his art, and he will cease to try to please the European who, believing in the rose and daffodil patterns of his youth, has yet to acquire the power of appreciating the higher and more refined art of the people amongst whom for a time his lot has been cast.

Although it is impossible to speak too highly of the services of men who for years have devoted time and energy to the promotion of art in our Indian schools, yet there is no doubt that much valuable force has been wasted from neglecting to cultivate in our students the innate powers which they undoubtedly possess, and which have become dulled in the attempt to make them keep to the road which we in this country think to be the right one. A confirmation of this opinion is afforded by a letter lately received from one of the Principals in the Bombay School of Art, and formerly, I believe, a distinguished pupil at South Kensington. Speaking of a student who had recently joined the school from a native town in the interior, and who, instead of being set to copy the figures, &c., in the elementary books of decorative art which, doubtless, are so useful here, was requested to try his hand on two subjects, both of which required the exercise of that inventive faculty which constitutes the artistic skill we ought to foster, and after expressing his admiration of his pupil's skill, and his anxiety lest he should in any sense cramp the powers which he so evidently possessed, he says—and to this I beg the attention of those who are looking to this country to teach art in India—"as a rule, those of my students who have come to me like this one, direct from the native town, without having received any instruction in the School of Art, are decidedly the best."

It is not to Britain, then, that India should be induced to look for art in those walks which chiefly bear upon her every-day life. Not that we should deny to the student the privilege of seeing and studying some of the best productions of art other than his own; but we must take care that these are the best.

Of Painting and Sculpture, India knows little, and it is only right that occasion should be taken to let her see good examples of both, for, it is under the influence of one and the same law that we are fascinated by a Turner's landscape—a Flaxman's statue—or the perfect tone and tune of form and colour, which are so often the fruit of Indian taste in decoration. All these are equally the children of art; and the day may come when the same power which the Indian artisan now shows will become developed in what would be considered the higher direction. Any way, the opportunity should not be withheld so long as the so doing is not allowed to interfere with a first duty, viz., that of fostering in India the art-power which already exists. Wherever and whenever possible, let us make the art which bears on every-day life an adjunct to trade.

The students of art in this country and in India will have presented to them, in the trade museums which it is the object of the scheme we are now considering to promote, the best examples of various manufactures, and these, from their beauty, will prove models of taste, whilst a no less important function—one with an immediate bearing upon trade—will be fulfilled by the facilities afforded to the commercial community in either country for direct reference to the actual examples of such goods as it may be desired to either order or supply. Everything in the way of European art, which it may be beneficial to exhibit in India, can be readily provided, without incurring the risk of having our museums started there upon an art instead of a trade basis, involving the waste of a force from the outset, which can and ought to be made directly subservient to the commercial interests of the country, using art as the handmaiden and not as the mistress of the position.

Returning, however, to the subject more immediately before us, we have now to consider to what extent, in this country and in India, the suggested new collections of specimens of the textile manufactures should be distributed. We have already indicated that, of the sets already deposited, thirteen have been utilized in this country and seven in India. Now, it is clear that, in order to derive the full benefits which the proposed system is calculated to afford, it must be extended so as to embrace within the sphere of its action many places other than those already favoured. In deciding to what places in this country the work already prepared should be given, those seats of commerce more immediately interested in textile manufactures naturally came first, and after these came such places as possessed industrial museums or other institutions calculated to afford the necessary facilities of access. The authorities in the selected districts, previously to the actual presentation of the work by the Secretary of State for India in Council, undertook—first, to provide for the permanent protection of the work, by placing it in a

suitable building, in the charge of a proper and responsible person or persons; second, to afford the requisite facilities for consulting the work, subject, however, to the condition that under no circumstances should any of the volumes be removed for the purposes of reference; and, thirdly, that access to the work should be given to any person bearing an order to that effect signed by the President, Vice-Presidents, or Secretary of the Society of Arts; the Presidents, Vice-Presidents, or Secretaries of the Chambers of Commerce; the Chairman or Secretary of the Association of Chambers of Commerce; the President, Vice-President, or Secretary of the Cotton Supply Association; the Chairman, Vice-Chairman, or Secretary of the Cotton Brokers' Association; the Chairman, Vice-Chairman, or Secretary of the Liverpool, East India, and China Association; the Presidents, Vice-Presidents, Chairmen, Vice-Chairmen, or Secretaries of such other Associations for the promotion of commerce as now exist, or may hereafter be formed; and by the Reporter on the Products of India. The foregoing conditions having, accordingly, been agreed to by the Chambers of Commerce of Belfast, Bradford, Glasgow, Halifax, Liverpool, and Manchester; by the Industrial Museum of Scotland, in Edinburgh; by the Industrial Museum of Ireland, in Dublin; by the Huddersfield Mechanics' Institution; by the towns of Macclesfield and Preston; and by the borough of Salford for the Royal Peel-park Museum;—a set of the volumes in question has been presented to each of these places, making, in addition to the India Museum, attached to the Department of the Reporter on the Products of India, thirteen places in this country where the work can be consulted by persons practically interested in the matter. With respect to the seven sets for India, these, under the instructions of the Secretary of State for India in Council, have been deposited in Calcutta, Madras, Bombay, Kurrachee, Allahabad in the north-western provinces, Lahore in the Punjab, and Nagpore in Berar. The distribution in this country, as will be observed from the list given, left many important places unsupplied, while, in one or two instances, some districts would almost appear to have been over favoured. Then, again, with regard to India. It is clear that the distribution of only seven sets there has only touched the borders of a great question, for to open up to us a vast country like India, and at the same time to exhibit her to herself, means a museum of the kind we have indicated in, at least, every main division throughout the country. With the resources at the disposal of the department at the time the volumes of textiles alluded to were got up, it was beyond our power to prepare more than twenty sets. Now, however, the case is different, for, with the increased facilities at command, it will be possible to supply as many as fifty sets, or even more, should they be required.

This, accordingly, is the present position of the matter.

We come now to the consideration of the question—Who should pay for this new effort to extend a knowledge of the manufactures of India? Hitherto all efforts on the part of the Indian Government to diffuse in Britain a knowledge of the products and manufactures of its great eastern dependency have been made at the cost of the people of India. Both countries, however, are interested. The India-office, in the sets of volumes already presented, has given evidence of its desire to promote the object in view; but, it is only fair that the expense of further efforts in the same direction should be divided; and, in so far as the suggested new sets of textile manufactures are concerned, I am assured that, should it be decided to get these up, the various commercial bodies in this country will be found ready to pay for them; indeed, offers to do so have already come to hand. But it is not only in the matter of textile manufactures that this country has received benefits for which she has never had to pay one farthing. The actual cost to India of the exhibitions of 1851 and 1862 amounted probably to not less than two hundred thousand pounds. No part of this sum was defrayed by Britain, although it is impossible to over-estimate the influence which the great first, and never-to-be-equalled, exhibition exercised in directing the Government and people of this country to the wonderful products of Indian art. Many on that occasion were led to see that the country which they had been accustomed to think of as degraded and barbarous was our superior in much that constitutes civilization; and with the increased respect thus produced has come an increased sense of our responsibility as the trustees of the millions of people under British rule in India confided to our care. But it is not merely in the matter of the exhibitions that the Government of India has done, and is doing much to extend in this country a knowledge of what concerns both countries. The department of the Reporter on the Products of India was constituted for this very purpose, and is annually consulted by many hundreds of persons in quest of practical information bearing upon trade with India; while the beautiful collections which make up the India Museum, the result of selections from the best examples of manufactures and of art forwarded from India to the different European exhibitions, even in their present confined home, are yearly visited by from forty to fifty thousand people. All these modes of spreading a knowledge of Indian wants and of Indian skill and art in manufacture are placed at the disposal of this country through the enterprise of the Government of India and without cost to Britain.

The time, however, would seem to be approaching when the question may be asked as to whether this country should not give some help in providing a fuller representation of the customs, arts, manufactures, and products of India.

In the new India Office, provision has been made for the reception of all the productions, whether of artistic or of commercial interest, which are of most practical value; and it is anticipated that the museum which will be thus formed will, from an art point of view, prove a greater attraction than even the decorated structure which constitutes the new home of the Indian Government in this country.

When all this is done, however, there will remain many bulky objects of great interest for which provision will have to be made; and should the scheme which we are now considering receive the approval of the authorities, a considerable amount of working space will be required.

An opportunity is now offered of admitting the principle that this country should share in the cost which would have to be incurred for the two objects last named.

Fife-house — where the India Museum is already located, but from which its main glories will, as stated, very shortly be transferred to the new India Office—would afford the required space; and, as it belongs to the Crown, I have to submit the suggestion that, until other arrangements may be made, it should be assigned to the Secretary of State for India for the purpose here named. In this simple manner all that is necessary would be effected.

This would be not merely a graceful, but a wise act on the part of the Government. It would still leave the control where, as we have already indicated, it ought to be, viz., with the Secretary of State for India; and India would continue to pay the larger part of the cost, since the museum and its operations should be so conducted as to bear chiefly on the promotion of the prosperity of its people, the vastness of whose numbers and resources, and the peculiarities of whose position, will always require separate consideration.

Let us return, however, to the subject immediately before us:—

In so far as the textiles are concerned, materials exist for completing at once the representation of that important group of Indian manufactures.

But it is not in the matter of tissues only that India should be fully and practically exhibited, both to Britain and to herself. There are numerous other articles of manufacture, which are available for the purposes of commerce, and all of which can be exhibited in a manner which will facilitate the operations of trade, and promote, at the same time, the cultivation of the artistic skill of both countries.

So far, then, with regard to manufactures; but it is not in works of the hand only that India is rich; she is infinitely so in the products of her soil. Extending over a vast space of different degrees of elevation, it is not wonderful that the productions of India are as numerous as its surface and climate are diversified.

It is probable that there are not less than fifteen hundred different substances produced in India, which occupy a place of more or less importance in the economy of the people; and many of them, if better known, may become objects of trade or exchange.

Nor is it merely in what is now produced in India, that she and other countries are interested. With a soil and climate so varied, she is capable of producing every article that, up to the present time, may have taken a place in the commerce of the world. Hence the importance of not merely making India and other countries widely acquainted with the productions she is now prepared to sell, but likewise of showing to her the products of other countries which she may either use or produce. And in so doing it is essential that all substances—whether of vegetable, animal, or mineral origin—that have already taken a position in commerce, should be exhibited, not as mere specimens, but in such a way as will show their trade classification in the markets of the world.

In this manner the merchant or student in our India museums will become acquainted with those conditions of each substance which affect its price, and thus be impressed with the importance of quality and preparation as an element in trade success. The importance of quality upon the future of our Indian trade in cotton, we all know and admit; but let me illustrate what is here aimed at in the Product Department of our museums, by another fibre, say flax, which can be grown in many districts in India.

According to the proposed method, the flax group would exhibit not only a complete series, classified according to the designations which they have received in the trade—along with the average prices at different periods—but the opportunity would be taken to show the effect of condition in increasing the value of the same article. This specimen, say, is worth £30 per ton; this one, which is of the same growth and innate quality, is worth £40 per ton, because it is better cleaned; and so on throughout.

In order fully to represent the products of India, and at the same time to show not only to one part of India what the other is producing, but also to each part what it is itself yielding, it becomes necessary to take stock, so to speak, of the entire country; for although there is available a large amount of information showing the numerous articles that are produced in certain places, yet, taking the country as a whole, we are still in considerable ignorance of its resources.

In the scheme alluded to, one section is, accordingly, devoted to the measures for determining what the riches of the country really are. The process by which this could be systematically and quickly effected, has for some time occupied my thoughts.

I must hasten, however, to the next division of my subject.

Hitherto the measures required to exhibit properly the manufactures and products of India have only been spoken of. But has England nothing which it would be of moment to bring under the notice of the millions of India? We know that she has much. Just as England is India's best customer, so India is England's best customer; and it is to be hoped that the time will never come when, through carelessness, or, shall I say, dishonesty, on this side, the bond of material interest that now binds the two countries together will be weakened.

It is impossible to divine what the future has in store for us in certain walks of commerce in which, at present, we stand pre-eminent; but this is certain, that our present duty is, by every fair means within our reach, to aid in the extension of the commercial relations which exist between Britain and India.

Let us now come to particulars, and see if, within the range of the scheme we have been considering, something might not be done to help in this; and first let me illustrate my meaning, by taking the textile manufactures of Britain as the illustration. The position, then, is this:—We, at present, yearly export to India some ten millions sterling worth of manufactured goods; these, in fact, constitute the bulk of the trade-stream which flows from this country to India. The fabrics which India buys of us, to the extent here named, are chiefly piece goods of the common class, suitable for making up in various ways; and although the loom-made and specially ornamented garments of the country—about which we have elsewhere spoken at length*—are those which open up such a large field to enterprise; † still, even the present trade in textiles is one which deserves to be cherished, for if through our own fault we lose it, the less likely will it be that our manufacturers will ever succeed in securing to themselves the supply of the many other classes of goods which are now open to their enterprise. Let the confidence of the people of India in the honesty of our goods be once fairly broken, and the first great step will have been taken to break our monopoly of a trade which, at its best, is an exotic.

But to continue:—I have to suggest, therefore, that a complete classified series of all the textiles which this country is in the habit of exporting, or is preparing to export, to India, might, with much advantage to this country and to India, be deposited in all our proposed India trade-museums.

These articles, or most of them, are doubtless well-known to the commercial communities of the Presidency and some to other towns in India. It is important, however, that facilities for becoming practically acquainted with them should be afforded to other places where, at present, they are but little known. Indeed, it is not unlikely that a museum placed in each of the great centres of our India import trade, and presenting, in an intelligible form, specimens of all these textiles, would teach even our merchants something. This part of the scheme also presupposes that the trade museums in this country should always, when possible, exhibit samples identical with, and bearing the same number as, those shown in India.

In short, such museums would, in the first instance, be designed chiefly for the mutual profit of Great Britain and great India, and would tend to tie the two great countries together by the surest and strongest of knots.

There are among the productions of certain places, like Bradford and Leeds, many fabrics which I am satisfied would take in India, and prove very saleable. Amongst these I would specify various light woollen cloths—many of them mixtures of cotton and wool—which would probably be most suitable substitutes in the Indian market for the thick cotton stuffs which the Indian himself makes, and which are so essential to his health and comfort at certain seasons of the year. It is a common error to suppose that warm fabrics are not required in India. Throughout a great portion of that country the suffering from cold during certain seasons, particularly at night, is as great as with us in Europe;

* "The Textile Manufactures and Costumes of the people of India," by J. Forbes Watson, A.M., M.D., Reporter on the products of India to the Secretary of State for India in Council; Wm. H. Allen and Co., 13, Waterloo-place, London.

† I am quite aware of the efforts which of late years have been made, more particularly by Glasgow and Manchester, to manufacture *Sarees* and some similar loom-made articles of clothing; the result, however, has been insignificant when we remember the extent of the consumption of such articles.

and, strange as it may appear to some, it is nevertheless a fact that cold is as prolific a source of disease and death in India as it is with us; for we have to recollect that the feeling of cold is to a great extent relative. A fall from ninety degrees of heat during the day, to fifty and sixty degrees at night, produces a most decided sensation of cold, and a consequent demand for warm clothing.

It would seem to me, then, that we are, at this very time, manufacturing certain goods for which we might at once find consumers in India; and the formation of collections of all such fabrics as we now make would enable the merchant or agent in India to see what we really have on hand, and thus give him the opportunity of ordering whatever fabrics, from his local experience, he knew would suit his customers.

With respect to the two sections of the textile manufactures of this country referred to, it would not appear to be expedient to make any distinction in favour of certain districts which may happen to be specially interested in some particular class of manufacture, as it is expected that there will not be any objection to these being fully represented in both countries;—by which we mean that, in addition to sets of samples of these being deposited in every museum in India, similar sets would likewise be distributed in all the trade museums in this country.

Regarding manufactures which are of general production throughout the country, there can be no doubt that these should be fully represented in the way indicated. But it is possible to conceive that there may be others—the special productions of certain districts, which it may be thought inexpedient to have fully exposed in this country as well as in India. In such instances, it would be open to confine the representation of such articles to our Indian museums and the local trade museum of the district which produced the articles in question.

It is only right that the possibility of a policy of this description should be considered, although I am inclined to think it one which will seldom be acted on; the broader, and, I believe, the better course being that of freely exposing the special manufactures of particular districts; for, as a rule, it is well known that orders are sent by preference direct to the head quarters of any particular manufacture, and publicity given to the fact that a particular place was noted for the production of certain articles, would much more than counterbalance any disadvantages arising from competition which might sometimes be engendered.

So far with respect to the special interests of particular localities. What has been said will apply equally to the case of the individual manufacturer or capitalist who, at great cost and skill, has produced articles which it is of importance to him and to the community to make known.

Returning once more to the main line of our subject, the question now before us is the propriety of forming collections calculated to represent in India the manufactures which Britain can supply to India. In treating of this branch of the subject we have, as yet, only alluded to textiles. But, has Britain nothing but textiles to give to India in exchange for her manufactures and her products? Let us ask Sheffield. Does she produce nothing which, if represented in our Indian trade museums, would bring orders from India? Or, turn to Birmingham, that great hive of industry, which you, sir, this evening, so worthily represent. Does Birmingham produce nothing that it would be of interest to her to have shown to the people of India? And so with regard to other places in this England of ours. Let us by all means see everything which she has got that will suit the purposes of Indian trade. In order, then, to carry out fully the scheme now presented, it becomes necessary not only to take stock, so to speak, of India, but of Britain also, to the end that her various manufactures, and the chief places of their production may be systematically and accurately given.

As regards this country, however, the required information, to a certain extent, already exists. Our various chambers of commerce, alive to the interests entrusted to their care, have, in connection with the proper representation, at the different international exhibitions, of the productions of the particular districts within their individual spheres of action, so far carried out this process; and they will probably be found ready, not only to approve of this supplementary course of action, but to promote, by all the powerful means they possess, the establishment of the trade museums here indicated.

This is a matter in which each chamber of commerce, as the representative of the interests of its own district, is specially interested; and, although there may be cases in which it may not apparently suit the interests of individual members to foster a scheme of this sort, calculated, as it may be, to lay open and extend a knowledge of the sources of supply of the various articles, &c., produced throughout the country, I believe that such views if they exist, will not be allowed to impede its advancement, if it be considered beneficial to the interests of the community in the districts in which the chambers may be situated. I am induced to make this remark from a circumstance which happened to myself, and which it can do no harm to put on record here. Some years ago—I am sorry to think how many—when I first brought forward the particular method of representing the textile manufactures of India, now carried out in this country and in India, I took an opportunity of consulting the President of a Chamber of Commerce, representing a city and district very largely interested in textiles and in the trade with India, as to the probable value of the plan now, I trust successfully begun, and was somewhat discouraged by finding that he, the chief in authority for the time being, and a man of great experience, could see no use for such a scheme, and no good in it if carried out. As I was not favoured with the grounds for this adverse opinion, and as the scheme had already received the approval of two of the most intelligent and influential members of the same chamber, I thought it might be well to make some inquiry as to the particular trade* in which my friend, the president's, pocket was interested, and I had not to wait long before I found the reason—my informant's exclamation being, "Oh! he is not likely to approve of your plan, for his firm, to my knowledge, is now doing a good stroke of business with even a few of the articles out of the large class of goods which you propose to tell everybody about!" All honour to the men who, through their own unaided enterprise, are doing "good strokes of business" in consequence of special information which they have made it their effort to obtain. It is to such men that we are indebted for the trade stream—small though it is as compared with what it might be—which flows between this country and great India—it is they who have helped to forge the link of self-interest which binds the one to the other; but this is no reason why the general interests of the community should suffer and not be promoted. The members of the chambers of commerce, who, throughout this country, at a sacrifice which is but little known, give their time and brains to the duties of their office, are, however, the men most likely to realise that what is for the general is also for the individual good.

My story is now ended. I have endeavoured, as briefly as I could, to present to you the main features of this scheme for the extension of the commercial relations between Britain and India, and I now leave it in your hands, assured that it will receive your best consideration.

* Each Chamber of Commerce comprehends, as a rule, members representing the special interests of each principal kind of trade carried on in its district, and no Chamber is efficiently constituted of which this is not true.

DISCUSSION.

Mr. Jones said he had some connexion with India, and he felt the force of one particular word which had been used in the paper,—viz., "honesty." He knew there was sent from England to India a very large amount of deceptive work. Manufacturers in this country who had gained celebrity for their productions had their names or trade-marks forged to a large extent. This remark especially applied to the trade in which he was engaged—watchmaking; he had been informed that there was in the bazaars of India a particular class of watch known as the "mock Jones," and he believed in that way very serious injury was being done to the English trade with India. Some years ago a Swiss manufacturer sent into the Chinese market a number of the commonest and most delusive watches for sale there, marked as English productions, the special object of which was to damage the character of English manufacturers, so driving them out of the market. He thought the people of this country had, in some respects, acted unfairly towards India. He recollected a discussion that took place in this room at the time when it was proposed to erect cotton factories in Bombay. The Manchester men denounced the measure as one which would be highly injurious to the manufacturing interests of this country, and they argued that it was best to confine India to agriculture, and that manufactured goods should continue to be supplied by England. When he recollected the fact that the region where the manufacture of the beautiful fabrics of Dacca was carried on had been almost desolated in consequence of the introduction of our goods into that country, he could not agree with the author of the paper as to the mutuality of the advantage that would accrue to the two countries if India were restricted to agricultural productions while England alone enjoyed the benefits of the higher profits realised by manufactures. Our own country was an example that those engaged in manufactures were better paid for their labour than those engaged in agriculture. The present condition of monetary matters between England and India was one which he thought the Government would do well to take into consideration, especially by equalizing the value of the rupee and the florin, the difference between which was very small. There was one point touched upon in the paper to which he would specially allude. He submitted it was not the province of the Government to ticket the price of our goods in museums all over a country like India. If the Government established these museums in the interior of the country, and put the price of the goods on them, it would embarrass trade, because an article would often be 50 or 100 per cent. more expensive a thousand miles up the country than in Bombay. He was sorry to hear such a proposal made by any one connected with a department of the Government. He thought that some one actually engaged in trade should be placed upon the Indian Council, so as to prevent such objectionable propositions from being put forward. He considered that a great deal of mischief had been done in India by the guaranteed railways going to continental manufacturers for their locomotives in preference to the English, for the natives of India would thus be led to think that we had no faith in our own manufactures. The reputation of the English producer was thereby damaged, especially when the blunder was made of buying things which were only half as durable as those of English make. Locomotives were placed upon the Indian railways which would run only 200,000 miles instead of 400,000, and yet there was only a difference in price of about £200.

Mr. James Shaw remarked that considering the enormous territory in India which was ruled by this country, it was marvellous that we should know comparatively so little about it. We had not taken the trouble to know India as we ought; and it was only those who were more particularly connected with that country who paid any attention whatever to it; they were, therefore, much indebted to the gentleman who had brought this very able and interesting paper before them. He was happy to see that a little more attention was being bestowed upon this great dependency of our empire, numbering as it did over 200,000,000 of population. But he was afraid the author of the paper had taken only a limited and departmental view of India. The whole gist of his proposition consisted in establishing trade museums in England and in India. Trade museums were all very well to a certain extent, but he thought we had had as many exhibitions as we cared about for some time to come; and he for one had no desire to see South Kensington multiplied throughout the country. He did not think it wise to stimulate to an extraordinary degree these trade exhibitions, which, he thought, had been overdone. At the same time, he believed there was a great deal to be done in India, but not in reference to art. The great bulk of the inhabitants of India knew nothing of art—the masses of the people were poor and ignorant—and he submitted that there were other walks in which we could more successfully benefit India than by promoting trade museums. The productions of India were annually increasing, both in value and bulk, and what we had to do to benefit that country was to make it more of a manufacturing country, so that they might not have to send the raw material to us and take it back again in the manufactured state, at a largely increased cost to themselves. He agreed with the first speaker as to the absurdity of the Government taking upon itself to ticket the prices of the products of any country; this would only impede trade. Being himself a manufacturer of iron, he asked what use it would be to send ticketed specimens of each descriptions of iron to the Hindoo? We could soon find out what the people of India wanted, and there was sufficient English enterprise to set about the supplying of these wants. Let them, therefore, hear less about trade museums. The subject was being overdone; and be could not concur in the very partial view as to the wants of India which had been taken in the paper they had heard this evening.

Mr. Wm. Hawes could not agree with the speakers who had preceded him in their criticisms on the able paper that had been read, though he differed from some of the conclusions arrived at by Dr. Watson. He thought the first speaker was in error in supposing that that gentleman proposed that the manufactures should be sent out ticketed with the prices, unless in certain cases. All he desired was, that the two countries should be made thoroughly acquainted with each other's productions by the practical means which were suggested in his paper. As to decrying trade museums and collections of works of art, he (Mr. Hawes) had not expected to hear such a sentiment brought forward, particularly in this room at the present day. This Society prided itself especially upon having stimulated exhibitions of the works of art, and the productions of industry of all nations. It was the boast of this Society, that through its influence exhibitions of the manufactures of all countries had been held from time to time, and the best information possible given respecting the products and industries of every nation. The last speaker had said he had no desire to see repetitions of South Kensington. He (Mr. Hawes) would, on the contrary, be glad to see them all over the country. He believed that institution had done immense good in promoting the arts and manufactures of the country. It was an honour to the nation to possess such a museum, and, indeed, there was no other country that could boast of a similar collection. They had been told that exhibitions and museums were beautiful in theory, but that in practice they were a failure. He denied the correctness of the assertion. If the theory were good, it would be good in practice; if the theory of collecting these great works and stimulating the demands of a country was a good theory, then, he said, such a collection as that at South Kensington was a benefit to the industry of the

country. How was it that the French were surprised at the progress we had made in art, and that they sent a commission over to inquire how it was that we had advanced so rapidly, while they admitted they had not kept pace with us in that respect? It was especially owing to our having given to our workmen the opportunity of seeing the works of art collected by the Science and Art Department that we had produced so great an improvement in our manufactures as to make us rivals, in some respects, to a nation which produced works in the very best taste and at the cheapest rate. The paper they had just heard pointed in the same direction with regard to the arts, manufactures, and products of our great Indian empire. Perhaps Dr. Watson had assumed that the Government could do more than he (Mr. Hawes) thought was within its province. So long as it was merely proposed that the Government should use the means at its command for collecting every possible information on these matters, and also collecting and classifying specimens—so long nothing but the greatest good could arise from its action; but the Government should stop there. It had no business to recommend one branch of trade and discourage another branch. So long as it gave the legitimate aid to commerce which the proposed collections would afford, it was doing great service, and would tend to increase the respect in which the officers of Government were held by the natives, as well as to direct the industry of both countries into the best channels. With regard to how these museums were to be paid for, he thought if the Government of India had paid for the twenty collections already formed, it was of little consequence whether or not they paid for as many more; but whether this country paid for them, or whether this was done by the two countries jointly, he hoped nothing would be said or done to interfere with the proposed further action of the Government in the direction indicated this evening, as he strongly felt it was by the means of these collections that our commerce with India would be best promoted.

Mr. John Dickinson remarked that there were those present who recollected the time when it was questioned whether there was any use in giving information with respect to the products of India. In 1813 the East India Company thought the trade of this country with India could not be increased. It was then said that the natives had reached a certain degree of civilisation; that they had but few wants; and that they were more likely to contribute to our wants than we to contribute to theirs. The trade with India then amounted to only about three millions per annum; it had now increased to twenty-one millions. With regard to particular articles, he had known cases in which attention had been accidentally called to products hitherto unknown in this country, and a trade of several millions per annum had sprung out of it; and those products from India were paid for in British manufactures. The result of increased knowledge of the productions of the country had been the large increase in our trade with that country to which he had alluded, with the prospect of further indefinite increase. So far as the knowledge of each country's productions had extended it had tended to promote commerce and connect the two countries together on terms of friendship. In reference to the remark of a previous speaker (Mr. Jones), as to the increased price of articles in the interior as compared with the coast, that fact was sufficient to call attention to the importance of promoting the means of cheap transit in India. That was one of the things which Government had to do, and he hoped it would not be lost sight of. The only other point to which he would allude was the admirable and generous tone, not only of this paper, but also of most of the discussions which now took place on Indian matters, and it was pleasing to witness the philanthropic spirit which of late years had sprung up in reference to all that concerned this most important dependency of the British Crown.

Mr. Dadhabhai Naoroji said that if there were any gentlemen present who wished to confine India to agricultural pursuits, they appeared to have forgotten the fact that long before the savage inhabitants of this island knew how to clothe themselves, the people of India were clad in purple and gold; and if they were to credit such men as Mr. Owen Jones and Dr. Forbes Watson, India was still unsurpassed in the application of art to manufactures. India had been in early times the manufacturing country of the world, except China; and if, with her resources of steam-power and fuel, England had snatched from her some portion of her manufactures, she ought not to envy her the extension of her productive capabilities in other directions. It was upon no selfish ground that he spoke; for notwithstanding the advice that India should be kept to agriculture, they might be assured that the principles of political economy, and the natural laws of production, would always prevail. The Indian, they might be assured, understood his own interests, and knew when to buy a foreign article and when not to buy it. If England wanted to keep her hold on the commerce of India it was for her to learn the lesson that "honesty is the best policy," and that fairness of intercourse between the two countries would be the best for both. So long as England supplied manufactured articles better and cheaper than other countries, she might expect to keep the hold she had acquired on the commerce of India through her superior mechanical resources. If England and India, however, were to be mutually benefited by their commercial relations with each other, we must act upon the maxim that "Knowledge is power." We could never induce the people of India to approve of our articles unless we gave them a practical knowledge of those articles, nor could we obtain things from India without the same kind of knowledge. But for the great exhibitions that had taken place we should have been ignorant of many of those Indian productions which were so much admired in England and in France. He could conceive no better way of imparting the required information than that of adopting the plan of museums, which had been recommended so forcibly this evening. Let the great masses of the people see with their own eyes how cheap and good an article England could produce, and there would be no lack of customers for it. It was too late now to speak against exhibitions and museums. It was not the fault of the exhibitions themselves, but of those who entertained expectations beyond the legitimate scope of them, that they had not produced all the results anticipated. With regard to the proposition immediately under discussion, the Government of India were, as it were, placed between two fires; at one time they had the Manchester people down upon them with the complaint that they did not give sufficient attention to the commercial interests of our Indian empire, and at another time they were blamed for interfering with the commerce between the two countries. For his own part he thought the people of India would be two happy to allow this country to take upon itself all that it thought necessary to develop the commerce of the two countries; and in order to do that properly it was essential that they should have as accurate knowledge of each others productions as possible. Some unpleasant feeling was engendered when it was first proposed to establish mills in India; but it was to be borne in mind that there were 200,000,000 of souls there, and all the mills of this country could not supply even a small percentage of their wants. The field was large, let it be open, free, and honestly worked, and the whole world would be benefited.

Mr. Pearce, in reference to the remarks of Mr. Jones, expressed his opinion that a Swiss-manufactured watch, of good workmanship, would be as much appreciated in India as one of English manufacture.

Dr. Forbes Watson, in replying upon the discussion, said, with regard to the observations of Mr. Jones, he thought he might appeal to the meeting that if that gentleman had carefully listened to what he had read, he

would have discovered that one-half of what he said did not apply to it at all. With regard to the example he had given, of one particular sample of flax being marked as worth £40 per ton, and another as worth only £30, he need scarcely explain that he did not mean to imply that this price of £30 per ton was to be stated as a fixed price in any particular town in India, but was intended simply to represent to the mind of the Indian producer that a little more care bestowed upon the preparation of that article would make it worth £40 in the market instead of £30. He put it to practical men present whether that was not the kind of appeal which they should make to the people of India. With regard to the speaker who followed Mr. Jones, he seemed to imagine, in referring to the bulky article of iron, that it would be difficult to show it in the way he (Dr. Watson) had proposed, and that, therefore, his plan would be a useless one; he need not say this was a very partial view. The plan he had spoken of was not one which was untried, and, as far as it had been yet carried out, people in an important branch of manufacture had largely availed themselves of it with, it was to be hoped, benefit to themselves from the information they so derived. With regard to other remarks that had been made, he might say that it was not proposed that Government should interfere with trade in any way. The object of these museums was to give the fullest information in reference to trade. He did not propose to attach the market price of the day to articles, but merely to state the price on an average of one or more years in the chief marts of commerce. He believed these museums would greatly facilitate, in the way he described, the operations of trade between the two countries. It might be impossible to represent certain articles in the practical manner he had spoken of, but, wherever it was possible to do so, he said, let it be done.

The Chairman said he had now a duty to discharge, in moving that the hearty thanks of the meeting be given to Dr. Forbes Watson for the very able and interesting paper to which they had listened. From his intimate connection with chambers of commerce he knew something of the nature of their discussions. It might be imagined that amongst the commercial circles included in those chambers there was an immense amount of discussion on other markets than those of India. All the tariffs of Spain, Russia, and other countries were investigated with a minuteness which left nothing to be desired; but, excepting in Manchester, where the raw material going to that city became a natural subject of discussion, there was comparatively a great want of frequency of discussion, and consequently of knowledge, as to the purchasing power of our Indian empire. That being so, he was glad to find that by means of Dr. Forbes Watson's labours, and the diffusion of the knowledge of those labours which the publication of this paper would give throughout the country, some further inquiry was likely to be made with respect to the manufacturing and productive industries of India. If they considered the fact that our trade was being every year more shut out by the prohibitory character of foreign tariffs, we saw how important it was that this magnificent possession, which was one of the few in which we had the control of commercial operations, should be opened as far as possible to the manufactures of this country. He had no doubt the chambers of commerce would take up with vigour, in concert with this Society, any measures for increasing the mutual relations of India with England. He agreed with the remarks made as to importance of cheap transit in India, which would be largely promoted by the irrigation works advocated by Sir Arthur Cotton. No more valuable means could be taken for extending our commerce with that country. He begged to propose a cordial vote of thanks to Dr. Forbes Watson for his paper.

The vote of thanks was then passed and acknowledged.

Proceedings of Institutions.

New Swindon Mechanics' Institution.—The twenty-fourth annual report, for 1867, congratulates the members upon the general prosperity of the Institution. The number of members is 1,175. The library during the year has received additions to the extent of nearly 200 volumes, the number of books now being 3,879. Upwards of 100 volumes have been renewed, and 323 rebound; the number issued also shows a very satisfactory increase, being 12,742 against 9,902. With regard to the dancing class, the Council have continued to exercise a proper supervision over its management, and have the pleasure of knowing that the members generally are well satisfied with the manner in which it is conducted. Among the lectures and entertainments which have taken place during the past year was one by E. Wheeler, Esq., F.R.A.S., on "The Philosophy of Heat and Cold," and another on "The Sun and Moon;" one by the Rev. Hugh Stowell Brown on "Common Sense," and another on "The Good Old Times;" one by J. C. Daniel, Esq., on "Lord Nelson;" one by J. D. Muter, Esq., on "The Water we Drink;" several concerts; and two amateur dramatic performances. All these have been well attended. The thanks of the Council are due to Joseph Armstrong, Esq., who has kindly presented to the Institution the sum of £50, for the purchase of new books, and towards the furtherance of the other objects of the Institution; also to the Rt. Hon. S. H. Walpole, M.P., and Captain Bulkeley, for the sums of £5 each given to the Educational Board for the purpose of increasing the prizes. The educational classes were never better attended than during the past season, and the Council hope that the success of the students at the last examination of the Society of Arts may induce a greater number of those of the present season to come forward in the month of April, and that the Institution may stand in a still more honourable position than before in the next report of the Society's Examinations. The annual excursions so kindly and liberally allowed to the members of this Institution by the Directors of the Great Western Railway took place in the month of July, when about 1,800 excursionists were enabled to visit London, and 1,700 were permitted to take a trip to various places in South Wales. The statement of accounts shows that the receipts have been £757 15s. 2¾d., and that there is a balance in hand of £90 17s. 10¼d.

AGRICULTURE AND COMMERCE IN ITALY, AS COMPARED WITH ENGLAND.

Nations, like individuals, live either by production or by manufactures. In some cases a country is sufficiently fertile to be able to support itself by the fruits of the soil, and by the sale of the surplus to satisfy its other wants. Another country does not produce a sufficient quantity of food to maintain itself, but by the profits of its manufactures it is enabled to buy the necessaries of life from its neighbours.

Italy is a type of the first case, that is to say, a producing country; and England is a type of the other, viz., a manufacturing country. Italy ought, therefore, to be able—not only to produce enough for home consumption—but to have a surplus which, when sold to other nations, would enable her to pay for clothing, &c. In other words, Italy should import manufactured goods from other countries, and pay for them by the exportation of her products. In this manner agricultural industry should compensate for the absence of manufacturing industry. To see if this be the case is most simple. The purchase of that which is wanting in Italy is represented by the value of the imports, and the means for purchasing them is represented by the value of the exports.

The following table represents the exports and imports of Italy during the three years 1863, 1864, and 1865:—

Articles.	Commercial Value of Imports.			Commercial Value of Exports.		
	1863.	1864.	1865.	1863.	1864.	1865.
	frs.	frs.	frs.	frs.	frs.	frs.
Wines, spirits, oil, &c.	36,724,407	45,410,051	38,624,754	88,959,028	91,062,214	115,111,524
Colonial produce, sugar, &c.	134,959,671	146,474,861	128,349,528	49,037,501	48,172,842	38,283,432
Fruits, seeds, herbs, and plants	5,540,562	7,485,071	5,667,924	66,677,300	63,849,455	67,465,154
Tallow and other fatty substances	18,259,085	20,929,691	15,991,361	9,646,400	11,570,757	11,597,959
Fish	18,782,157	17,130,801	13,232,563	1,269,381	1,521,840	849,482
Cattle	14,931,785	14,598,397	12,532,771	10,025,964	8,466,634	8,616,100
Skins and hides	36,326,876	34,492,233	29,587,237	10,732,298	7,713,991	4,505,036
Hemp and flax (raw or manufactured)	20,083,224	23,526,441	21,696,821	18,834,344	20,840,795	26,325,268
Cotton (raw and manufactured)	101,869,909	85,221,168	106,572,843	17,116,839	11,102,617	9,227,184
Wool, hair (raw and manufactured)	89,643,044	94,288,293	84,313,009	16,329,442	13,701,706	3,160,438
Silk (raw and manufactured)	183,280,882	141,149,201	168,477,975	254,281,489	205,839,154	148,900,414
Corn, cereals, flour, and pastes	121,358,305	201,175,832	152,192,432	57,166,731	39,676,810	43,785,131
Timber and woodwork	17,444,533	28,101,039	20,362,923	11,873,692	8,302,572	8,945,685
Paper and printed books	6,589,627	6,273,908	5,508,239	6,685,690	6,530,419	6,881,084
Hardware and cutlery of all sorts	52,700,078	47,218,732	44,113,100	25,429,353	27,970,284	16,464,317
Metals and metal goods	66,312,366	65,604,400	60,480,174	8,583,290	14,972,518	3,613,798
Gold, silver, and precious stones, jewellery	7,657,775	7,940,871	3,939,136	1,897,913	4,159,482	2,965,394
Stone, earths, &c.	22,103,155	26,612,721	22,366,757	41,453,835	42,810,417	40,762,081
Porcelain, earthenware, glass, &c.	13,385,847	14,805,414	15,505,612	840,092	1,357,165	709,382
Tobacco	14,340,314	64,287,166	15,658,513	3,419,054	2,302,031	156,733
Total frs.	982,293,852	1,092,726,341	965,173,672	700,265,636	631,923,793	558,285,576
Total £	39,291,754	43,709,053	38,606,947	28,010,626	25,276,951	22,331,423

Thus it will be seen that in 1863 the value of the imports amounted to 282,028,016fr. (£11,281,120) more than the exports; in 1864 to 460,802,638fr. (£18,432,105); and in 1865 to 406,888,096fr. (£16,275,523). From this it is very evident that Italy buys more than she sells. Taking only the products of agriculture, the first 13 items of the above table, it will be seen that they are not sufficient for home consumption, and that in 1864 the imports exceeded the exports by 329,010,720fr. (£13,160,429). From this it will be seen that commerce altogether is in a very bad state in Italy, and that agriculture is still worse, representing three quarters of the excess of imports over exports. So that, if this state of things be not speedily remedied, the country will become bankrupt. To get out of this difficulty it is necessary that the nation should produce. The taxes on agriculture are enormous at the present time, because they do not know how to manage. When Italy can produce 25 hectolitres of corn per hectare (28 bushels per acre), when a hectare of grass will produce 120 quintals of hay (10,688lbs. of hay per acre), and a hectare of vineyard will yield 100 hectolitres of good wine (900 galls. per acre), then the taxes will be paid, leaving a good profit for the agriculturist. The natural requirements of agriculture are not many—land, water, and manure. These are not difficult to satisfy. Land is not wanting in Italy; there are abundance of rivers and streams, and canals should be constructed to irrigate the land where the supply of water is insufficient. The manure would be furnished by the cattle. What is required in Italy is the knowledge to profit by these natural advantages, *saper fare*. Agricultural instruction should, therefore, be encouraged by the Government, and everything done to aid the population in acquiring this knowledge.

In order to produce 25 hectolitres per hectare of corn, the use of manures is indispensable, and to obtain this a greater stock of cattle should be kept. This will be seen by comparing the quantity of cattle in Italy with that of Great Britain, where the average production of corn is even more than 25 hectolitres per hectare, viz., 27 bushels per acre.

The total number of each description of live stock in the several divisions of the United Kingdom in 1866 was, according to the statistical notes on the industries and commerce of the United Kingdom, published by the British Commission at the Paris Exhibition—

Cows	3,381,568
Other cattle	5,184,900
Sheep	26,374,685
Pigs	3,993,506
Horses	1,606,095
Total	40,540,754

From the latest returns the quantity of live stock in Italy in 1865 amounted to—

Cows and other cattle	3,708,635
Horses, mules, asses	1,391,626
Sheep and goats	11,040,339
Pigs	3,886,731
Total	20,027,331

The total extent of land under cultivation in the United Kingdom amounted, in 1866, to 44,369,000 acres. Italy has 46,972,226 acres of land under cultivation, not including about 9,880,000 acres of wood.

The following will show the proportion of cattle per acre in the United Kingdon and in Italy:—

	In Italy.	United Kingdom.
Cows and other cattle	·078	·193
Horses, mules, asses	·029	·036
Sheep and goats	·232	·594
Pigs	·092	·090

Although the proportion of cattle per acre in England is superior to that of Italy, the English imported, in 1865, the following amounts of materials for manures:—

Bones	65,650 tons
Guano	237,400 ,,
Other materials	802 ,,

amounting altogether to the value of about £3,087,000 sterling.

In Italy, in 1864, the imports of materials used as manure amounted to 31¼ tons, of the value of £6,254, and the exports amounted to 16 tons, of the value of £3,209; deducting the amount of exports from the value of the imports, there remains £3,045 spent in foreign manures. Thus, where the English spend £1,000 the Italians spend £1.

TECHNICAL AND SECONDARY EDUCATION IN FRANCE.

M. Duruy, the Minister of Public Instruction, is indefatigable in his endeavours to extend and improve the system of instruction in France. It is admitted by all who are acquainted with the schools of France, that the teaching of modern languages has hitherto been of the most superficial and unsatisfactory kind, and no normal school has hitherto existed for the formation of sound teachers in this branch of education. The minister has just created, at the new technical normal school of Cluny, a special section for modern languages. The course of study in the new section will be of the same duration as that of the section of sciences, namely, two years; but after the expiration of that period of study, and practice in the college annexed to the normal school, the pupil

teachers are to be sent for a year to the country whose language they profess to teach, and will be required to write every week to their professor in that language. The pupils are to be placed in public schools, so that they may not only complete their knowledge of the language of the country, but also study its method of teaching, and pursue their general studies.

The Emperor and Empress paid a visit the other day to the laboratories of the Ecole Normale Superieure and of the Sorbonne. At the former establishment, M. St. Claire-Deville is engaged, at the instance of his Majesty, in making a series of experiments on the calorific value of mineral oils, and exhibited the principal results which he has already obtained.

It appears that the Emperor has in view the use of these oils for the heating of the boilers of the vessels of the Imperial Navy; and one object of the experiments in question is the prevention of the dangers arising from the explosive nature of petroleum.

Their Majesties then visited another laboratory in the same school, in which the pupils were engaged in their studies, and were presented to the Emperor and Empress by their professor.

The next visit was to the laboratory at the Sorbonne, under the direction of M. Jamin. This establishment is quite a new one; its object being, to quote the words of a French writer on the subject,—"To emancipate the experimental sciences from the difficulties which surround their early study. The scientific eminence of France depends upon such measures." It is said that fresh impulse is about to be given to these and other valuable meaans of diffusing scientific instruction. M. Ruhmkorff was introduced to their Majesties, and exhibited the wonderful effects of his induction coils.

This Imperial visit, and other circumstances of daily occurrence, show the deep interest that is felt for scientific and artistic instruction, in order that France may maintain her high place in many of the arts, and improve her position in others.

Fine Arts.

SOUTH KENSINGTON MUSEUM.—Visitors to the Paris Exhibition may have remarked, at the end of one of the passages in the British section, a large yellow majolica column, with white relief ornament upon the surface. The ceiling of the new refreshment rooms, recently opened at the South Kensington Museum, is supported by four of these columns, which are worthy of careful inspection. They have been manufactured by Messrs. Minton, from designs by Messrs. Gamble and Townroe, founded on suggestions of the late Mr. Godfrey Sykes. The introduction of porcelain for the enrichment of the ornamental portions of columns is not an entire novelty; but a complete porcelain column is believed to be without a precedent. It is intended that the walls of the refreshment room shall be covered with majolica tiles, with a low relief ornament on them. A small staircase at the west end of the refreshment corridor has lately been opened; the designs are by Mr. F. Moody, and the works are still in progress. The portions of the decoration already completed and fixed, promise to render this staircase an attractive feature of the museum. The staircase is what is called a barrel-vaulted one; its sides are panelled and decorated with enamellsd earthenware by Messrs. Minton, in imitation of the Della Robbia ware. The dado, or skirting, is exceedingly rich in design. At intervals of three steps, caryatids support a cornice, from which it is evident that a handrail will project; the spaces between the caryatids are filled with panels in bold relief on a celadon ground. Between the dado and the cornice above are panels also in glazed pottery, with bas reliefs of figures holding shields; the design of these bas reliefs is peculiar, and of a varied character. At the top and bottom of each flight are pilasters, which support the arches against which the barrel vault butts. The spaces in the domes over the landings are at present incomplete. The propriety of using glazed pottery for the sides of a public staircase is apparent. The facility of cleaning the surface of the decoration, and the durability of the pottery, are both facts recommending the judgment displayed by the management of the museum in its selection of a good, decorative, and lasting material. Messrs. Minton have, perhaps, hardly reproduced the effect of the old Della Robbia ware, inasmuch as their glazing rather softens the lines of the details instead of leaving them sharp as the artist intended. The old Della Robbia glazing was so exceedingly thin that it did not obliterate the sharpness and crispness of the modelling. Again, the glitter of Messrs. Minton's enamel is distracting, and it does not seem so opaque as the ancient enamel. These observations on modern enamels, as compared with ancient ones, are applicable to the copies of the Henri Deux ware exhibited in the south court of the museum, which are placed near the originals, the difference in quality of the glazed surfaces being very palpable. Some stained-glass windows, which were exhibited by the Science and Art Department at Paris, are in course of being fixed, two on the north-east staircase, and one in the refreshment rooms.

Manufactures.

EXHIBITION OF REAPING AND MOWING MACHINES IN BERLIN.—An exhibition of the above-mentioned machines is to take place in Berlin, commencing on the 13th and ending on the 19th of July. This exhibition has been organised by the Société d'Agriculture de Marc-Brandebourg and Niederlausitz, and is to include the three following classes of implements:—1. Reaping machines, with arrangement for laying the cut corn in rows.—First prize, a gold medal and £30; second prize, a silver medal and £23. 2. Reaping machines without such arrangement as that above mentioned.—First prize, a silver medal and £15; second prize, a sum equal to £7 10s. 3. Mowing machines.—Prize, a silver medal and £7 10s. The machines are to be tested in the first place by means of the dynamometer, and afterwards each separately in the field. The exhibitors may if they please employ their own teams, and try their machines on crops which will be placed at their disposal for that purpose by the society. Applications are to be made, before the first day of June, to M. Le Conseiller V. Schmidt, No. 27, Mattaikirsch-strasse, Berlin.

Commerce.

TREATIES OF COMMERCE.—The late changes which have taken place in Europe seem likely to produce considerable changes in their commercial relations. The cabinets of Paris and Berlin are said to have arrived at an understanding respecting the annulling of the existing treaty between France and Mecklenburg, and the concessions to be made by Prussia in consequence, not only to France, but to all those states with which treaties have been made. One consequence of the arrangement resulting from this understanding will be the admission of the Grand Duchy into the Zollverein, and another, the conclusion of a treaty between the latter and Austria. Other important negociations are also on foot between the German States and Austria; thus, it is said that Bavaria and Saxony have been invited by Prussia to enter into an arrangement for the new commercial treaty to be made between the last-named country and Austria. Lastly, it is asserted that Prussia and Austria are engaged in attempts to induce Russia to review her commercial tariff; the customs duties on the Russian frontier weigh heavily on Austria. Heretofore the government of Saint

Petersburgh has declined to make any new treaties with either of her neighbours, but it is said there is a disposition at the present time to make concessions with respect to some important articles of commerce. This expectation seems supported by the facts which have lately been published respecting the growth of Russian commerce, and the improved tone of the governmental journals of Russia with respect to all commercial questions. The new arrangement of political boundaries in central Europe renders some changes inevitable, and there seems fair reason to suppose that such changes will be in favour of an increased amount of commercial freedom.

Coffee Trade of the United States.—It appears from the *Produce Markets' Review* that there are indications of the steady revival of this branch of commerce in the United States. The paralysing effect of the war has almost passed away; and both imports and consumption for the past year, though not yet on a level with 1858, bid fair, if they progress at anything like their present rate, to exceed them in a very short time should the existing depression in the trade be removed.

The Wines of Spain and Portugal.—It appears, by the circular of Messrs. Matthew Clark and Sons, that the shipments of wines from Cadiz to all parts, during the past year amounted to 63,415 butts, being an increase of 2,150 butts over the previous year, while those from Oporto reached only 34,680 pipes, being 5,820 pipes less than in 1866. The shipments of wine to this country from Tarragona, during 1867, amounted to 9,000 pipes, against 9,800 pipes in 1866, and 5,900 pipes in 1865. The moderate prices ruling for the red wines of the North of Spain cause a steady increase in the home consumption.

Colonies.

Railways in Victoria.—The revenue of the government lines still continues to show a decrease as compared with that of the previous year. The total revenue up to 14th November, 1867, was £456,008 18s. 5d., whilst for the corresponding part of 1866, it was £500,737 11s. 8d. The following is the return of the monthly revenue of the Victorian railways:—

Railways.	Passengers.			Goods.			Total.		
	£	s.	d.	£	s.	d.	£	s.	d.
Murray River Line	7,600	12	10	17,873	6	9	25,473	19	7
Williamstown Line	1,687	12	8	1,245	8	2	2,933	0	10
Ballarat Line...	7,668	6	6	8,418	5	8	16,086	12	2
	16,956	12	0	27,537	0	7	44,493	12	7

Obituary.

C. Thurston Thompson, the well-known photographer, died at Paris on the 20th of January, after a painful illness and considerable suffering. Since his return from Spain, in the early part of 1867, his health has been anything but good, and during his stay in Paris, where he was assisting in the arrangement of the photographic section of the British portion of the Exhibition, he was the victim of two very severe attacks of jaundice. He was the son of the eminent engraver, Mr. John Thompson, and was born in 1816. After receiving his education at Dr. Mitchell's, in Kensington, he studied the art of wood engraving under the able tuition of his father, and soon became an expert in that art. He drew and engraved a considerable number of the illustrations of "Yarrell's British Birds." Associated with Mr. Bingham, he was appointed to superintend the production of the photographs which were taken of the Exhibition of 1851. In the following year he proceeded to Paris, and remained some time in Mr. Bingham's studio. On his return to England he received a commission from the Department of Practical Art to photograph the collection of furniture then being exhibited at Gore-house, where the department was located temporarily. In 1855, as in 1851, and subsequently in 1862 and 1867, he was appointed Superintendent of the Photographic Class of the British Section of the Exhibition. Whilst in Paris he executed photographs of objects selected from French provincial museums. In his own special department of photography, the reproduction of pictures and works of art, he had no equal in this country and was unsurpassed by any abroad. His refined taste and knowledge of art, derived from his early training, rendered him peculiarly fitted for his work; and in consequence of his distinguished abilities he was permanently appointed official photographer to the South Kensington Museum in 1856, after his return from the Paris Exhibition of 1855. It would be almost impossible to enumerate all his works, but it may be interesting to state that amongst his foremost are the photographs of the Raffaelle cartoons, Turner's "Liber Studiorum," Her Majesty's collection of arms at Windsor, the wedding presents of H.R.H. the Princess of Wales, many objects from the Kensington Museum, and lastly, and perhaps most important, an exceedingly interesting series of photographs of the collections belonging to the King of Portugal in the royal palace of Necessidades, at Lisbon, and a series of photographs of ancient ecclesiastical and domestic architecture in Spain. His loss to the Photographic Society, in which he was for many years an active member of the council, as well as to the South Kensington Museum, is indeed a severe one.

Notes.

Royal Academy of Music.—A paragraph in the *Times* says that this institution having struggled for nearly half a century to support itself on the voluntary principle, by subscriptions, balls, concerts, &c., has been obliged to decide on closing its action. The surrender of its charter has been offered to the Government. It is stated that the directors will cease to act in March next.

Researches in Siberia.—At a recent meeting of the Russian Imperial Society of Geography it was announced that Mr. Poliaskoff had traversed the country of the Baïxal, during the months of June and August, in order to make barometrical and thermometrical observations, and that in the neighbourhood of Tounska he had found ancient weapons, principally arrows, the points of which were of cornelian and jade; this interesting fact has given rise to a search being made for deposits of jade on the banks of the Onote, a tributary of the Angara. Mr. Pontzillo has collected and carried home specimens of more than a thousand kinds of insects, and Mr. Przewalsky a collection of plants and birds from this inhospitable and little known region. A series of meteorological observations is about to be carried out in the same country on the same bases as that adopted for European Russia.

The Cab Question.—It appears by the *Globe* that a deputation of hackney carriage proprietors waited on Monday on the Chancellor of the Exchequer to ask that the duties paid on cabs might be reduced, and the licence be made annual and payable in August, at which time the trade is comparatively idle and very little loss would accrue to the proprietor in getting his cab passed. Mr. Alderman Lawrence, M.P., in introducing the deputation, said he considered their complaint was one that called for attention. The public complained of the hackney carriages, and he was bound to admit that they were not equal to the public conveyances on the Continent; but he believed this was owing in a great degree to the very heavy duty, £19 5s., payable by the proprietors for each cab, as payment of such a sum pre-

cluded a person investing capital that was subject to so large a duty. When the Act passed in 1853, regulating the present fares, corn, hay, and all kinds of fodder were not much more than one-half the present price; and, beyond this, the rent of stabling had much increased since that time, and the profits of the proprietors were lessened in consequence of the connexion of the various railways, the cabs not being required as they used to be. The Metropolitan Railway now carried passengers at so small a price from the west-end to the city, and so expeditiously, that cabs had lost one of their principal sources of profit. Since the passing of that Act the duty had been materially reduced upon stage carriages, but no alteration had been made as to the hackney carriage duty. Upon all these grounds he therefore asked that Her Majesty's Government would be pleased to take the matter into their careful consideration. Mr. Gower (of the Barbican) and others having addressed the right hon. gentleman, the Chancellor of the Exchequer said,—"I have had much pleasure in receiving this deputation, and hearing the remarks made by Mr. Alderman Lawrence and Mr. Gower, and the manner in which the last speaker has treated the subject. I may say personally I have a very great objection to taxing locomotion in any way, and am quite aware that the hackney carriage trade in London has many disadvantages that do not arise in foreign cities. I am prepared to say that the whole matter shall receive the most careful consideration of Her Majesty's Government and myself; but at the present time, seeing that there is a decreasing revenue and increasing expenditure, I am not prepared to say what the result of those deliberations may be, but I feel certain that, should there be a reduction in the duty, it will be for the mutual benefit of the proprietors and the public."

Correspondence.

Natal.—Sir,—I regret that I was unable to attend Dr. Mann's valuable paper on the colony of Natal. Among other points, I wished to mention the successful propagation, by my relative, Mr. John Vanderplank, of Pietermaritzburg, of Turkish silkworm eggs, and of Turkish tobacco seed by Mr. John Robinson, M.L.C., who has done so much for Natal as a journalist, and a promoter of public improvement. I furnished them, at their request, with these productions of Turkey; and I think it much to be desired that other suitable productions of Asia Minor should be tried in the congenial climate of Natal.—I am, &c., Hyde Clarke.

32, St. George's-square, S.W., 31st January, 1868.

The Artisans' Reports.—Sir,—My attention has been directed to Mr. Hawes's summary of the reports of the artisans sent by your Society to the Paris Exhibition, published in the *Journal of the Society of Arts* of January 24th. With regard to his epitome of my own report, I find that Mr. Hawes gives it "much foreign work superior to English, &c." I beg respectfully to submit that it was by no means my intention to convey any such impression, nor do I think that my report will be found upon examination to favour any such conclusions. It is true (and it would be strange if it were otherwise), that I found some goods by foreign manufacturers that I thought worthy of commendation, but these generally were articles unimportant in themselves, or of a class not usually manufactured in this country; and I indicated them more as a warning for the future, than on account of their own intrinsic excellence. My general impressions I thought I had broadly and clearly stated when I wrote, "I think it will be conceded that in the higher branches of what may be called the regular Japan trade, the English are far in advance of the foreign exhibitors. In the papier-mâché branch especially, whether for form, surface, or ornamentation, the English work is generally superior." I am afraid that we are getting too much into the habit of advertising the superiority of continental productions, and, under the appearance of candour, decrying our own. Such a course cannot fail to exercise a most injurious tendency, and will, by fostering a taste for foreign manufactures, prove very detrimental to our own.—I am, &c.—Thomas Archer.

159, Moseley-road, Birmingham, Feb. 3rd, 1868.

Our Markets.—Sir,—It may appear somewhat extraordinary at first sight, that handsome and convenient markets may be built in appropriate situations, replete with every appliance for the purposes of trade, and yet not be frequented by those for whose convenience they may have been expressly intended. May not the solution of this difficulty be found in the two words "market tolls," which are apparently intended to recoup the undertakers for the cost of the market buildings; but, although the original outlay may have been repaid over and over again, tolls still continue to be levied, and are generally farmed out to the highest bidder, who has sometimes but little scruple in enforcing his rights by any means. Tolls are also demanded for open standings in the street where no expense has been bestowed. The more cogent reason for such an impost may perhaps be found in the fact, that all municipalities are governed by the principal well-to-do tradesmen of the respective localities, who cannot be supposed to look with favour upon those persons who occasionally visit their town for the purpose of selling at a rate somewhat lower than the regular shop prices. It is therefore their interest to maintain the system of market tolls inviolable, in order to keep up prices; and they claim the power of putting on such tolls as a right, because they pay rates and taxes, which the market people do not, entirely ignoring the fact that the market people pay rates and taxes at home. This specious argument has no foundation, because it can be shown that town tradesmen's rates and taxes are not paid by themselves, but by the consumer. For if the town tradesmen were to be relieved by any means from that burden, competition in trade would soon bring down prices to their proper level, and tradesmen would be no better off than they were before. The consumer, therefore, not only pays his own taxes, but also those of the tradesman with whom he deals. The only alleviation for this grievance to the consumer would be, the power of purchasing from market people. Here the town tradesman steps in, and says that the consumer shall not purchase at a lower rate, and contrives a system of tolls that will effectually prevent that result. In effect, they cause the market people to pay rates and taxes, or their equivalent, at home and at market also. So the poor consumer—the affluent care nothing for prices—is compelled to pay rates and taxes, or their equivalent, for both the tradesmen and the market people, besides his own. I do not allude to the fashion of late, for town tradesmen to absorb nearly all the market-standings, because, with the disappearance of the tolls that fashion will also disappear. If, therefore, it should be deemed expedient to establish a new market in some well-adapted locality, it will be necessary, in order to ensure success, to raise the funds by subscription, and make the stalls and standings free to all who can show a title to some degree of respectability according to their rank and station in life; all expenses of supervision being, of course, borne by the town rates. Markets cannot, however, be made thoroughly respectable, until we shall be able to eliminate, or at any rate diminish, the crowds of disreputable persons who attend to carry on nefarious trades, and who do not pay market tolls. The legislature has given us free-trade in corn, but owing to corn exchanges free-trade is not yet; no man can transact business in a corn exchange unless he be in possession of a high-priced stall, and in many exchanges an additional charge is made at the door. Certainly, free-trade is not yet; and innumerable instances may be shown that fierce protection is still the rule, not the exception.—I am, &c., Henry W. Reveley.

Baker-street, Reading.

To Correspondents.

Errata.—In last *Journal*, p. 218, col. 1., line 42, for "£4," read "4s.;" also, at top of col. 2, the statement should be that "freehold allotments of 200 acres" are *given* to suitable settlers, not that they may be "bought."

MEETINGS FOR THE ENSUING WEEK.

Mon......Society of Arts, 8. Cantor Lecture. Dr. Letheby, "On Food."
R. Geographical, 8½. Captain Sherard Osborn, "On the Exploration of the North Polar Region."
Medical, 8.
Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1. Renewed discussion upon "The Fresh-water Floods of Rivers." 2. "Floods in the Nerbudda Valley." And (time permitting) 3. Mr. W. J. McAlpine, "On the Supporting Power of Piles; and on the Pneumatic Process of driving Iron Columns."
Photographic, 8. Annual Meeting.
Ethnological, 8. 1. Prof. Busk and Mr. John Evans, "On Human Remains and Works of Art found in the Tumuli and Caves of Portugal." 2. Rev. — Houghton, "On the Hairy Men of Eastern Asia." 3. Dr. Hyde Clarke, "On the Varini of Tacitus."
Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Wed ...Society of Arts, 8. "Report on the Art-Workmanship Competition, 1868."
Microscopical, 8. Annual Meeting.
Graphic, 8.
Literary Fund, 3.
Archæological Assoc., 8½.
Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.
Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Fri.......Astronomical, 3 Annual Meeting.
Royal Inst., 8. Professor Roscoe, "On Vanadium."
Sat ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

Patents.

From Commissioners of Patents' Journal, January 31.

Grants of Provisional Protection.

Bags for the conveyance of samples by post—216—W. Davis.
Baskets—151—J. G. Rollins.
Beer and wine finings—212—W. J. Coleman.
Boilers—204—J. F. Spencer.
Bonnets—147—H. B. and A. Mullord.
Brick kilns, &c.—155—F. Postill.
Brushes, painting—119—C. A. Watkins.
Bullets—184—J. Davidson.
Busk fasteners—153—G. E. Reading.
Capsules, &c.—150—W. Betts.
Churns—210—L. N. Le Gras.
Combs or reeds, expanding and contracting—194—M. Robinson.
Cotton, &c., pressing—3635—C. G. Wilson.
Cradles, aërial—127—A. B. Boyer.
Engines, carding—173—T. B. Kay and F. Hamilton.
Engines, motive-power—189—D. Timmins.
Fabrics, piled—145—R. Schneider.
Fabrics, textile—137—J. Parker.
Fabrics, treating woven—122—C. D. Abel.
Fences, wedging and fastening—110—W. D. Young.
Furnace linings, &c., composition for—131—G. Nimmo.
Furnaces—139—J. Head.
Furnaces, &c.—24—C. Long.
Furnaces, &c., obtaining and applying hydrogen gas to—3580—J. Stanfield.
Gaiters and bootakins—140—W. Wilkins and W. G. Pollard.
Gas-heating and cooking apparatus—146—C. E. Brooman.
Glass bottles, &c., filling with soups, &c.—171—J. Winter, jun.
Grass and corn cutting machines—133—D. Hodson and J. Dodd.
Harness, &c., links for—187—G. S. Fisher.
Hay, straw, &c., cutting—170—G. S. Fisher.
Heavenly bodies, apparatus for indicating the relative positions and movements of certain of the—214—J. H. Johnson.
Instruments used in drilling, &c., hard material—162—J. Hosking, jun.
Iron and steel—149—J. A. Jones.
Iron ores, treating—164—H. Aitken.
Kilns for baking porcelain, &c.—185—W. E. Newton.
Kitchen ranges, &c.—188—F. J. Baynes.
Lath cutters—168—N. H. Rolfe.
Light, obtaining artificial—138—J. Kidd.
Looms—126—T. Sagar and T. Richmond.
Looms—134—J. Hudson and C. Catlow.
Looms—143—J. J. Ashworth.
Looms—181—H. A. Bonneville.
Meat biscuits, &c.—186—J. Carr and C. Lucop.
Metals, &c., cutting and dressing—166—J. M. Napier.
Music, printing of—132—J. Lang.
Nails and tacks—158—R. Heathfield.
Ordnance, breech-loading—7—A. M. Clark.
Paper bags, &c., printing—29—W. W. Morley.
Paper pulp—167—D. A. Fyfe.
Pencil cases—183—B. J. Heywood.
Planing machines, &c.—129—W. E. Gedge.
Railway carriages, &c.—120—T. Wood.
Railway switches, &c.—154—C. D. Abel.
Railway trains, signalling in—196—J. Woodley.
Sewing machines—202—A. V. Newton.
Sheep, folding—89—R. Winder.
Ships, propelling—160—H. C. Löbnitz and A. Buquet.
Ships, propelling—172—J. Millward.
Ships, &c.—200—J. H. Johnson.
Sleeve links, &c.—190—G. Gopsill.
Spinning machines—144—J. Tolson and J. Boothroyd.
Steam, employing waste—161—S. and E. Burrows.
Stoves and fire-places—152—T. Nash.
Studs—128—F. and I. Alekan.
Sword blades, &c., shaping, &c.—156—W. E. Newton.
Tablets, &c., preparing—87—S. G. Archibald.
Tallow cups, lubricating—73—W. H. Bailey and J. W. Lowther.
Telegraph wires, laying, &c.—130—L. M. Becker.
Thrashing machines—218—H. Brinsmead.
Truncheons—206—C. W. Brown.
Valves—220—A. B. Brown.
Valves, self-acting—182—A. Bochkoltz.
Washing machines—163—J. Young.
Water-closets—142—J. Eggleton.
Water-heating apparatus—208—C. R. Havell.
Water pipes, protecting from injury by frost—175—B. T. Moore.
Windows—148—J. Wood.
Wood-veneer, treating—169—W. R. Lake.
Wool, machinery for preparing—159—J. Moorhouse.
Worsted, &c., spinning—178—H. Kershaw.
Yarns, washing printed and parti-coloured—165—J. Crossley.
Yarn, &c., clearing and smoothing—141—T. Travis, W. H. Prince, and J. Tomlinson.

Patents Sealed.

2236. J. H. Johnson.
2241. T. Allan.
2242. J. G. Tongue.
2244. J. and T. Elce.
2245. C. D. Abel.
2248. J. Russell.
2249. A. Budenberg.
2254. W. W. Hughes.
2255. W. Wilson.
2264. J. Heaton.
2265. W. Prangley.
2285. A. M. Clark.
2291. T. J. Baker.
2303. A. M. Clark.
2325. H. M. Mellor.
2369. J. W. Dixon, jun., and W. Buttery.
2508. G. A. Buchholz.
2542. R. W. Ewer.
2552. J. Marsden.
2842. R. Smith, jun.
2860. W. H. May and P. Graham.
2871. J. B. P. A. Thierry.
3277. W. Anderson.

From Commissioners of Patents' Journal, February 4.

Patents Sealed.

2259. W. J. Pughsley.
2260. A. C. Bamlett.
2262. J. G. Tongue.
2267. T. Whittaker & M. Rourke.
2270. T. Luthringer.
2271. E. J. W. Parnacott.
2276. C. McDermott.
2278. F. C. Marshall and H. Stewart.
2280. M. Hamer.
2281. T. S. Cressey and J. Webb.
2286. C. Benson and J. Barker.
2297. C. Hohgrefe.
2299. H. B. Barlow.
2302. G. Hodgson.
2304. G. Warsop.
2307. F. H. Holmes.
2329. J. Badger.
2336. C. Holliday.
2339. W. Betts.
2340. W. Betts.
2360. J. W. Dudley.
2459. H. J. Simlick.
2579. W. E. Newton.
2972. W. Gray.
3031. W. E. De Bourran.
3093. J. Orr.
3319. W. Boulton.
3410. J. Fitter.

Patents on which the Stamp Duty of £50 has been paid.

210. T. Steel.
244. J. H. Johnson.
249. V. Burq.
261. W. Teall and A. Naylor.
294. J. Ball.
286. J. Hughes.
292. C. Lungley.
310. J. A. Phillips.
322. J. Booth.
332. C. Beard.
281. J. McNaught and Wm. McNaught, jun.
319. R. M. Alloway.

Patents on which the Stamp Duty of £100 has been Paid.

230. W. Winstanley, J. Kelly, W. Payne, & J. Formby.
263. J. Chatterton.
246. E. Smith.
249. H. Phillips and J. Bannehr.
275. H. Bessemer.
430. J. J. Miller, jun.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 14, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock :—

February 19.—"On the Supply of Animal Food to Britain, and the Means Proposed for Increasing it." By Wentworth Lascelles Scott, Esq., F.C.S.

February 26.—"On a Daily Mail Route to India." By Hyde Clarke, Esq., D.C.L.

March 4.—"A Workman's Views on Technical Education." By Mr. John Randall, one of the Artisan-Reporters on the Paris Exhibition.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

The fourth and concluding lecture of Dr. Letheby's course "On Food" was delivered on Monday evening, the 10th inst. A full report of these lectures will be given in the *Journal* during the vacation.

Tenth Ordinary Meeting.

Wednesday, February 12th, 1868; William Hawes, Esq., F.G.S., Chairman of the Council, in the Chair,

The following candidates were proposed for election as members of the Society :—

Dickinson, John, 12, Haymarket, S.W.
Griffith, George, Woodside, Harrow.
Mathew, E. W., Wern, Carnarvon.
Wilkins, John, 48, Hungerford-road, N., and Took's-court, E.C.

The following candidates were balloted for, and duly elected members of the Society :—

Allen, J. H., 2, East India-avenue, E.C.
Clarke, David, Mayor of Macclesfield.
Clarke, George W., North Cheshire Chamber of Agriculture, Macclesfield.
Davenport, George, 45, Ludgate-hill, E.C.
Fitzwilliam, W. S., 28, Ovington-square, S.W.
Gourley, E. T., Mayor of Sunderland.
Van Abbott, G., 5, Princes-street, Cavendish-square, W.

The Secretary read the—

REPORT OF THE JUDGES ON THE ART-WORKMANSHIP COMPETITION, 1868.

It would not have been unnatural if, with the great demands made upon their time and energies by the preparations for the Paris Exhibition, the class of art-workmen who have heretofore taken part in the Society's competitions should have abstained from sending in works on the present occasion. Such, however, has not been the case, for, with the exception of some half-dozen objects which it would have been well if the officers of the Society could have had some power of summarily excluding from exhibition, the numerous specimens of art-workmanship which have been sent in for this year's competition for the Society's prizes to art-workmen display much energy on the part of the competitors, and an average high order of merit.

Indications were given in last year's competition of a power and disposition on the part of the competitors to execute meritorious works, other than those in accordance with prescribed designs; and the Society, consequently, extended its invitations in that direction. The result has, however, scarcely realised expectation, since, with few exceptions, the works wrought in accordance with prescribed designs are in all respects superior to those in which the workman has followed his own inspiration.

This circumstance points forcibly to the weak side in the present condition of the training, or rather want of training, of the art-workman. His knowledge of the functions, capabilities, and right application of the processes he employs with so much dexterity, is greatly in advance of his taste and knowledge of the principles of design. His head does not keep pace with his hands. The addition of a small amount of knowledge of the elementary principles of the theory of design would in many cases have prevented the considerable waste of ingenuity and labour shown in many of the subjects which have not followed any prescribed design.

To this there occur two notable exceptions. The one case is that of No. 68, a female head, "Summer," by Mr. Mark Rogers, and the other a dessert service, in the majolica style, designed and painted by Miss L. L. Hawkins. The former is a small work, of very great merit, carved by the practised artist whose works have already received the utmost recognition and commendation at our hands. On this account we have not again awarded him one of the prizes offered specially in the class of wood-carving, but as the work combines excellence of execution with taste, and that knowledge of the principles of design in which at present we think the British workmen are deficient, we have thought it right to award to him the prize arising from the fund placed at our disposal from the proceeds of the North London Industrial Exhibition, as a recognition of those merits.

In the case of Miss Hawkins's majolica service, the specimens are of imposing extent, and have involved the devotion of much time, energy, and labour to their elaboration. The result, however, scarcely corresponds with the sacrifices made to attain it, since the unhappy tone of colour which predominates in the ornamentation greatly mars the agreeable effect of the whole. So far as a competition such as the present is concerned, a single specimen, really beautiful, would have better exhibited the obviously rare capabilities of the artist, than the

large quantity she has produced with so much apparent facility. We can only hope that Miss Hawkins may be induced, on another occasion, to forward a careful specimen of her talent, painted in a more satisfactory emulation of the masterpieces of Renaissance earthenware at their best period both as to taste in design and skill in execution.

Upon the whole, the most satisfactory works to which we have awarded prizes in this division have been contributed by Mr. Brangan and Mr. Dujardin; the former, in a good average style of wood-carving, manifests the possession of considerable taste as well as dexterity; the latter, both in wood and plaster, shows specimens of flower carving of peculiar tenderness and delicacy of handling.

Mr. Leach's frieze (No. 89), from "A Midsummer Night's Dream," is very clever; and there is a very agreeable naïveté in Mr. Godard's "Girl's Head," carved in pear-tree (No. 70).

Of the works sent in in accordance with the prescribed designs, the most uniform excellence is shown in the various processes of metal working. Mr. Dufour's *repoussé* work is excellent, as is Mr. Hatfield's (senior) chasing of the Virgin and Child. In the last-mentioned specimen we recognised an element not often to be met with in these competitions—the handicraft was kept in due subordination, and not suffered to divert the spectator's attention from the general scope and artistic purpose of the model. Too often in such objects the chasing of an angel's wing is made more telling than the angel's head; or the flowers trodden on by an amorino's foot may have had infinitely more pains bestowed upon them than has been given to the definition of the foot itself. So the major is often, through the art-workman's egotism, made to hide its head before the minor; but of this solecism Mr. Hatfield, sen., has steered clear with most commendable taste.

Mr. Fidler's marble carving is very satisfactory, since it shows that the sculptor can not only execute but design. His re-arrangement of the subject given, so as to adapt it to fill a lunette instead of a frieze, has been skilfully managed, and, in all the slight changes and additions involved through the re-arrangement, he has well maintained the spirit as well as the letter of his pattern.

The stone and wood carving is of good average quality, but calls for no special remark.

In the pierced work in metal—"ornament after a missal cover"—Mr. A. E. Milward in silver, and Mr. H. J. Hatfield, jun., in bronze, have attained rare excellence. Mr. E. Milward has made a good wrought brass knocker, while Mr. W. Sendall's, in iron, is first-rate.

We were glad to recognise the perfect success with which, in glass-blowing, Mr. Joseph Leicester had reproduced the tazza from South Kensington. Mr. Oppitz's glass engraving, and Mr. Genth's binding (especially the specimen in morocco), were excellent.

In the application of painting to industry, the specimens of figure-painting on porcelain by Mr. E. Saunders and Mr. W. J. W. Nunn, and of ornament painting by Mr. Fisher and Mr. Slater, were better than usual. In the class of decorative painting, however, with the exception of the *grisaille* reproduction, after a picture-frame in the South Kensington Museum, the arabesques contributed furnish a very inadequate idea of even the common run of good trade work in decorative painting, the colouring in all cases being inharmonious, and the style of handling laboured and mechanical.

In the same way, the competition for the prizes for illumination was not what, in these days, when almost every weekly publication is overflowing with clever illustrations, we have a right to expect. There was a total absence of life and spirit in the specimens sent, the best rising only to about the level of neatness.

The die-sinking and wall mosaics were not "up to the mark," but the engraving on ivory, by G. Berry, was very good, and shows something better than much we have seen upon pretentious specimens of furniture, which failed only to attain great excellence through the feebleness and occasional scratchiness of the engraving of the ivories with which they had been inlaid.

In conclusion, we beg to offer the following suggestions, if not for adoption, at least for discussion:—

Firstly, we think the time has arrived when animation might be given to future competitions, by a considerable change of programme. Especial prominence might be given to evidence of ability in processes not commonly practised in this country,—such as several of those involved in the manufacture of Venetian glass; in the execution of enamelling, both upon earthenware and metal bases; in the application of painting and lacquering, as in Japanese and Cashmerian work; in Damascening, both after the Milanese and Oriental systems, &c. From such efforts new branches of national industry might possibly arise; and, at any rate, working men would be induced to exercise their ingenuity and to acquire that pliability or general aptitude in which, as compared with the French art workman, the English artificer is now somewhat deficient.

Secondly, the apportionment of the money prizes requires revision, so as to bring the rewards offered into better proportion to the labour or outlay risked in the different sections by the workmen entering upon the competition; regard being, of course, had to the special branches of art industry in which temporary stimulants might seem most needed.

Thirdly, prizes might be offered for evidences of proficiency in two or three branches of industry not yet included in the Society's programme, as stained glass, jewellery, brass-rule cutting, the application of turning to artistic wood or metal work, &c. Some such changes, and the withdrawal of all hackneyed models, would probably tend to relieve the apparent monotony of the Society's competitions; and, after a year or two's interval, the leading features of the present programme might be reverted to with a fresh and lively interest on the part both of the art-workmen and of the public.

(Signed) Richard Redgrave.
M. Digby Wyatt.

List of specimens sent in competition, with the Prizes awarded:—

FIRST DIVISION.

Works sent in in Accordance with the Prescribed Designs.

1. Carving in Stone.—After a frieze for a chimney-piece by *Donatello*. Price £15. By Alexander J. Earp, 2, Ebenezer-cottage, Kennington-park, S.
2. Ditto. Price £10. By H. Coles, 16, Alma-terrace, Fentiman-road, Lambeth, S. (Prize of £5).
3. Carving in Marble.—After the same design, by John B. Fidler, 61, Arundel-street, Sheffield. (Prize of £15).
4. Carving in Stone.—After a chair-back in the South Kensington Museum. Price £10. By W. H. Barrett, 14, Alma-terrace, Fentiman-road, Lambeth, S. (Prize of £7 10s.).
5. Ditto, by "Troy."
6. Carving in Oak.—Panel, by C. H. Line, 41, Prince of Wales-crescent, Kentish-town, N.W. (Prize of £7 10s.).
7. Ditto, panel enlarged to suit for pilaster of chimney-piece. Price £12. By W. H. Baylis, 27a, Riding house-street, W. (Prize of £7 10s.).
8. Ditto, by Thomas E. Mayle, 33, James-street, Stockwell, S.
9. Repoussé Work in Metal.—After the Martelli mirror case in the South Kensington Museum. Price £20. By A. Dufour, 36, Cleveland-street, Fitzroy-square, W. (Prize of £10).

10. Ditto, after a panel, in low relief, of the "Virgin and Child," in the South Kensington Museum. Price £25. By G. Page, 39, Northampton-road, Clerkenwell, E.C.
11. Ditto. Price £15. By S. S. S.
12. Ditto. Price £14 14s. By "Bona Fide," Durham-cottage, Lordship-lane, Wood-green, N. (Prize of £5).
13. Ditto, after a tazza in silver. Price £6. By Alfred Page, 29, Myddelton-street, E.C. (Prize of £3).

14. HAMMERED WORK IN BRASS.—After a knocker in wrought iron in the South Kensington Museum. By E. Millward, 35, Little Clarendon-street, Clarendon-square, N.W. (Prize of £5).
15. Ditto, by "M. C. S."
16. Ditto, in iron. Price £3. By W. Sendall, High-street, Wisbech. (Prize of £7 10s.).

17. CHASING IN BRONZE.—After a relievo in marble' "Virgin and Child." Price £15. By S. Beresford, 189, Oxford-street, Stepney, E. (Prize of £7 10s.).
18. Ditto. Price £20. By T. Nichols, 4, Everilda-street, Hemingford-road, N.
19. Ditto. Price £16 16s. By H. C. Hatfield, sen., 46, Bolsover-street, Euston-road, W. (Prize of £10).
20. Ditto, ornament after a missal cover. Price £18 18s. By H. J. Hatfield, jun., 46, Bolsover-street, Euston-road, W. (Prize of £10).
21. Ditto, in silver, after the same design, by A. E. Millward, 8, New Compton-street, Soho, W.C. (Prize of £10).

22. ENGRAVING ON METAL.—After an arabesque by Lucas Van Leyden, by G. W. Hindley, apprentice at Messrs. Garrard and Co., 29, Panton-street, Haymarket, S.W. (Prize of £2, being a portion of the Goldsmith's Company's prize).
23. Ditto on ivory, after the same design, by G. Berry, 31, Brewer-street, Golden-square, W. (Prize of £4).

24. PAINTING ON PORCELAIN.—After a drawing by *Raphael*. Price £4. By Edwin Saunders, 8, Martha-street, Cambridge-heath, Hackney, N.E. (Prize of £5).
25. Ditto. Price £5. By Walter J. W. Nunn, 10, Grafton-street, Globe-lane, Mile-end, E. (Prize of £3).
26. Ditto. Price £2 10s. By "J. E."
27. Ditto. Price £3 3s. By W. Slater, Field-place, Stoke-upon-Trent.
28. Ditto, by Thomas Stanway, 74, Lower Russell-street, Hanley, Staffordshire Potteries. (Prize of £2).
29. Ditto, by Joseph B. Evans, South-street, Mount-pleasant, Fenton, Stoke-on-Trent.
30. Ditto. Price £5 5s. By W. P. Rhodes, Liverpool-road, Newcastle-under-Lyne.
31. Ditto. Price £3 3s. By John Willshaw, 27, Bow-street, Newcastle-under-Lyne.
32. Ditto, ORNAMENT, by Alexander Fisher, 5, Clyde-street, Stoke-on-Trent. (Prize of £3).
33. Ditto. Price £6. By W. H. Slater, James-street, London-road, Stoke-on-Trent. (Prize of £3).

34. DECORATIVE PAINTING. — After an ornament by *Aldegrever*. Price £7 10s. By Charles Pfander, 28, Bayham-street, Camden-town, N.W.
35. Ditto. Price £5 5s. By John Slater, Field-place, Stoke-on-Trent.
36. Ditto. Price £5. By W. J. Hutchins, Gold-tops, Newport, Monmouthshire.
37. Ditto, after a picture-frame in the South Kensington Museum. Price £23. By Charles Pfander, 28, Bayham-street, Camden-town, N.W. (Prize of £7 10s.).

38. ENGRAVING ON GLASS.—Executed on a claret jug, after an arabesque by Lucas Van Leyden, by P. Oppitz, 76, Stamford-street, Blackfriars, S. Price £50. Exhibited by Messrs. W. T. Copeland and Sons, 160, New Bond-street, W. (Prize of £10 to P. Oppitz.)

39. WALL MOSAICS.—After a female head in *Raphael's* cartoon of the "Beautiful Gate," by Samuel Cooper, 2, Waterford-terrace north, Fulham, S.W.

40. DIE-SINKING.—After a Wedgwood medallion in the South Kensington Museum, by W. A. Walker, 5, Tysoe-street, Clerkenwell, W.C. (unfinished).

41. GLASS BLOWING.—After an original in the South Kensington Museum, by Joseph Leicester, 34, Tenison-street, York-road, Lambeth, S. (Prize of £7 10s.).

42. BOOKBINDING.—"De imitatione Christi," bound in calf, after a specimen in the South Kensington Museum. Price £3 10s. By Louis Genth, 90, High Holborn, W.C. (Highly commended, but ineligible for a prize, the producer having received an award in the same class in a former competition).
43. Ditto, Mosaic, bound in morocco. Price £3 10s. By Louis Genth, 90, High Holborn, W.C. (See note to 42).

44. ILLUMINATION.—After a specimen in the South Kensington Museum, by "T. H. R."
45. Ditto. Price £5. By Miss Mary R. David, 4, Anderson-street, Chelsea, S.W. (Prize of £1).
46. Ditto. Price £5 10s. By Charles Pfander, 28, Bayham-street, Camden-town, N.W. (Prize o £2).

SUBJECTS SENT WITHOUT PRESCRIBED DESIGNS.

47. CAP, CARVED IN CAEN STONE. By W. Aumonier, 173, Marylebone-road, N.W.
48. Ditto, by "Erna."

49. REPOUSSÉ WORK IN METAL, after Wyon's medal for the North London Exhibition of 1866. Price £10. By James Gwillim, 19, Sidney-square, Mile-end, E.
50. Ditto, after Wyon's medal of St. George. Price £10 10s. By F. S. Briault, 5, Southampton-street, Pentonville, N.

51. CHASING IN METAL.—Emblem of bread and wine. Price £4. Modelled and chased by C. Jacquard, 1, St. George's-road, New Kent-road, S.E. (Prize of £1).

52. HAMMERED WORK IN METAL.—Mirror frame. Price £5 5s. By Thomas Bush, 36, Hall-street, City-road, E.C.
53. Ditto, a Ewer. Price £5 5s. By the above.
54. Ditto, series of specimens. By T. Winstanley, 22, New Compton-street, W.C. (Prize of £3).

55. MODELLING IN PLASTER.—Evangelical emblems. By J. Meiklejohn, 58, Sussex-street, Pimlico, S.W. (Prize of £3).

56. Ditto, panel of spring flowers. Price £10. Designed and modelled by E. Dujardin, 46, Camberwell-grove, S. (Prize of £5).

57. MODELLING IN CLAY.—Sketches from *Punch* and *Fun*. Price £4. By J. W. Bentley, 22, Sherwood-street, Golden-square, W.

58. Do. A Tazza, intended for pottery to be decorated as Palissy Ware. Copy of work produced by Henry Brownsword, Salem-street, Etruria, Staffordshire Potteries, for Messrs. Wedgwood and Sons.

59. ILLUMINATION.—Price £3 3s. By Miss H. Jupp, 3, Bellevue-terrace, Clevedon, Somerset.

60. Painting on Porcelain.—Specimen of Heraldic Painting. By Edward Mayer, Lyndhurst-street, Burslem, Staffordshire.
61. Ditto. Dessert Service, Majolica style. Price 100 guineas. Designed and painted by Miss L. Leila Hawkins, Belvedere-road, Upper Norwood, S. Twelve plates, subject: the Signs of the Zodiac; centre-piece, Summer; two dishes, Spring and Winter; four dishes (The Muses), Memory, Music, Astronomy, and Eloquence; rose-water flagon and bowl, Clouds and Rain.
62. Engraving on Glass.—Jug and two Goblets. Price £30. Antique shape. Heraldic designs, surrounded with arabesque borders. Designed and arranged by Mr. Jones, in the employ of Messrs. Copeland and Sons, and engraved by Paul Oppitz, 76, Stamford-street, Blackfriars, S. Exhibited by Messrs. W. T. Copeland and Sons, 160, New Bond-street, W.

SECOND DIVISION.

Wood Carving without Prescribed Designs.

(*a*.) *Human figure in the round, in alto or in bas-relief. Animals or natural foliage may be used as accessories.* 1st. prize of £25 and the Society's Silver Medal. 2nd prize of £15. 3rd prize of £10.

63. An Allegorical Clock. Price, without works, £38. By "Tempus Fugit."
64. "Neptune;" carving in walnut-wood. Price £25. By Charles Liddle, 5, Goding-street, Vauxhall, S.
65. Female Figure, in carved panel of walnut-wood. Price £10. By Samuel Moutrie, 219, Stanhope-street, Hampstead-road, N.W. (Prize of £3).
66. "The Seasons;" Four Medallions, in peartree-wood. Price £8 8s. the set. Designed and carved by W. Aumonier, 173, Marylebone-road, W.
67. "Daphne." By H. W. McCarthy, 106, Brook-street, Kennington-road, Lambeth, S.
68. "Summer;" Female Head. Price £15 15s. (when finished). By Mark Rogers, 111, Tachbrook-street, Pimlico, S.W. (Highly commended, but ineligible for a prize in this class, the producer having received an award in the same class in a former competition). (The "North London Exhibition" Prize.*)
69. Boy's Head, carved in a Bracket. By E. Glancy, 113, Manor-street, Chelsea, S.W.
70. Girl's Head, carved in peartree. Price £4. By H. Godard, 13, Upper Marylebone-street, W. (Prize of £2).
71. Medallion and Flowers. Designed and carved by E. Dujardin, 46, Camberwell-grove, S. (Prize of £2).
72. "The Nativity of Cain." Price, when finished, £18. Designed and modelled by S. Shadaway, carved by J. S. Shadaway, jun., 31, Walton-street, Brompton, S.W.
73. Human head. Specimen of carving in different stages, for the use of amateurs. By W. H. Holmes, 101, Dean-street, W.
74. Child's head. By William Davison, 20, Marlborough-road, Chelsea, S.W.

(*b*.) *Animal or still-life. Fruit, flowers, or natural foliage may be used as accessories.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

75. A Dead Lark. Price £8. By John Wallace, 26, Adam-street East, Portman-square, W. (Prize of £2).

* This Prize consists of the interest of £167 7s. 3d. Consols, invested in the name of the Society of Arts, to be awarded by the Council "for the best specimen of skilled workmanship" at the Society's Exhibition.

(*c*.) *Natural foliage, fruit, or flowers, or conventional ornament, in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.* 1st prize of £10. 2nd prize of £7 10s. 3rd prize of £5.

76. Oval Frame in lime wood. Price £3 15s. By W. M. Holmes, 101, Dean-street, W.
77. Mahogany Frame. Price £7 7s. By G. Box, 15, William-street, Regent's-park, N.W.
78. Scoop for a Tea-caddy, carved in box wood. Price £2. By J. Manhood, 11, Effingham-street, Pimlico, S.W.
79. Box. Carved by Philip Davison, 8, Randall-street, Hydge-grove, Battersea, S.W.
80. Jewel Casket. By G. Rumford, 19, Eccleston-street East, Pimlico, S.W. (Prize of £2).
81. Portrait Frame. Price £8. By G. H. Bull, 16, Millman-mews, Millman-street, Foundling, W.C. (Prize of £1).
82. Oak Bracket. Price £8. By the above.
83. Panel of Flowers Carved in Satin-wood. By Edward Glancy, 113, Manor-street, Chelsea, S.W. (Prize of £1.)
84. Fruit and Flowers, after the style of Gibbons. Price £7 7s. Carved in the solid by R. A. Brangan, 54, Foley-street, Portland-place, W. Gilt by R. Farrell.
85. Panels, representing "Spring, Summer, and Autumn" ("Winter" not ready for exhibition). Price £42 the set of four, or can be sold separate at £10 10s. each. Designed and carved by R. A. Brangan, 54, Foley-street, Portland-place, W. (Prize of £5).
86. Panel in Oak, intended for centre frieze Ornament. Flemish renaissance. Price £3. Designed and carved by "E. J. G."
87. Oak Clock Cases (unfinished). Price £6 6s. Designed and carved by "E. J. G."
88. Panel for Cabinet Door. By G. H. Barnsdale, 2, Queen-street, Peterborough. (Prize of £1).
89. Part of a Frieze; subject from "Midsummer Night's Dream." By J. M. Leach, 23, Effingham-street, Pimlico, S.W. (Prize of £3).
90. Clock-case, carved in oak; Elizabethan style. Price £20. By "W. H. B."
91. Gothic Panel in oak, for pulpit or reading-desk. Price £15. Designed and carved by H. G. Price, 36, London-street, Fitzroy-square, W. (Prize of £2 for the three works, Nos. 91-3.)
92. Ornamental Panel in mahogany, carved for casting in metal. Price £10. By the above.
93. Two Panels in oak; natural foliage. Price £9 the pair. By the above.
94. Panel in Walnut-wood for a round-end sideboard. By J. Sparrow, 76, Vauxhall-bridge-road, S. (Prize of £2).

DISCUSSION.

The Chairman said he would now ask his friend, Mr. Digby Wyatt, one of the adjudicators of the prizes, to express his opinion upon the progress that had been made in these exhibitions during the time that they had been instituted by the Society. He had no doubt that would elicit observations from many persons whom he saw present.

Mr. M. Digby Wyatt expressed his regret that on the last two or three occasions when these meetings had been held his other engagements had unavoidably prevented him from being present. That absence had arisen from no lack of interest on his part in the undertaking which the Society had so ably carried out to the benefit of the working classes and of art generally. He had endeavoured on all occasions in studying the works sent in (and he trusted thereby learning something from them), to allot the prizes in a perfectly impartial spirit, but human judgment was not infallible, and, of course, he was liable to error. He confessed, when

he remembered the scanty display when these competitions were first instituted, and the comparative poorness of the technical dexterity then shown, he recognized a most visible and marked improvement in the exhibition now before them. In addressing this meeting he addressed men who had many of them shown at the late Paris Exhibition that England was not deficient, and scarcely, if at all, behindhand, in the power to produce works of the highest order of merit. In that respect they had done honour to their country, and to the Society which had assisted in developing their capabilities. In nearly every department of industry, those who had carefully studied the French Exhibition must have seen that England showed a manifest advance. He thought one main weakness in the art-workman of the present day was a want of knowledge of the best mode of applying his own powers. He thought very often the result of labour would be tenfold better—even if the labour were somewhat inferior—if the workman understood the best way of putting his strength forward; just as a strong man often tugged at a load which a weaker man would carry with no great strain if he knew how best to apply his strength. It was not in bringing his branch of labour to mere mechanical perfection that the workman was to succeed, but in elevating it from the mechanical function to the creative function; and as he gained the power of creation he promoted his own gratification and advanced the art he practised. He (Mr. Wyatt) thought in these days, when so much was said about technical education, the education they most needed was of an elementary kind, so as to have the means within themselves of acquiring higher knowledge. Only a small portion of mankind were able to see with their minds; there were many who saw with the eyes, but they did not enjoy the true faculty of vision, because no corresponding chord was awakened in their brains. The true visual power was when they saw with the intellect as well as with the eyes. The man who had learnt the meaning of words thoroughly was able to use them with exactness and with effect; just so with labour; they had only to learn the use and scope of their labour to make it tell as they made their words tell. The moment they had acquired the power of language, they had opened to them almost all the mysteries which the most advanced practisers of their art had before them. They could buy at a book stall elementary treatises on design, or form, or physical knowledge, or philosophy at a small cost; and the moment they had a thorough command of language they had within their own grasp the means of their own improvement; and in the measure of their ability to use those simple powers which he urged them to acquire, in that measure would they advance themselves; and they would need scarcely any technical education if they used those powers aright. They were apt to regard technical education as a means of producing cheap labour for the master, rather than elevating the working man as an intelligent and thinking being. If a man awakened to the necessity of learning, and if he once got over the *pons asinorum*, the stumbling-block of the incapacity to properly read and properly learn—if he got over that impediment—he could select for himself that knowledge which would be most useful to him. He was, he thought, justified in this belief by the very excellent reports on the Paris Exhibition, emanating from members of the artizan class, in the volume lately produced under the auspices of this Society. The Society had been twice blessed in what it had given and received; for if it had assisted a certain number of working men to see the marvels of the French Exhibition with benefit to themselves, the mass of information given in return was such that it would repay the Society ten-fold. If it had been his duty at times to attempt to teach, where he ought perhaps to have learnt, he acknowledged that from those pages, and from contact with educated and talented workmen, he had learnt much. It gave him much pleasure to see the advances they had made, and he hoped for years to come to see corresponding progress.

Mr. G. Page (metal-worker) begged to be informed on what grounds the prize had been given to the repoussé work in metal, after the Martelli mirror case.

Mr. Digby Wyatt replied that he could not enter into a personal discussion with persons interested in the award of the prizes. The awards had been made to what were considered to be the best productions in each branch of art-industry.

Mr. Copeland thought it due to Mr. Page that a reply should be given by Mr. Digby Wyatt to the inquiry he had made.

Mr. Digby Wyatt said, the reason the award was made to that work was simply that, in the opinion of the judges, it was the best.

Mr. Philip Palmer, in reference to the suggestion of the judges, in the last paragraph of their report, that a prize should be offered for stained glass, remarked that he was rather surprised that Mr. Digby Wyatt, with his excellent knowledge of that branch of art, should have recommended a prize to be offered for it, because the chief merit of stained glass was really in the design, and it was impossible for anybody but a thorough artist to produce a good design for such work. It was known that stained glass went through a number of different processes, which occupied a considerable time, and involved elaborate appliances. Another point was, a large space would be required to exhibit the stained glass; indeed, for the due display of it a temporary building of iron would be necessary.

Mr. Copeland recommended that more encouragement should be given to the production of designs, instead of adhering to the models emanating from South Kensington, and others with which the public were familiar. He thought if greater scope were given for originality of design, it would have a beneficial effect upon art-workmanship generally.

Mr. Rasmussen (silverworker) said there were several remarks in the report of the judges which deserved consideration in reference to extending the programme of prizes. As regarded the awards of the prizes, he might venture to say he quite concurred with the decision of the judges. He suggested that prizes should be offered especially to apprentices, so that a young man of 19 should not have to compete with workmen of far greater experience and skill than himself. He thought this would have a most beneficial effect.

Mr. Page said that if it was not intended in competitions of this kind to award the prize for two consecutive years to the same competitor, he thought this should be distinctly stated in the programme.

Mr. G. Lock (wood-carver) said he thought it was not desirable to disqualify for prizes persons who had been successful competitors in previous years. He thought the principle was wrong, and opposed to the usual practice in such cases. Architects, sculptors, and painters were placed under no such prohibition, but were allowed to compete even if they had obtained prizes in the same exhibition in previous years. The object of the Society was to encourage the most proficient men in each class of work, and it ought to be proud to see that those who distinguished themselves in former years were able to hold their own in subsequent exhibitions, and rather than except them from the awards, they ought to be encouraged to go for higher prizes than they had yet obtained. This Society, in its earlier years, did great service to sculpture by the prizes it awarded to artists; and there could be no doubt it had often been the means of raising them to a higher position in their professions. He thought the prizes given generally in these art workmanship competitions were not of sufficient amount to induce the production of a high class of work. The prizes given in the department with which he was connected (wood carving) were so small as not to give much encouragement to the skilled workman. There were a number of prizes, of from £1 up to £5; and anyone acquainted with the position of wood-carvers in London, knew these were insignificant amounts to receive as rewards. He thought

if the Society encouraged the younger members of the trade, especially apprentices, by giving rewards for elementary productions, it would be a great advantage to them. At the same time, he believed higher prizes would stimulate the production of superior works to those which had been hitherto exhibited.

Mr. R. Coningsby said, while agreeing with the last speaker that the prizes in some of the classes were not of sufficient amount to stimulate the best workmen, yet, it was evident from the disappointment of one exhibitor, expressed this evening, that the prizes of the Society were sought after, and much valued. At the same time he did not think the matter should be regarded in a merely pecuniary light. It was too much the custom in the present day to value things by their £ s. d. value. A higher class of reward might be offered, but he did not think it ought to be in money, but in honour, as in the case of a statesman, or a warrior; if that were done, young men in the trade would feel more pride in being journeymen or workmen of high skill, than in being masters on their own account, because they would feel that the work so appreciated was produced by their own hands.

Mr. R. Baker (wood carver) agreed to a great extent with the remarks of the last speaker, and also with much that had been said by Mr. Lock; but, personally, he had reason to be satisfied with the amount of the prizes, inasmuch as he had once been awarded £10 for a piece of work which was in itself worth only £4 or £5. He would venture to offer a suggestion to the Council, which he thought would be of some benefit. He imagined the main object of these competitions was to stimulate the production of a higher class of work in this country. In order to do that they should look to the wants of art workmen, and one of the greatest wants of the day was a better knowledge of the principles of the ornamentation of past times. He suggested that the society should offer, amongst other prizes, some relating to different styles of ornamentation—for, instance, for a bracket or a panel—one in the Italian style of the 16th century, another in the French style at one of the best periods, and another in the English style of the Elizabethan period. That would tend to concentrate the mind of the workman upon the style, and he would enter with more spirit into the details, instead of catching up bits of information here and there; and in endeavouring to understand the principles of these different styles he would be making real progress in his art. Another suggestion he would make was, that some good would, in his opinion, result from introducing a few practical working men to assist the judges in making the awards, not that he doubted the ability and perfect fairness of the gentlemen who acted as the adjudicators, but because there were many little details connected with the execution of work which no one but a practical man would be likely to see. He thought the art-workmen would do well to form a club or guild amongst themselves, so that when any great work was to be executed, architects and others might know who the best workmen were, and where they were to be found. From his observations in Paris he was satisfied the art-workmen of this country did require a great deal of instruction and encouragement; but he asked them not to look for it from Government or even from the Society of Arts; but if they looked to themselves they would make England something worthy of herself, and would not be thrown into the shade by other nations.

Mr. Gwillim, as a worker in iron, agreed with the opinion expressed that the prizes in some departments were insignificant, more particularly in the class of smiths' work, which involved the expense of a forge.

Mr. Holliday supported the suggestion of separate prizes for competition by apprentices, as they stood little or no chance of success in the general competition.

Mr. Botly expressed his sense of the obligations which the Society was under to the gentlemen who had acted as judges in this competition. He urged upon the Council the propriety of taking into their serious consideration the suggestions that had been made with regard to prizes for apprentices.

Mr. Blackie suggested that the awards should either consist of medals alone or be accompanied by them. When the awards consisted of money only there was no lasting memento of success in the competition; he believed the Society's medal would be much valued by the competitors. He thought there was no reasonable ground for complaint as to the small amounts of the prizes, more especially in the case in which the exhibitor received a prize of £10 for a piece of work he valued at only about £5. He remarked upon the absence from the programme of prizes for mechanical productions. England, he believed, would never be a great art country, but she owed her present position mainly to her manufactures and machinery; therefore, he thought mechanics ought not to be forgotten in the Society's programme of prizes.

Mr. Digby Wyatt said he would address a few remarks upon the different matters which had been brought under discussion. In the first place he would say to Mr. Page that he introduced an apologetic remark with reference to the awards of the prizes, because, as he said, human judgment was fallible; and in excepting Mr. Page's work from the award it was done conscientiously, because the other work was considered more entitled to it. With regard to stained glass being introduced into the programme, that, as well as the other suggestions of the judges, was put forward, not for adoption necessarily, but rather to call the attention of the Council, by whom the programme of the competition was drawn up, to the matter. Mr. Palmer had remarked that one of the greatest difficulties with regard to stained-glass was the distinction that existed between the artist and the workman, inasmuch as it was designed by the artist and executed by the workman. He (Mr. Wyatt) felt that was the very point to which the energies of the Society should be directed: their great object was to obliterate this wide distinction between the artist and the workman. With regard to Mr. Palmer's objection, on the score of the size of the specimens, that would hardly hold good, inasmuch as he had seen as beautiful examples of Swiss stained glass in a small compass as could possibly be produced; and, though there might at first sight appear to be some difficulty on the part of the workman in getting the glass burnt, yet, with the master's permission for the use of his kiln, he imagined a very manageable specimen of stained glass might be produced to show the workman's ability. Mr. Copeland spoke of the advantage of encouraging original designs in workmanship. The report of last year mentioned that there was a tendency on the part of the workmen towards improvement in that respect. This year, however, the work was better in following the designs given; but the Society did not shut the door against original designs. Mr. Rasmussen corroborated the views of the judges as to the advantage of extending the programme, especially to some other branches of metal work in which the French excel. Those who noticed the productions, at the French Exhibition, of M. Christofle and M. Barbédienne, must have seen that the worker in silver plate was also a perfect enameller, and had produced works as perfect as anything that was done in China or Japan. With regard to prizes for apprentices, he thought the Society's object was not to teach youths, but to stimulate the production of perfect specimens of workmanship—whether done by boys or by old men was of no consequence. Mr. Page also made a remark with regard to the prize not being awarded to the same exhibitor a second year in the same class. Mr. Lock expressed an opinion that the same man should be allowed to compete for the same prize in succeeding years. That was a subject for the Council to consider, and on the next occasion no doubt there would be a clear understanding on that point. With regard to larger rewards, it was singular that in the class of smiths' work, with which the speaker who referred to this subject was specially

connected, the prize awarded this year was no less than £7 10s., while the price of the article was only £3. Mr. Coningsby, who urged that Mr. Lock's views were too mercenary, observed that the best mode of encouragement was to confer honour on the successful workman. A man, however, must look for honour first in his own class, and then afterwards his reputation would rise in the class above him. It was not the Society which could honour him; he must honour himself by the exercise of his own ability. Mr. Baker observed upon the want of knowledge of particular styles. This, no doubt, was so, and it was to remedy this evil that the Museum at South Kensington, as well as the British and the India Museums, were especially useful; and he thought this knowledge was better gained from them than it would be by such an offer of prizes. Any imitations of style would be much inferior to the originals; and the best way of encouraging the study of good styles was the giving designs to copy which furnished good models. This, however, was a question for the Council to decide upon. Then, the same speaker recommended that a certain number of practical workmen should be appointed to assist the judges with their advice in the award of the prizes. He thought, however, that at such meetings as the present, they got the benefit of advice given in the most open and free manner. If some of their own class were appointed to the duties suggested, there might be mistrust of their influence on the part of the competitors. Mr. Blackie recommended that medals should supersede the present money prizes. It was possible the Council might see fit to allow workmen who desired to receive a portion of the prize in the shape of a medal to do so, or they might add a medal of small intrinsic value to the principal prizes gained.

The Chairman said, the object of the Society in establishing these competitions, was not, in the larger and wider sense, to encourage the production of works of art, but to encourage the workman, and give him the credit really due to him, which, till they begun this work, was generally claimed by the employer. They had endeavoured to bring the art-workman into the front rank, so that the public might know to whom the dealer in these commodities was really indebted for the labour and skill displayed. There was no doubt that though the increase in the number of works sent in year by year was not so great as could be wished, still they had made substantial progress. Let them look at the results of the last two years, as shown in the following table:—

	1867.	1868.
Total number of articles sent in for competition	102	94
Articles sent in in accordance with prescribed designs	47	46
Articles sent in not in accordance with prescribed designs	31	16
Wood-carvings without prescribed designs, but in accordance with prescribed regulations	24	32
Number of prizes awarded	46	43
Amount of " "	£175 10s.	£198 10s.

The judges had very properly stated in their report that it could not be expected that in the year of the French Exhibition there would be the same amount of leisure for the production of these works, and so a somewhat less number had been sent. Still, they found that the works exhibited this year were of a higher quality. The falling off in number was especially in the articles produced from the designs of the working men themselves. It was said by some that they ought not to think so much of the money prizes, but that they should rather look to the honour of obtaining them. Now, honour was a good thing, but money was not to be despised. Nevertheless, he (the chairman) could see no objection to a medal being awarded, at the option of the recipient either in lieu of the pecuniary prize or jointly with the pecuniary prize. Many persons would no doubt be pleased to have a medal which they could preserve as a memorial of their skill. That was a question which would receive the attention of the Council. In the reports of the artisans who visited the Paris Exhibition last year, there was one universal complaint of something being wanting in the English workman which the foreign workman had; and what they wanted was the means of obtaining that knowledge which they said the French workman possessed. That could only be done in two or three ways. He did not believe it was in the power of the state, by any compulsory system, to make people learn; to suppose they could do this was entirely chimerical; but they could give to every man of real industry the opportunity of teaching himself; and if his primary education was good, when he got into the workshop he had the means of obtaining the knowledge which he really required. There were no better means, in his opinion, of promoting art-education than visiting museums and attending exhibitions of pictures and sculpture. The opportunities now afforded for educating the eye and the taste were greater than ever existed before. The representations of beautiful works of art which were to be obtained in publications at exceedingly cheap prices, containing wood engravings from the original works of the finest masters must disseminate a taste for and a love of art, because these works were sold by millions, and it was impossible they could be studied without the taste of the whole community being improved thereby. They had been asked to offer prizes to apprentices, but there was one difficulty with regard to apprentices in the present day. It was one of the rules of some trade societies to limit the number of apprentices as much as possible, and while those rules existed the spirit of emulation was necessarily weakened. He, for one, would, however, be inclined to adopt the suggestion that they should give apprentice-prizes. Then, again, it was suggested that it was not desirable to award prizes to those who had carried off prizes in former years. He thought if a man received a prize one year, and did work of a superior character, showing improvement in mind, hand, and taste the next year, they could not exclude him from a second prize, because he obtained one for an inferior work the year before. This, however, was a question for the Council. They were asked to give prizes for another distinct subject, viz., mechanics. The Society published, every few years, a list of premiums for various objects, including mechanical inventions, but these affected a totally different class from that of art-workmen. With regard to the suggestion that two or three working men should be asked to join in the adjudication of the awards, he would say that this had been tried in a former year, but the result had not been encouraging. Such distinguished artists as Mr. Redgrave and Mr. Wyatt were above all influence, and could have no other desire than to make their awards in the most conscientious manner in accordance with the merit of the works exhibited. He considered it a great honour to the competitors that they should have their productions examined by such men. He might mention that each year the authorities at South Kensington had bought several of the best works from these competitions, for exhibition in the Museum. This was certainly a high honour, and must be a great advantage to their producers.

SCHOOLS OF ART.

The Committee of Council on Education have just revised the grants to Schools of Art and the teaching in night classes, with the view of improving the conditions which were established after the publication of the last report of the Committee of the House of Commons in 1864.

The changes are explained in the following memorandum and extracts from the accompanying letter, addressed to masters of Schools of Art:—

Memorandum.

The Lords of the Committee of Council on Education having had under consideration the existing regulations for affording aid to Schools of Art, have authorised the following additional payments:—

1. With a view to encourage advanced students to attend in large numbers and to remain longer in the Schools of Art, a payment of £3 on account of free-studentships for every artisan, being a draughtsman, designer, modeller, or handicraftsman, who shall submit satisfactory advanced works under the regulations in the Directory, and who shall be recommended jointly by the local committee and by the department's examiners. Students on whose account these payments are made, must be prepared to attend regularly for the year following the date of appointment, and must be admitted to study in the school without payment of fees.

2. An addition of £5 to the sum allowed for an art pupil-teacher. In schools where 20 artisans are satisfactorily taught one pupil-teacher will be allowed, and two pupil-teachers in schools where 50 artisans or upwards are satisfactorily taught. The payment in any school on account of pupil-teachers will therefore in future be either £15 or £30.

3. In addition to the payments of 15s. or 20s. on account of artisans who submit satisfactory works under the regulations, a proportional payment will be made on account of artisans whose works do not reach the standard required for full payments.

4. Bonuses will be awarded to the head-masters of the Schools of Art in which the results as tested by the examinations of the Department shall be most satisfactory. The basis of the awards will be the general amount of satisfactory work as tested by examinations, considered with reference to the number of students under instruction.

The awards will consist of—one sum of £50, three sums of £40, five sums of £30, ten sums of £20, twenty sums of £10.

5. In order that the committees of Schools of Art, night classes, and elementary schools, may more readily provide themselves with approved examples, the aid given towards the purchase of them will be increased from 50 per cent. to 75 per cent., and in special cases, where buildings or rooms are permanently and entirely devoted to instruction in art, this aid will be extended to the provision of apparatus and fittings.

6. In Schools of Art, where artisans are satisfactorily instructed, grants will be made to enable the masters to visit the South Kensington Museum, and other Metropolitan institutions, in order that they may acquire, for the benefit of their students, a knowledge of the latest progress made in those educational subjects which affect the schools.

7. Special grants of the works published under the sanction of the Department, and of other examples, will be made from time to time to such schools as have suitable premises for exhibiting and protecting them, and for their effective use as means of instruction.

The letter says—

1. As respects free studentships. The Committee of the school will be free to recommend as many artisans as they may think eligible, and as are willing to attend and work attentively for the year for which the fee will be paid by the Department in advance. The numbers appointed will depend upon the evidences of competency sent up to the Examiners of the Department; and it is expected that the masters will endeavour to use these studentships as a means of carrying further the instruction of the advanced students, especially of such as are engaged in the local manufactures.

2. It is intended by the changes in the payment for art pupil-teachers, to give every School of Art, fairly within the meaning of that term, an opportunity of appointing at least one art pupil-teacher who may relieve the master of certain details of management, and thus give him more time for actual instruction, and who may assist him, or occasionally act as his deputy, but it is not expected that these pupil-teachers should be permanently appointed as teachers, unless they should become qualified, by taking a certificate of the third grade.

3. Under clause 3, every artisan taught by the use of sound examples, will obtain a payment for the funds of the school, greater or less, according to the amount and quality of his works.

4. As respects the bonuses of from £10 to £50, offered to masters.—These are intended to promote the maintenance of a sound system of instruction throughout the schools, and will be awarded on the evidences of success furnished by the annual examinations of works and students.

5. It is hoped that this extension of the aid hitherto given will enable masters to obtain, through the local committees, such renewal, or increase, of sound examples as may render the schools thoroughly efficient in this respect.

6. As regards the masters' visits to the metropolis.—These visits, which have ceased since 1862, are now revived, in the expectation that the masters will use the opportunity afforded to them to become acquainted with the resources of the South Kensington Museum and Art Library, and make them of greater use to their schools under the system of loans.

The masters of Schools of Art are urged to encourage the teaching of drawing in elementary schools and night schools, and to maintain friendly relations with the managers and teachers of them, in order that students, when competent, may pass from these elementary classes into the Schools of Art. These latter may thus, by degrees, obtain in the public estimation that position which can only be based on the existence of a large number of persons possessing elementary art knowledge, from amongst whom can be drawn students prepared for the higher teaching which is afforded in Schools of Art.

Commerce.

Exports of Cheese and Butter from Holland.—The exports of Dutch cheese, during the year 1866, amounted to 30,339,000 kilos.; this shows a decrease of 1,346,000 kilos. on the exports of the previous year, and an increase of 2,180,000 kilos. on those of 1864, and 4,496,000 kilos. on those of 1862. The average annual exports of this branch of industry, from 1862 to 1866, were 28,500,000 kilos. In 1866 two-thirds of this article was exported to England, and a great part of this is re-exported by the English merchants to the colonies, the Mediterranean and Gibraltar. The exports to France during the same year amounted to 4,500,000 kilos. The exports of butter amounted, in 1866, to 18,373,000 kilos., the largest amount in five years. In 1863, 14,506,000 kilos. were exported. The average exports from 1862 to 1866 amounted to about 16,500,000 of kilos. per annum. The greater part of the butter is exported to England, and, in 1866, amounted alone to 17,173,000 kilos., against 12,500,000 kilos. in 1863.

Movement of Shipping in the Port of Venice.—The statistics of the movement of shipping in the Port of Venice, during 1867, have recently been published, and show an increase of 280 arrivals, of a total tonnage of 65,854, and 448 departures, amounting to 110,822 tons, on those during 1866.

Trade of Genoa.—The following statistics of the arrivals and departures of shipping in the port of Genoa, during the month of December, are published by the Chamber of Commerce of that city. From this it appears that the number of arrivals of steam vessels amounted to 178, and the departures to 181; in all 359 steam vessels, of the total tonnage of 97,123. The movement of sailing vessels amounted to 566, of the tonnage of 84,737, of

which 351 arrived and 215 sailed. Thus the total movement of shipping during the month amounted to 925 vessels, of 181,860 tons. During the whole of the past year (1867) the total movement of shipping was 11,718, amounting to 2,198,254 tons. These figures do not include the vessels employed in the coasting trade of the Riviera.

THE IRISH BUTTER TRADE.—The subjoined letter, addressed to Mr. Downs, of Tooley-street, by an Irish farmer, and quoted in the *Produce Markets' Review*, throws some light upon the difficulties under which this trade at present labours:—"I beg to acknowledge receipt of your report on my sample firkin of butter, which is very satisfactory. We poor Irish farmers are not quite so bad as most English people suppose. The men who write those stupid impertinent letters to the London merchants are not farmers; they are men in our provincial towns, who buy butter from farmers at the very lowest price, and hold it often till stale, waiting for an advance in the English markets; quantity and not quality being their interest, as their profit is the same on the inferior as on the best. They consequently take little or no trouble to instruct the farmers in the preparation of their butter, or as to the taste and wants of the English consumer, neither do they give us any suggestions to improve the trade in any way, and it is only through these men it can be made. I now see why they encourage extreme salting, seeing that if our butter was mild it would compel us eventually to go direct to the English salesmen. The small dairy farmers are shut out from your markets by the excessive rates of carriage of rail and steam companies on small quantities, such as we could send fresh and fresh,—say 6s. 6d. per firkin, while the merchant pays 1s. per firkin on quantity; therefore we are entirely in their hands, and, I am sorry to add, they are no friends of the farmers, their interest and ours not being identical. If we had even a few such men as you in this country, who would give us information as to the mode of making, packing, salting, fluctuation of markets, and wants of consumers, &c., we might expect to compete successfully with foreigners, but you must now see, we get no facilities from carriers or Irish merchants to do so. I think, in spite of the difficulties and expense of transit, I will send direct to England, and am anxious to try to come still nearer to perfection."

Colonies.

NEW ZEALAND FLAX.—The manufacture of native flax seems suddenly to receive increased attention in all parts of New Zealand. The *Southland News* has the following report of progress:—"Mr. Thompson, shipbuilder, of Invercargill, has of late turned his attention to the working of the native flax, and after several experiments has at length succeeded in producing from the raw material a strong, clean, and well-coloured fibre, perfectly suitable for rope making. The process employed is mechanical, neither heat nor chemical agents being had recourse to. Mr. Thompson states that, with the appliances he has brought together, two men will be able to turn out from three to four hundredweight of clean flax per day."

CHARITABLE INSTITUTIONS IN VICTORIA.—The statistics for the past year give twenty-five hospitals, some of which had benevolent asylums in connection with them. They had 155 wards, having 1,334,484 aggregate number of cubic feet in the wards, and 1,414 beds. Indoor relief was given to 10,183 persons, and outdoor to 49,291. The daily average of outdoor relief was 817·7, and indoor 1161·5. The number of benevolent asylums was 6, having 1,045 beds. Relief was given to 63,943 outdoor persons, and 6,127 indoor; the average daily relief being outdoor 833·8, and indoor 965·9. There were five orphan asylums, having 863 beds, and affording relief to 894 indoors and 8 outdoors. The expenditure of the hospitals was £89,722 18s. 6d., and the receipts from government for building purposes £14,950, for maintenance £50,073 15s. 4d., and from private contributions £23,421 17s. 1d. The private contributions to benevolent asylums were £6,956 17s. 9d.; to orphan asylums £6,923 19s. 1d. The government contributed £14,200 for building purposes, and £28,794 15s. 1d. for maintenance. The expenditure was £63,790 6s. 10d. A calculation of the sums contributed by the public to the various charitable institutions during 1866, gives the sum of £49,077 15s. 4d. This does not include the amount contributed to religious purposes or special appeals to the public benevolence on temporary matters.

Obituary.

SIR DAVID BREWSTER died on Monday, the 10th inst., at his country seat of Allerly, near Melrose, at the age of 86 years. His father was rector of the Grammar School of Jedburgh, where Sir David was born, on the 11th of December, 1781. Mr. Brewster intended his four sons for the ministry; and three out of four rose high in that profession. The second son, David, chose the study of natural science and philosophy. In 1800 the University of Edinburgh conferred on him the honorary degree of M.A., and here he had the advantage of intercourse with Robinson, Playfair, and Dugald Stewart, who were then professors. In 1807 he received the degree of LL.D. from the University of Aberdeen, and in the following year he was elected a fellow of the Royal Society of Edinburgh; and in that year, also, he projected and began that most laborious work, the "Edinburgh Encyclopædia," of which he continued editor until its completion, in 1830. In 1813 he published some results of his optical studies, in the "Treatise on New Philosophical Instruments," a work which had reference to illumination generally and lighthouses in particular. He also contributed a paper to the Royal Society of London, "On some Properties of Light." The Copley Medal was awarded to him by the society, in 1815, for his paper on the "Polarization of Light by Reflection," and he was also elected a fellow. It was in 1816 that Sir David made his name popularly known as the inventor of the kaleidoscope. In 1818 the Rumford medal was given to him by the Royal Society, for further "Discoveries relating to the Polarization of Light." In 1819, in conjunction with Professor Jameson, he started the *Edinburgh Philosophical Journal*, which he afterwards carried on alone, under the title of the *Edinburgh Journal of Science*, of which sixteen volumes were published, containing many scientific papers from his own pen. He twice had the honour of receiving the Keith medals from the Royal Society of Edinburgh, of which body he was for many years Vice-President. In 1825 he was elected a corresponding member of the Institute of France, and in 1849 he succeeded the illustrious Berzelius as one of its Associates. In 1827 he published his "Account of a New System of Illumination for Lighthouses;" and, although he offered his services to the lighthouse boards of the United Kingdom, nothing appears to have been done until 1833, when experiments were made in Scotland, which showed that "one polyzonal lens, with an argand burner of four concentric circles, gave a light equal to nine parabolic reflectors, each carrying a single argand burner." The great improvement that has been made in lighthouse illumination dates from that period. In 1830, William IV. conferred upon Brewster the honour of the Guelphic Order, and he was knighted in the following year. The last thirty-five years of his life he spent as Principal of the United College of St. Leonard's and St. Salvator at St.

Andrew's. In 1859, he was chosen Principal and Vice-Chancellor of Edinburgh University. He was also a magistrate for the county of Roxburgh. His favourite subject was optics in its higher and mathematical departments. It was he who, from his examinations of the solar spectrum, overthrew the assumption that white light is composed of seven colours, and demonstrated that, in reality, it was produced by the combinations of only three. Among the many branches of this intricate science which engaged his attention we may specially mention the optics of crystals, upon which he gave science many valuable memoirs, and atmospheric polarisation, a subject upon which he wrote in the "Edinburgh Philosophical Transactions" a few months before his death. The discovery of the principle of the stereoscope is due to Wheatstone, but Sir David has the fullest right to the claim, that in his hands—chiefly through the skilful application of semi-lenses—it started into a practical instrument. To his optical researches are due great improvements in our modern microscopes and telescopes; and to his early appreciation of the labours of Fresnel this country is indebted for the introduction into our light-houses of the dioptric system of illumination and of the polyzonal lens. Among his works may be mentioned his treatise on "New Philosophical Instruments," on "Optics," on the "Kaleidoscope," the "Stereoscope," his "Life of Newton," the "Martyrs of Science," his "Treatise on Natural Magic," and his "More Worlds than One." The latter work was written to oppose the speculations advanced by the late Master of Trinity College, Cambridge, in his "Plurality of Worlds." He was twice married, first in 1810, to Juliet, second daughter of the late James Macpherson, Esq., M.P., of Belleville; and, secondly, in 1857, to Jane Kirk, second daughter of the late Thomas Purnell, Esq., of Scarborough. By the former he has left issue David Edward, a Lieutenant-Colonel in the Indian Army, who was born in 1815.

Notes.

Eruption of Vesuvius.—Few people can form a clear idea of the eruption of a volcano, and therefore a few extracts from an interesting letter written to a friend in Paris, by a clever young painter, who won the Grand Prize at Rome last year, son of the learned M. Regnault, of the Institute, may be acceptable. M. Regnault and party started from Naples the other day at ten in the morning, but, in consequence of the difficulties of the ascent, only reached the source of the lava as the sun was setting. The sight he describes as sublimely horrible; the lava came boiling out of a kind of tunnel, and flowed like a torrent, but with the glare of molten metal at a white heat; at times its flow was interrupted, when the writer describes it as swelling and heaving like the breast of a huge giant, and belching forth sulphurous vapours. They stood on the site of an old crater, which last year was hollow, but which had since been heaved upwards and rent asunder, and through the fissure thus caused came jets of smoke, ashes, and projectiles; these falling around had created a second cone, which increases daily, and now crowns the summit of the grand cone; at the foot of this second crater, at a spot where the great one is still open, poured out the molten torrent, divided into two or three streams, which reunited at the foot of the cone, and then again separated into two branches, one of which flowed on towards Resina, and the other towards Torre del Greco. Over the heads of the party floated a great mass of smoke, illuminated by the red glare of the lava, and, at intervals of from ten to fifteen seconds, an immense black column issued from the crater and fell in ashes around. In the midst of this column of fire and smoke were thousands of heated stones, which fell on the small cone and rolled down its sides with terrific noise. When a walking-stick was dipped into the burning lava it immediately burst into flame, like a match, and the current was so rapid that the stick was nearly carried out of the hand. The heat was so intense, that even with the hat before the face, and a handkerchief over the hand, it was impossible to support it for more than three or four seconds. From time to time the guide of the party flung a small quantity of lava out of the stream, and the party were able to produce impressions of coins which they chanced to have about them. In descending, the party found itself face to face with a new torrent of lava, which had started from a spot above that which they had visited, and was slowly descending the very route which they had left; had there been any delay in their journey, they might have been surrounded, and placed in some difficulty, but they succeeded in passing in front of the torrent. On the following day they ascertained that the new lava stream had taken the road to Torre del Greco, after having passed over a distance of more than a mile during the night.

French View of English Art Education.—M. Ferdinand de Lasteyrie delivered a lecture recently, at the Union Centrale des Beaux Arts, in Paris, on "The State of Industrial Art Education in England." After adverting generally to the progress made since the first international exhibition, principally through the generous and enlightened initiative of the late Prince Consort, the lecturer took a rapid review of the schools of design in Great Britain. England, he said, was the opposite to France, the country of decentralization, thus the most important results are not to be looked for in the great industrial towns; and he referred to a small town in Cornwall, where the art school was attended by ninety-two persons out of every thousand of the population. "The progress, rapid and important as it had been, did not, however," said M. de Lasteyrie, "seem of a nature to alarm us. We still keep the lead, as was shown by the last exhibition, and the persevering endeavours of the founders of the Union Centrale will contribute to raise our standard of industrial art higher and higher. The system is perfectly organized in England, and we may borrow some good ideas from it. England has her Department of Science and Art, and her universities grant special degrees: why should we not have a Conservatoire of Industrial Art, with diplomas of Bachelors of Art?" Such are the views of an intelligent Frenchman, who, however, evidently misunderstands our university system, and thinks that a "Bachelor of Arts" is a proficient in the fine arts.

The Mont Cenis Tunnel.—According to the usual monthly statement of the progress made in the Mont Cenis tunnel, published by the Italian Government, the length of tunnelling during the month of December, 1867, was 73·25 mètres, of which 35·40 mètres were on the Italian side at Bardonnechi, and 37·85 mètres at Modane on the French. The position of the tunnel, up to the 31st December, 1867, was as follows:—

	Mètres.
Total length of tunnel	12,220·00
" " of boring	7,846·65
Remaining to be done	4,373·35

The progress made in the tunnel during the whole of the past year is 1,511·96 mètres, of which 824·50 mètres were at Bardonnechi, whilst at Modane the advancement was 687·46 mètres. This difference may be attributed in a great measure to the extra hardness of the rock encountered on the French side. The falling off in the advancement made during the month of December, as compared with the other months, is due to the suspension of the works for some days for the purpose of verifying the levels and line by the engineers. Altogether, the progress during the past year has been most satisfactory as compared with that of the previous year, when the total progress at both ends amounted to only 1,024·99 mètres.

REWARDS FOR ADULT EDUCATION IN FRANCE.—The admirable conduct of the poor schoolmasters of France in giving up their evenings to the education of adults has attracted general attention, and excited a great public interest in the subject. As evidences of these facts may be mentioned the recent creation of three prizes, to be given to those who establish and conduct such classes, the donors being the principal of a college, who does not wish his name to transpire; M. de Saint Balmont, member of the general council of the Meuse; and M. Fornand Lahour, maire of Saint Pathus, and private secretary to the Minister of Justice. Each of the prizes consists of a gold medal of the value of a hundred francs.

AGRICULTURAL EXHIBITION AT VERONA.—The Academy of Agriculture, Commerce, and Arts, of Verona, intend celebrating, in the course of the present year, the one hundredth anniversary of their establishment, by an agricultural and industrial exhibition, with a show of cattle, to be held at Verona from the 14th Sept. to the 15th Oct. For this purpose, the Minister of Agriculture has granted a subsidy of 4,000 francs and sixteen medals; the Provincial Council 4,000 francs; the Chamber of Commerce 1,000 francs; and the Municipality of Verona 3,000 francs.

Correspondence.

RECENT INTERNATIONAL MONETARY CONFERENCES.—SIR,—I will now, with your permission, resume the subject of my letter, published in your *Journal* of the 10th January. Mr. Ruggles has given some valuable comparative statistics of the gold coin issued from the Mints of the United States, Great Britain, and France respectively, from 1792 to 1865 inclusive. We may conveniently disregard all fractions of a million of dollars, and condense his figures as follows, with the addition of some fresh calculations of per centages, rendering the information more useful than in its original cruder form:—

	Value in Dollars.	Per centage of Total Coinage.
(*a.*) *Total Gold Coinage before* 1851.	Millions.	
United States (from 1792)..	180	$18\frac{1}{3}$
Great Britain („ 1816)..	480	$48\frac{2}{3}$
France („ 1793)..	325	33
	985	100·
(*b.*) *Total Gold Coinage from* 1851 *to* 1866.		
United States	665	$31\frac{1}{2}$
Great Britain	455	$21\frac{1}{2}$
France	988	47
	2,108	100·
(*c.*) *Total Gold Coinage from* 1792 *to* 1866.		
United States	845	$27\frac{1}{3}$
Great Britain	935	$30\frac{1}{3}$
France	1,313	$42\frac{1}{3}$
	3,093	100·

Very probable grounds are put forward for assuming that out of the total amount coined by the United States, about 300 million dollars worth, at the utmost, remains in its original state, and would ultimately require recoinage to be made international in the sense contemplated by the Paris Conference. A great part of the remaining American coinage would still be flowing out of the States as export for recoinage at other mints; and we may assume 250 million dollars worth as a fair net estimate; and 400 to 500 million dollars worth might similarly be estimated as the gross circulation of English sovereigns. Mr. Ruggles would seem, however, to have misunderstood "M. de Parieu and other distinguished economists of Europe," as absolutely estimating the amount of gold now in actual circulation in France, Belgium, and Italy at 7,000 million francs, or 1,400 million dollars. M. de Parieu, in his article in the *Revue Contemporaine* of 31st October, 1866, after adding to the gold coinage of France, from 1792 to 1866, that of Italy (about 417 million francs in gold, from the time of Napoleon the First), and that of Belgium (say 20 million francs), brings the total coined gold to 7,000 million francs, and remarks that but little of it can have been demonetised. But we may fairly inquire, (1) As special causes have affected gold coinage in the United States, and probably reduced its gross total amount from 845 million dollars coined since 1792, to a present amount of 250 million dollars; and (2) As another set of special causes, and particularly our very liberal system in England of coining bullion into coin, and of exchanging coin, or notes representing coin, into bullion, almost practically free of charge, have probably reduced the gross total amount of British sovereigns and half-sovereigns coined since 1816, from 935 million dollars worth to 500 million dollars worth in circulation; ought we not also to assume some considerable reduction from 1,400 million dollars worth of gold coined by France, Italy, and Belgium, since 1792? Our estimates suppose a reduction of 70 per cent. from the United States, and of 46 per cent. from the British coinage. Considering the effect of the newer condition of the continental gold coinage, a reduction therefrom of about 25 per cent. may, in its turn, be made with apparent fairness. This would bring the comparative gold circulation of the countries included in the monetary convention to about 1,050 dollars worth, or to nearly the same proportion per head of population as the estimated figures for the United Kingdom. There is fair ground at least to assume that although the sovereign and dollar be more widely diffused than the napoleon, there are twice as many napoleons in circulation as sovereigns, four times as many as half-eagles, and about one-third more than sovereigns and half-eagles together. Mr. Ruggles estimates the cost of recoinage at one-fifth of one per cent., and states that this is the rate ascertained by experience. If this be so, and the whole of 300,000,000 dollars had to be recoined, the cost would be 600,000 dollars for America, and 1,000,000 dollars, say £200,000, for Great Britain, as the charge for recoining 100 million sovereigns. Mr. Ruggles submits that it "should be borne in mind that this expense of recoinage by the several nations is to be incurred but once for all, while the incessant re-meltings and recoinages under the present system by the mints of different nations, are a constant and needless diminution of the monetary wealth of the world. The burden principally falls on the nations, like the United States, which export gold needing to be recoined, the value of which abroad is reduced precisely by the cost of its recoinage: and if the total expense of the recoinage necessary throughout the world to accomplish the proposed unification were even to reach 2,000,000 of dollars, it would be speedily reimbursed in the saving of further recoinages, brokerages, and exchange." This estimate, by Mr. Ruggles, of the cost of coinage, seems so very moderate, that it deserves inquiry whether it is not underrated. The most recent information to which we can refer at this moment, is contained in a memorandum by Sir Charles Trevelyan, dated Treasury, Feb. 16, 1848, in which it is stated that when gold, silver, and copper have been struck in the same year in the same mint, and when two, if not all three of these metals have been under operation at the same time, it is extremely difficult to determine, even approximately, the propor-

tions of coinage expenses, and of establishment and contingent charges fairly assignable to each. It appears pretty plainly, that in England we should have something of the same difficulty to ascertain what it costs to coin a given amount of sovereigns, as Mr. Seely is now experiencing in getting at the cost of building ships in the royal dockyards. In fact, Sir Charles Trevelyan, in 1848, had to fall back upon some old evidence given to a committee of the House of Commons in 1837, in which it was stated, that in France, the expense to which the Government was put by the coinage of gold, was about a quarter per cent., and in England a fraction less than a half per cent. What saving has been effected since 1837 by reforms in the Mint system, or by improvements in machinery, it is not within our power to ascertain, but the result, probably, is to be found somewhere between the extremes of one-half and one-twentieth per cent. Even if we were to take it at a quarter per cent., and that the average current sovereigns of Great Britain are diminished by wear to the extent of a half per cent., or by ·0565 of one grain in the 113·002 grains Troy of pure gold which ought to be in each of our present sovereigns, there would be a balance of gain of a quarter of a million pounds sterling, instead of the loss of £200,000 to our Government, which Mr. Ruggles estimates would attend the internationalisation of our British coinage. In this question the public stands very much in need of some accurate information, derived from careful experiments, on a large scale, upon the coin actually in circulation, and not upon the picked coin which is taken to the Bank of England. The results ascertained in 1833, when Lord Auckland was Master of the Mint, showed an average loss of one-half per cent. on current coinage, the oldest pieces of which were only sixteen years old, and which is much below the age of our oldest present coinage. In 1807 some experiments were made by the officers of the Royal Mint, which showed a loss of 1·1666 per cent. on guineas, and of 1·6479 on guineas and half-guineas. The average deficiency was even greater (1·7271 per cent.) on guineas and half-guineas in 1774, when there was a recoinage of gold, which cost the country three-quarters of a million sterling. Our system in England, of coining and recoining without charge or seignorage, and for the advantage of certain classes of the community, has always been excessively costly, and has justly met with the condemnation of the best informed of the many officers of eminent talent who have from time to time been connected with our Mint administration. It has cost the taxed public many millions, and an international system of coinage might prevent much future loss of the kind. We are glad to notice the shrewd spirit in this regard in which Mr. Ruggles comments in his report upon a statement "by an eminent and experienced banker in Europe, that there are now scattered through its different nations, and along their frontiers, at least five thousand money-changers (including their *employés*) who gain their living by changing the gold of the various countries of the world." Mr. Ruggles adds, "If there are but two thousand, earning yearly an average of one thousand dollars each, it would amount to two millions of dollars yearly, which the world ought to save and would save by the proposed unification, not to mention the vexatious loss of time in calculating fictitious rates of exchange, and the large additional saving in the future product of gold." Passing to other subjects discussed at the monetary conference, we may refer to the *Procès-Verbaux* (Paris, Imprimerie Impériale, 1867), as containing ample testimony of the consistency with which Mr. Ruggles supported the dollar of the United States and the sovereign of Great Britain as units which cannot be superseded, although they may easily be assimilated to the coins of other nations. At the meeting of the conference on the 19th June last, the delegates from Portugal (Count d'Avila), from Austria (Baron de Hock), from Switzerland (M. Feer-Herzog), all spoke as well as Mr. Ruggles in favour of the reduction of the sovereign to 25 francs, and of the dollar to five francs, as the basis of a perfect international coinage. The delegates from England (Mr. Graham, Master of the Mint, and Mr. Rivers Wilson, Private Secretary to the Chancellor of the Exchequer) replied that there would be serious inconveniences in leaving in circulation sovereigns of 25 francs 20 centimes in case of issue of new sovereigns reduced to 25 francs, and that a re-coinage would therefore be necessary. Mr. Graham, through Mr. Wilson, then proceeded to observe that if once the pound sterling were brought to 25 francs, it follows that the population, accustomed to division by 20, would call for the 20-franc piece, and thence would follow a necessity for a second re-coinage, and, in such event, the abandonment of the sovereign, and that it would be better to adopt immediately the French system. Such an argument as this, that a reduction of 20 centimes in the pure gold value of the sovereign would have an effect powerful enough to lead to so many *non sequiturs*, reminds one forcibly of a remark of the acting president of the conference, M. de Parieu. The *Globe* London paper of 12th September, 1866, had warmly protested against the monetary convention, enlarged upon the advantages of a difference in the coinage of various countries, and mourned over the admission of Australian sovereigns into British currency. This, M. de Parieu remarked, in the *Revue Contemporaine*, led him to think that, in contradiction to those who think of uniting France and England by a submarine tunnel, there are probably some few persons amongst his English neighbours who would invent the English Channel if it did not already exist. The observation of Mr. Graham was well answered by the representative of Switzerland, who remarked that if we reduce the sovereign to 25 francs, and divide it (of course, decimally), we obtain the double of the actual shilling, and not the franc; and added that, in fact, this double shilling exists, since it is the English florin, and that, consequently, the reduction of the sovereign would not lead to its abandonment. At the 3rd meeting of the conference (see *procès verbal*, page 39) one of the Swedish delegates, M. Wallenberg, member of the Diet, and director of the Bank of Stockholm, made a true and most practical observation, when he stated that England should take a large interest in reducing the sovereign to 25 francs, as indicated in the conference, because the pound sterling is given in considerable quantities as the equivalent of 25 francs. There is no doubt that M. Wallenberg is well founded in this remark, and it passes belief what large sums we Englishmen allow ourselves to be mulcted of in this way, not only in great transactions, such as in many public loans to foreign governments, in which 25 francs is the fixed exchange for the sovereign, but also in the more numerous smaller transactions of daily life, in which vast sums are transferred from the pockets of John Bull to his continental neighbours at the easy rate of 25 francs per pound. This is constantly being done in paying for railway fares, telegrams, postages, hotel expenses, &c. We let our fleece be shorn in these ways without a murmur, and yet, when the matter is proposed to be made clear and straight by a proper equalisation of the sovereign, there are some amongst us disposed to parallel the old calendar anti-reform cry of "give us back our eleven days," and to think the beginning of the end is coming, when the 113·002 grains of pure gold, which are theoretically in the sovereign, shall be reduced to 112·0677 grains. At the fifth meeting of the conference, H.I.H. Prince Napoleon presided. A very simple question was before it, namely, "Is it necessary, for the success of monetary unification, to constitute, from henceforth, an everywhere identical unit as regards metallic composition, weight, and denomination, and, in such case, what basis should be assigned to it? or does it suffice to constitute common types having a sufficiently high common denominator, for example, multiples of five francs, for gold coin?" Immediately after the Prince had opened the discussion,

Mr. Wilson read a very lengthy declaration, in French, intended to explain what he termed the very delicate and exceptional position in which the English delegates found themselves placed, and the extreme reserve which the government had found it necessary to enjoin upon them, their simple duty being to hear, to study, and to report, the English nation being, as regards this question, in a totally different position from the majority of the continental nations, and in a much more independent position. The declaration goes on to aver, that so long as public opinion shall not be decidedly in favour of a change in the actual system; so long as this system does not present inconveniences either in the large transactions of commerce, or in the trivial details of the private life of the country; so long, in fact, as it shall not be incontestably demonstrated that the adoption of a new system offers advantages superior enough to justify the abandonment of that which is approved by experience, and rooted in the habits of the people, the English government will not deem it its duty to take the initiative in the path of assimilation of its coins with those of the continental countries. One would fancy, in reading this remarkable paragraph, that the subject really in debate was some vast and revolutionary change of "system." But what "system" is involved in the fact that 113·002 grains troy of pure gold are empirically coined into a sovereign? This proportion, or £50 19s. 5¾d. as the nominal mint value of a pound sterling of pure gold, sinking the alloy, was settled in the reign of Charles the Second; but it was not meant to be as a law of the Medes and Persians, for William the Third and Queen Mary changed it, and coined £52 3s. 8¾d. as the nominal mint value of a pound of pure gold. And so it continued until 1717, when Charles the Second's proportions of the gold coinage were reverted to. At all events no inconvenience was experienced through this change. And it occurred in the time of a king whose government did more for our coinage than that of any preceding monarch. In order to show the alterations which would be required in the mint proportions or nominal values of our gold currency to make it international, we have constructed the following table, some of the figures in which are approximations, on account of small fractions being omitted:—

NET OR INTRINSIC VALUES, AND GROSS OR STANDARD VALUES, OF ENGLISH GOLD CURRENCY, AND MINT RATIOS OF GOLD TO SILVER FROM 1663 TO 1868.

(I.)—NET OR INTRINSIC VALUES.

Dates.	Nominal Value of One Pound troy (*i.e.*, of 5760 grains weight) of PURE GOLD, in pounds sterling.	Nominal Value of One Ounce troy (*i.e.*, of 480 grains weight) of PURE GOLD, in pounds sterling.	Mint Ratio of Gold to Silver, as determined by the pure metal in one pound sterling of gold coin, and in 20 shillings of silver coin.
1663 (15 Charles II.)	$50 \cdot \frac{107}{110}$ = 50·9727 = £50 19 5¾	£4·2477 = £4 4 11½	1 to 15·2096
1696–9 (William and Mary)	$52 \cdot \frac{41}{220}$ = 52·1863 = £52 3 8¾	£4·3489 = £4 6 11¾	1 to 15·3885
1717 (3 Geo. I.) to 1868	$50 \cdot \frac{107}{110}$ = 50·9727 = £50 19 5¾	£4·2477 = £4 4 11½	1 to 15·2096 (A.D. 1717 to 1816) 1 to 14·2870 (from A.D. 1816)
PROPOSED INTERNATIONAL STANDARD.	$51 \cdot \frac{17}{40}$ = 51·4250 = £51 8 6	£4·2851 = £4 5 8½	1 to 14·4070 for Great Britain only.

(II.)—GROSS OR STANDARD VALUES.

Dates.	Nominal Value of One Pound troy (*i.e.*, of 5760 grains weight) of STANDARD GOLD, in pounds sterling.	Nominal Value of One Ounce troy (*i.e.*, of 480 grains weight) of STANDARD GOLD, in pounds sterling.	Standard fineness of Gold Coinage.
1663 (15 Chas. II.)	.... £46·725 = £46 14 6	£3·8938 = £3 17 10½	$\frac{11}{12} = \cdot 916\dot{6}$
1696–9 (William and Mary)	.... £47·838 = £47 16 9	£3·9865 = £3 19 8¾	$\frac{11}{12} = \cdot 916\dot{6}$
1717 (3 Geo. I.) to 1868	.... £46·725 = £46 14 6	£3·8938 = £3 17 10½	$\frac{11}{12} = \cdot 916\dot{6}$
PROPOSED INTERNATIONAL STANDARD.	.... £46·275 = £46 5 6	£3·8568 = £3 17 1½	$\frac{9}{10} = \cdot 9000$

Notwithstanding that the declaration of the English delegates rather inclines one to the belief that the question is prejudged, it expressly states that it would be wrong to suppose that the government indulges in foregone prejudices upon the important question which was under debate by the Conference, and (we translate from the French) that the English Government will always be ready to give its support to every attempt having for its object to enlighten and guide public opinion in the appreciation of this question in a general manner (*d'une manière commune*), and in the discussion of means by which this assimilation—so advantageous in theory—might be brought about. The apparent timidity in discussing this question, shown by the English delegates, evidently surprised the members of the Conference. Prince Napoleon had to assure these delegates that they need not fear to give their advice, as their opinion, like that of the others, could not bind their government. Count d'Avila, Portuguese Minister to the Court of Madrid, stated that he knew the difficulties attending a change in the English monetary system; but, from a theoretical point of view, that did not explain the reserve of the

British delegates. M. de Parieu, at the conclusion of this meeting, observed, and with sound reason, that an approximation could be made between the French and English monetary system if the sovereign, in its pure gold value, were reduced to 25 francs; and that it would not be absolutely necessary for that to change the standard of fineness. This would, he observed, be a great, even although insufficient, progress; and there would, notwithstanding, be neither identity of weight nor of fineness in this instance. But, on the other hand, it would give types having a common denominator without any identity; for example, if England only brought her sovereign to 25 francs without France striking pieces of the same value. Prince Napoleon thereupon remarked that this would not be an international money. But M. de Parieu replied, international money does not mean identical money, but only easily commensurable money. The simple proportion of pieces of 20 francs to those of 25 francs, would constitute already a sort of international unison of a certain utility. At the next day's conference Prince Napoleon again presided, and although at previous meetings it had been most carefully explained that the common denominator for the weight of the gold coins was not intended to disturb any unit, but that it might be simply theoretical, without any necessity for coining it, all this seems to have been completely forgotten by the English delegates when the question of the day came on for discussion, namely, "What should be the common denominator?—should it be the five-franc piece?" Mr. Graham then stated, through Mr. Wilson, that in his individual opinion the ten-franc piece, if it were adopted, would have an advantage over the five-franc piece, in giving a higher unit, which would be desirable for England, and as offering a more simple relation to the ordinary system of the franc. This is a somewhat singular answer from an English point of view, seeing that 10 francs is no common denominator of the international sovereign and napoleon, but five francs is both a common denominator of these coins and of other coins, easily to be brought into the scale of multiples of five. However, the question was brought to the vote, and carried in favour of the five franc common denominator, by 13 to 2. Mr. Graham remarked that if five francs were adopted as the common denominator all accounts would be reduced to the dollar in England. Yes, might have been replied, if the steeple of Tenterden is the cause of the Goodwin Sands; for the one is as logical as the other supposition. A discussion was then opened upon the question, whether it would be useful, in case of gold being adopted as the international metal, that the types of gold coin determined by the monetary convention of 23rd December, 1865, should, in the interests of unification, and following out reciprocity, be completed by new types, for example, pieces of 15 francs and of 25 francs? The American, the Italian, and several other delegates spoke in favour of the 25-franc piece. Prince Napoleon explained that France would be quite ready to admit that coin into the terms of the convention of December 1865, with the consent of the other countries parties to it. Mr. Ruggles insisted that it should be well understood that the United States hold particularly to the adoption of the type of 25 francs. Upon this *(vide Procès Verbaux)* p. 85), Mr. Graham stated that the number of coins ought not to be too much multiplied; that the introduction of pieces of 15 and 25 francs into the French system would be defective, and that it would be better worth while, in this point of view, to stop at 20 francs. He asked if France really meant to strike 25-franc pieces? His Imperial Highness replied "that certainly, if France only consulted her personal convenience, she could see no necessity for the issue of this new coin; but, to facilitate the work of unification, which is the object of the labours of the conference, she would make the concession asked for by the United States. The coinage of a 25-franc piece would appear, in fact, to suit England and Austria equally." The Count de Nava de Tajo then observed that it would suit Spain also. M. Kern, one of the Swiss delegates, observed that he had voted for the 25-franc piece, because the United States and Austrian delegates thought they would be able, on their part, to make some concessions to the project of union, and because he supposed that England would welcome with satisfaction the decision of the conference. But, in this respect, he had experienced as much surprise as regret when he heard the delegate from Great Britain say that the 25-franc piece did not appear to him to be useful. Mr. Rivers Wilson then explained for Mr. Graham, that the British delegate had only expressed himself from a purely theoretic point of view, and that the 25-franc piece would be rather hurtful than useful to the general economy of the French system, but that it would not be the same with reference to a monetary union between France and England. Prince Napoleon, in commenting on this, said that "he deeply regretted this confusion, proving as it did that if it be true to say that the members of the conference were discussing theoretically, it was only in this sense, that they do not bind their governments, as would negotiators furnished with full powers, but that it was well understood that they had no concern there with giving themselves up to speculative studies, an object being indicated for the labours of the conference, and it was towards the practical means of arriving at that object that the delegates of all the states should direct their efforts." At the next (7th) meeting M. de Parieu proposed "that the conference should express its wish that any measures which might be resolved upon by the Governments of the different states, to modify their monetary systems in the sense of the bases indicated by the conference, should, as far as possible, result in diplomatic conventions." This resolution was unanimously carried. On the question of how long should be given to the various governments to send their answers, Mr. Wilson stated that, "the longer the term be deferred, the more chance would there be of obtaining from his Government a satisfactory reply; and that there was reason to fear that by wishing to hasten the resolutions of the English Government they would render them the less favourable; and that, in any event, he could not promise a definite conclusion from England within a more or less prolonged delay. If the British Government were disposed to adopt any measures, it would confine itself, probably, in the first place, to opening an inquiry, which would be made either by a committee of the House of Commons, or else by a Royal Commission." Mr. Wilson, of course, did not hint to the Paris Conference that, according to our English customs, this reference to a Royal Commission is too often like shelving a subject, or adjourning it to another generation. For whilst the commission is sitting upon it, the public forget the whole reference, and cool down to a state of indifference, almost of oblivion, respecting it; and then, when the report appears in its blue covers and bulky folio form, it does not circulate at all in the ordinary sense of the word; or even if it influence public opinion, it does little in the way of educating it. Nine times out of ten, such reports get cast aside as contributions to the waste-paper stores of the chandler's shop. Seeing how report after report in favour of decimal coinage has been allowed to be negatived by the deadening influence of a Royal Commission of two persons, we need not take so hopeful a view as Mr. Ruggles does of a reference of the kind. Mr. Ruggles is not discouraged at the prospect, but tells us: "We may surely indulge the hope that the practical and clear-headed Anglo-Saxon race, now so widely diffused through different quarters of the globe, abandoning narrow prejudices and worn-out traditions, may be found cordially agreeing on a common money for the use of civilized man." M. de Parieu, in his paper on l'Union Monétaire, very significantly remarks that we have a little difficulty of *amour-propre* in this question, which we must manage to get the better of. He well depicts us in

England, saying "why do you talk of modifying our monetary standard? Have our rights, our fundamental laws, any thing in common with those of the Continent? Is not our civil and political order surrounded with Gothic battlements as high and inaccessible as those which deck many of our buildings? We have in circulation in the world more than 80 millions in gold, and we were the first to accredit this form of currency in the whole universe. The sovereign is known in the two hemispheres. It has subsidized the work of the most barbarian nations, and sometimes the blood of European armies. Everywhere that the English flag has made itself known and respected, English money, and the paper which represents it, have found their place and conquered their credit. Let the pound sterling be copied and initiated if it be desired, but why wish to modify it?" No one has better explained than M. de Parieu himself why this should be wished, and the practical advantages have been set forth by him in the statesmanlike address he delivered at the concluding meeting of the conference, on the 6th July last, and in the *Journal des Economistes* of the following month (see article De l'Uniformité Monétaire, par E. de Parieu, Membre de l'Institut, Vice-Président du Conseil d'Etat). We may, perhaps, be accused of talking "cosmopolitan jargon," if we say that a country like ours, which inaugurated free trade, should lead the van, instead of bringing up the rear, in matters that assist free trade, like international and decimal coin, weights, and measures; but we should willingly submit to such an imputation if we could make a breach, however small, in the bulwarks of bureaucratic apathy, on a subject important alike to education, to commerce, and to harmony amongst nations.—I am, &c., Fredk. Hendriks.

Palace-gardens-terrace, W., 17th Jan., 1868.

Food and Cleanliness.—Sir,—I have a very strong conviction that the poor, and those rather above them, and the cause even of education, may be immensely and speedily benefited by certain very simple measures. I have already said that food may be cooked and carried round to them at a saving of food, coal, time, and to the feeding them with more wholesome and warmer food. I have tried to demonstrate this by a mass of details, because I was particularly urged at once to come forward with details, although I fancy it might have been more advantageous at first to have leisure to discuss principles—their bearing, not only on the question of food, but on any other questions that naturally come into the mind in any lengthened and serious consideration—how to economise time, labour, and materials, or, in other words, the resources which are at the command of the thoughtful political economist, in any hearty endeavours to ameliorate the condition of the people. I hope I have so discussed the food question as to indicate a practical spirit. I am sure that no difficulty has been started but that may be overcome. Meantime—and as bearing, perhaps, on this question of food, or the delivery of cooked food to the people by cart service—I shall be glad if you will allow me to refer to another matter I have at heart. It may help to throw light on the food question by illustrating certain principles as applied to other wants. You are aware that our object is to prevent waste, discomfort, loss of time—which is money—to methodise and systematise the operations for providing necessaries of life in cities and towns. Now one necessary of life—as well as food—is clothing. Both these things—food and clothing—will, if improved, conduce to power or heart (tone of health) to receive education. I have, then, a project which will cheaply conduce to cleanliness. It is this:—I propose to distribute, to the respectable poor, nets of strong thin cord, each net to be numbered by a marking-ink linen-marked number. These nets are to be of a convenient size for holding their clothes to be washed—to hold them loosely, just as a net holds potatoes. These nets are to be collected by waggons or light vans; each net being, of course, fastened up at the mouth. The nets of clothes, including shirts or tablecloths, or other cloths, or curtains, &c., &c., will be placed in a suitable tank of cold water, and after a time will be subjected to slight pressure, or to running water, and then they will be put into a hollow wheel, like the revolving paddle-wheel of a steam-ship—a wheel some thirty feet in diameter, turned by steam power; some hundreds of nets of clothes can thus be agitated at one time, and with the introduction of steam, hot water, ley, or soda and soap, or other chemically ascertained suitable materials for dissolving whatever may adhere to, or, in other words, aid to clean the netted clothes. The netted clothes will then be placed in a cylindrical vessel, like the porter vat of a brewery, and will be subjected to considerable pressure, just as we press a sponge or flannel that we wish to clean. This pressure will press out dirty water, which will be allowed to run away; on releasing the piston or other mechanism used for pressure on the netted clothes (for, mind, the clothes never leave the nets) the netted clothes expand (just as a sponge or flannel when squeezed and liberated). This expanding will cause a vacuum, or partial vacuum, within the body or bulk of the squeezed materials, and this will allow the sucking in of clean ley or water and soap. This alternate pressing and releasing the pressure is maintained for some time. Lastly, the netted clothes will be agitated in a wheel with warm water, and then the water will be partially expelled by centrifugal action brought to bear by laws well understood, and applied to sugar as well as clothes in time past. Then the nets of clothes will be placed on wooden or galvanised-iron racks, in a drying-room, and subjected to a dry hot-air blast, which will expel the moisture, just as a hot east wind dries a quartern loaf. The netted clothes will now be delivered home according to the numbers or addresses on the several nets. I have discussed this matter with the poor; and although they knew they would get their things in a rough-dry state, they say that more than half the labour would be saved—that pulling out the clean things, and damping and mangling, would be as nothing to the labour, and toil, and inconvenience of washing the very dirty clothes the poorer classes have to put up with, under disadvantages of want of space, want of suitable implements, and conveniences of drying, &c. Of course all details and calculations I, or better engineers, can easily give. We should use the Cornish system, probably, of steam-power, heating our water, and so on, by steam, and so we should cause a vast saving of coal, and conduce (if ever so little) to the solution of one of the anxious (fuel) problems of the age.—I am, &c., Wm. Riddle, C.E.

Rodger's Shipwreck Raft.—Sir, in reply to the communication from M. Chr. Cooke, which appeared in your publication of the 24th ult., relative to this invention of my late uncle, Capt. Wm. Rodger, R.N., I beg to mention that, in conversing with him on the subject, he told me the raft was quite a success. This is borne out with the result of the trials alongside her Majesty's ships *Northumberland* and *Queen Charlotte*. He, however, became absorbed in the improvement of anchors, and, much to his chagrin, the raft was entirely neglected. He was strongly of opinion no vessel should be put to sea without being supplied with drawings of one or two approved rafts; and that it was the duty of every captain to instruct his crew in the mode of putting them together, these drawings being to be had at the Custom-house for a nominal sum.—I am, &c., William Rodger.

Manchester, February 4, 1868.

The Late Mr. Thurston Thompson.—Sir,—I find that a mistake has crept into my notice of the late Mr. Thurston Thompson, which was printed last week in the *Journal*. In the Exhibition of 1862, Mr. Le Neve Foster was the Superintendent of the Photographic Class, and not Mr. Thurston Thompson, who acted only as juror to that class.—I am, &c., The Writer of the Notice.

11th February, 1868.

MEETINGS FOR THE ENSUING WEEK.

MON......Entomological, 7.
British Architects, 8.
Asiatic, 3.
Victoria Inst., 8.
Society of Engineers, 7½. Dr. Cullen, "On the Panama Railroad," and "On the Darien Ship Canal."

TUES ...Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Civil Engineers, 8. Mr. W. J. McAlpine, "On the Supporting Power of Piles; and on the Pneumatic Process of Driving Iron Columns as practised in America."
Statistical, 8. Mr. Hamilton, "On Trade with the Coloured Races of Africa;" and Major-Gen. Balfour, C.B., "On English and French Budgets."
Pathological, 8.
Anthropological, 8.

WED ...Society of Arts, 8. Mr. W. L. Scott, "On the Supply of Animal Food to Britain, and the means proposed for increasing it."
London Inst., 6½.
R. Society of Literature, 8½.

THUR ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. Charles Darwin, "On the Character and Hybrid-like Nature of the Offspring from the illegitimate unions of Dimorphic and Trimorphic Plants."
Zoological, 4.
Chemical, 8. Mr. David Forbes, "On Chemical Geology."
Numismatic, 7.
R. Society Club, 6.
Society of Fine Arts, 8. Mr. J. A. Heraud, "On the Moral Aspects of Modern Poetry."

FRI......Royal Inst., 8. Professor Tyndall, "On the Discoveries of Faraday."
Geological, 1. Annual Meeting.
Philological, 8.

SAT ......R. Botanic, 3¾.
Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

Patents.

From Commissioners of Patents' Journal, February 7.

GRANTS OF PROVISIONAL PROTECTION.

Axles, conveying rotatory motion to—258—K. J. Winslow.
Bedsteads—3631—B. Browne.
Bellows—299—R. J. Moser.
Bell pulls—269—A. C. M. Prince.
Belts, &c., swimming—263—C. Kilburn.
Biscuits, anti-scorbutic—290—W. H. Crispin.
Boats—135—W. Ayliffe.
Boilers—199—A. M. Clark.
Boilers—246—G. Allibon and A. Manbré.
Boot heels, tips for—286—E. Egersdorff.
Boots, &c., soles and heels of—236—T. Rowley.
Boots, &c., uniting together materials employed in the manufacture of—235—T. Cook.
Bottles, securing stoppers in—207—J. L. Davies.
Bottles, securing stoppers in—275—A. H. Thurgar.
Buildings, heating—237—W. Oram.
Canisters—252—J. and D. Storer.
Canteens—231—T. Goune.
Casks, &c.—250—G. Severn.
Concave surfaces, grinding and polishing—280—W. E. Newton.
Door knobs, &c.—241—J. C. Sanders.
Eggs, preserving—287—H. A. Bonneville.
Electrical train intercommunication, &c.—315—S. M. Martin and S. A. Varley.
Engines, locomotive—2907—W. B. Adams.
Excrement, removing—253—A. Small.
Fabrics and yarns, dressing—82—J. Tucker.
Fire-arms and cartridges—285—W. Tranter.
Fire-arms, breech-loading—201—J. Parsons.
Fire-arms, breech-loading, and ammunition—264—C. E. Brooman.
Fire-arms, &c., breech-loading—317—W. E. Newton.
Fortifications—266—T. Robinson.
Fruit trees, &c., protecting from frost, &c.—279—W. E. Rendle.
Furnaces—215—J. H. Johnson.
Furnaces, &c.—248—M. Tildesley and J. Bird.
Gas, regulating the supply of—247—S. Price.
Gas, &c., preparing oxide of iron for purifying—257—T. L. G. Bell.
Grain, cleaning and separating—295—T. Corbett.
Grain, &c., drying—228—S. Bennett.
Hat bodies, &c., machinery for forming—281—W. E. Newton.
Hats, bonnets, &c.—278—G. Kellogg.
Heat, utilizing—265—C. Ritchie.
Hides and skins, tanning—245—H. M. Ragland.
Letter-boxes, &c.—234—W. Dennis.
Lightning conductors—233—T. W. Gray.
Looms, ribbon—288—H. A. Bonneville.
Lubricators—195—R. and T. Carling.
Lubricators—255—A. M. Clark.
Madder, &c., liberating the colouring matter of—219—G. T. Bousfield.
Malleable materials, shaping—191—J. Davies.
Matches—213—J. J. Long.
Metals, &c., melting and heating—271—J. H. Johnson.
Milling machinery—242—W. Bottomley.
Mills for grinding or crushing—226—W. Thompson and T. Stather.
Mirrors, hand—276—J. J. Hicks.
Mules and billies, self-acting—240—G. Kirk and W. Murray.
Needles, &c., scouring—313—W. Guise.
Oils, refining—297—J. Pearson and J. W. Young.
Optical illusions—267—R. G. Wells and D. Jones.
Organs—232—C. S. Barker.
Peat, &c., preparing—221—F. L. H. Danchell.
Pipes, cast-iron—311—D. Law and J. Wharrie.
Pipes, joining metallic—284—J. Roberts and J. Morgan.
Pipes, &c., cast-iron—238—D. Y. Stewart.
Post-offices, &c., travelling—256—C. Woodroffe.
Printing machines, lithographic—301—J. H. Johnson.
Pumps, &c., applying india-rubber to—193—W. Firth.
Railways—251—W. J. Jennings.
Rollers, elastic—268—E. J. W. Parnacott.
Sewing machines—305—C. A. McCurd.
Ships—136—J. Williamson.
Spray producers—223—P. Harrower and J. C. Stuart.
Stoves, gas—239—H. Hodge.
Stoves, &c.—274—A. Middlemist.
Tables, billiard—244—H. J. Dickinson.
Valves—230—R. Needham.
Valves—261—C. W. Dixon.
Velocipedes—309—S. B. Ardrey and S. Beckett.
Washers, &c.—283—F. N. Clerk.
Watches, &c., securing when carried in pockets—260—J. M. Lewis.
Water, apparatus for drawing off—277—T. Dickinson.
Water-closets—254—E. W. De Rusett and R. F. Dale.
Wheat, drying—289—W. A. Gibbs.
Wood, &c., manufacturing articles from—229—E. Tomlinson.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Cotton, opening and cleaning—310—W. Tasker.
Powder magazine, fireproof—308—W. Snell.
Safes, fireproof—307—W. Snell.

From Commissioners of Patents' Journal, February 11.

PATENTS SEALED.

2287. H. W. Withers.
2288. F. Wirth.
2292. W. R. Dawson.
2293. F. J. Seymour.
2300. J. Davenport and J. Kitson.
2305. R. Girdwood.
2306. R. Edmondson.
2311. A. Turner and W. Hemsley.
2315. J. Shanks and J. Cargill.
2403. J. Newark.
2455. W. B. Smith.
2572. A. M. Clark.
2578. W. E. Newton.
2594. R. Lowe and J. Taylor.
2643. L. Lenzberg.
2980. A. M. Clark.
2220. J. H. Johnson.
2310. E. Courtin.
2318. W. T. Eley.
2320. H. T. Everist.
2322. J. J. Bright.
2323. G. and J. Pilling and F. Jennings.
2331. J. Fawcett.
2332. T. Walker.
2334. W. B. Leachman and J. Holroyd.
2337. J. A. Jones, R. Howson, and J. Gjers.
2341. G. Buxton and S. Bann.
2343. H. Bessemer.
2344. J. T. Way.
2347. T. Bushby.
2350. E. Ormerod.
2351. A. F. Baird.
2356. M. Henry.
2362. A. Leveson.
2370. F. B. Houghton.
2372. M. Cahen.
2381. C. Reifert.
2384. W. Burrow.
2388. A. Cohen.
2389. J. Murgatroyd.
2507. J. Howard and E. T. Bousfield.
3110. H. Allman & F. N. Gisborne.
3315. W. R. Lake.
3473. J. Durrans.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

309. S. W. Wood.
328. A. Steven.
330. A. A. Hulot.
345. J. Lake.
360. R. A. Brooman.
370. A. V. Newton.
396. A. V. Newton.
426. B. Thompson.
430. A. V. Newton.
405. J. G. Tongue.
371. J. Dale.
470. W. Robinson.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

333. C. White.
315. T. and J. Blezard.
331. J. Higgins and T. S. Whitworth.

Registered Designs.

4924—Jan. 29th—An improved link for chain—Richard Foster, Willenhall.
4925—Feb. 1st—A vice or clamp—Cocker, Bros., Sheffield.
4926—Feb. 3rd—An involute scroll—David Lord, High-st., Horton, Bradford, York.
4927—Feb. 4th—A combined foot-brush and scraper—James West and Sons, Braintree, Essex.
4928—Feb. 7th—A blind pulley—Cox and Williams, River-street Birmingham.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 21, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

February 26.—"On a Daily Mail Route to India." By Hyde Clarke, Esq., D.C.L.

March 4.—"A Workman's Views on Technical Education." By Mr. John Randall, one of the Artisan-Reporters on the Paris Exhibition.

Art-Workmanship Competition.

The works of the competitors, which are now arranged in the Great Room for the inspection of members and their friends, will only be on view up to and including Saturday, the 29th inst.

Notice to Members.

The Council have placed the Great Room at the disposal of the Society for the Encouragement of the Fine Arts on Thursday evening, the 27th inst., when a Paper upon the Works of James Barry, R.A., will be read by Mr. F. Y. Hurlstone. A limited number of tickets of admission have been kindly forwarded to the Secretary of the Society of Arts, to whom any members who may desire to be present should apply.

Institutions.

The following Institution has been received into Union since the last announcement:—

Beauvoir College Evening Classes.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Eleventh Ordinary Meeting.

Wednesday, February 19th, 1868; Benjamin Shaw, Esq., Member of the Council, in the Chair.

The following candidates were proposed for election as members of the Society:—

Johnson, Matthew Hawkins, 379, Euston-road, N.W.
Roe, Thomas, jun., Mayor of Derby.
Sarll, John, Drapers'-hall, Throgmorton-street, E.C.
Wise, William Lloyd, Chandos-chambers, Buckingham-street, Adelphi, W.C.

The following candidates were balloted for, and duly elected members of the Society:—

Baker, William Procter, Clifton, Bristol.
Byatt, Horace, St. Mary's School, Chatham.
Chapman, Henry, 41, Boulevard Malesherbes, Paris.
Harington, Sir John, Bart., 58, Eaton-place, S.W.
Pembridge, James, The Academy, East-street, Hereford.
Scott, W. B., C.E., St. Pancras Vestry, Edward-street, Hampstead-road, N.W.
Westerton, Charles, 27, St. George's-place, Hyde-park-corner, S.W.

The Paper read was—

ON THE SUPPLY OF ANIMAL FOOD TO BRITAIN, AND THE MEANS PROPOSED FOR INCREASING IT.

By Wentworth Lascelles Scott, F.A.S.L., F.R.S.S.A., &c.

In compliance with the request of several members of this Society, I have promised to ask your attention this evening to the subject of our national meat-supply—a subject of vital importance, and one which has too long been neglected in this country.

At the present moment, the newly-awakened interest in the "great food-question" cannot fail to be productive of substantial results, but it is undeniable that such results might have been arrived at just as well many years ago, thus in some measure preventing the occurrence of those very evils we are now at the eleventh hour attempting to remedy.

The chief points proposed for your consideration and discussion to-night may be rendered as follows:—

I. What quantity of animal food is required per head of the population per annum?

II. What amount is actually available? And

III. How shall we best supply the deficiency, if any?

I hope, under other circumstances—viz., in the course of a somewhat ponderous volume, as yet in embryo*—to deal with these and certain other questions in their several details, but now I simply have to ask your kind indulgence while I lay before you a few brief, and it may be disjointed, observations, believing as I do that all deficiencies on my part will be more than compensated for by the valuable statements and opinions the mere mention of animal food is sure to elicit.

Starting with the first division of our subject, I feel I am upon rather delicate ground, having the misfortune to differ a little in opinion with some of our highest authorities in relation to the consumption of food. I will endeavour, however, to keep all such heterodox ideas in the background, as far as practicable, upon the present occasion.

I have considered, from data too lengthy and complex to trouble you with just now, that in this country and climate, 1342 grains of nitrogenous or flesh-forming

* "The Food Resources of the British Empire."

matter per head of the population are required each day, if the inhabitants of the British Isles are to be maintained in the highest (average) condition of physical and mental activity, and that of this quantity four-tenths, or 536 grains, should be furnished by animal food, and three-tenths, or 402 grains, in the form of meat.

I have further assumed that meat, as a whole, contains upon the average 13 per cent. of assimilable nitrogenous matter, and although there may be some present who do not quite agree with these estimates, I think I may fairly believe that any differences will be too small to affect the main arguments of this paper.

It is remarkable that even Londoners, who consume a larger proportion of animal food, as a rule, than is accorded to the other nine-tenths of the population, do not get the necessary quantity, or anything approaching to it, the meat-deficiency for the metropolis only, amounting to upwards of 102,000,000 lbs. at the lowest computation. In round numbers, I consider that Great Britain, to be well and rationally fed, requires an addition to her meat supplies of fully 3,544,330,000 lbs. annually.

Our next point—what amount of animal food is actually available—is a somewhat formidable question, and one, too, upon which opinions differ pretty widely; however, if we make a rule of taking the lowest rational figures for our requirements, and the highest for our supplies, our general deductions therefrom must certainly be under the truth. In furtherance of the objects of my future work, I have necessarily been at some pains to acquire information of the ordinary food-produce of this country, and I cannot help observing that there are few things more difficult to obtain, or more unsatisfactory when you have got them, than British agricultural statistics. Mr. Matchwick, in the general introduction to the catalogue of the British Section of the Paris Exhibition, writes:—"As regards the productions of the soil, there are, unfortunately, no official returns of the quantity of corn, meat, wool, or of butter, cheese, or other dairy produce annually produced. In this respect England is far behind most continental nations, where for years past a complete series of agricultural statistics has been in operation. Until 1866, no complete returns for the whole kingdom, of even the average and number of live stock, were obtained."

As if to ensure the least possible degree of utility to the two years' imperfect statistics we have been favoured with, these returns are taken before and after the lambing season in 1866 and 1867 respectively, crediting us with an increase of mutton of nearly 30 per cent. on the previous year, or 7,422,553 sheep, whereas there is but too good reason to believe that a slight proportionate decrease has taken place. Then, again, in these returns a summary of which I append here, the errors and omissions are numerous. In one county alone, to my personal knowledge, the number of animals was incorrect in nine instances, and omitted altogether in four other cases. However, now that an attempt at agricultural statistics has been made, I hope we shall go on improving and extending them, if only in our nationally tardy manner.

Total Number of each kind of Live Stock in the United Kingdom.

	1866. *(Returns taken before Lambing).*		
	Great Britain.	Ireland.	United Kingdom.
Cows	1,883,522	1,482,616	3,366,138
Other cattle	2,902,314	2,263,541	5,165,855
Total cattle..	4,785,836	3,746,157	8,531,993
Sheep	22,048,281	4,274,282	26,322,563
Pigs..............	2,477,619	1,497,274	3,974,893

	1867. *(Returns taken after Lambing.)*		
	Great Britain.	Ireland.	United. Kingdom.
Cows	2,038,092	1,519,720	3,557,812
Other cattle	2,954,942	2,182,658	5,137,600
Total cattle..	4,993,034	3,702,378	8,695,412
Sheep	28,919,101	4,826,015	33,745,116
Pigs..............	2,966,979	1,233,893	4,200,872

My own estimate (for 1868) is as follows for the United Kingdom:—

	Number of Animals.	Average Weight of Meat.
Total Cattle............	9,300,000	400 lbs.
Sheep	34,560,000	45 "
Swine	4,940,000	60 "

Now, various opinions have been given as to the number of animals slaughtered for food per annum, and the quantity of "butchers' meat" yielded by each variety; some of these are so extravagant as to be without the pale of rational hypothesis altogether. Care, inquiry, and comparison of actual results have led me to believe that, taking one animal with another, the annual number slaughtered cannot exceed 23 per cent. of the existing live stock. Cattle, sheep and lambs, and pigs, I consider, yield 400 lbs., 45 lbs., and 60 lbs. each of trimmed meat, and, therefore that only 1,281,468,000 lbs. can be available for consumption in the British Isles during the present year, or less than 2 oz. of meat (including bone and fat) per head of the population per diem.

I need scarcely dilate upon this terrible deficiency; however much opinions may differ in points of detail, I think the main fact is sufficiently self-evident. At the first glance the metropolis appears more favoured; it consumes, without doubt, about three times this proportion of meat; but this seeming advantage is not so in reality, for several reasons—one being the number of hotels, institutions, and large establishments where the waste is very great, and another, the peculiarly dyspeptic character of the majority of City occupations, occasioning much (comparative) difficulty in the assimilation of food.

There are, without doubt, numerous obstacles in the way of a fair estimation of the amount of animal food available for consumption in this country; but if we take London as being certainly found in the possession of a larger amount of animal food than any other tenth part of the population, and yet find it to be lamentably deficient in its meat-supplies, it is not too much to say that the entire country is in a state of mitigated starvation. There is a section of the public, which, doubtless, has some representatives here to-night, who cannot grasp this fact; they consider it would be simply monstrous if it did exist; and so the kindly wish being father to the thought, it of course cannot be; figures, which but few people take the trouble to go into, can be so easily exaggerated, &c. Some few of our popular writers, too,—I could point to several instances—have unconsciously done harm by impressing the popular mind with graphic descriptions of the enormous quantities of food—some of it brought from the uttermost ends of the earth—consumed by great cities, without, at the same time, exhibiting the utter inefficiency of the same to supply the real requirements of our "teeming millions."

In the consideration of supply and demand, prices will help us considerably, and we may derive some little instruction from a comparison of the cost of meat some

years ago and at present. I do not mean the time (1490) when "3 shepe" could be bought for a crown, a "lambe" for sixteen pence, and "6 pyggys" might be obtained at the very moderate figure of two shillings, while a "bushell of whete" cost ten-pence halfpenny.* but say we begin with 300 years later.

In 1789–90, according to Mr. Arthur Young, our prices for animal food were:—

Beef	$3\frac{1}{2}$ to $3\frac{3}{4}$d.	per lb.
Veal	$3\frac{3}{4}$d.	,,
Mutton	$3\frac{1}{2}$d.	,,
Pork	$4\frac{1}{2}$d.	,,
Butter	$8\frac{1}{4}$d.	,,
Cheese	$4\frac{1}{2}$d.	,,

while, at the same period, the market value of the services of that favourite Parliamentary standard, "the Dorsetshire labourer," amounted to 1s. $4\frac{3}{4}$d. per diem.

The contract prices of butchers' meat per cwt. at Greenwich Hospital, since 1735, have been as below:—

Year.	Price per cwt.	Year.	Price per cwt.
1735	0 16 11	1836	2 1 $3\frac{1}{2}$
1740	1 8 0	1837	2 10 $10\frac{1}{2}$
1745	1 2 2	1838	2 2 5
1750	1 6 6	1839	2 7 $7\frac{1}{2}$
1755	1 7 $9\frac{1}{2}$	1840	2 14 0
1760	1 11 6	1841	2 16 $0\frac{1}{2}$
1765	1 7 3	1842	2 12 $8\frac{1}{2}$
1770	1 8 6	1843	2 0 1
1775	1 13 5	1844	2 0 10
1780	1 12 6	1845	2 6 9
1785	1 17 $6\frac{1}{2}$	1846	2 3 $4\frac{1}{2}$
1790	1 16 10	1847	2 14 $5\frac{1}{2}$
1795	2 2 10	1848	2 11 $7\frac{1}{2}$
1800	3 4 4	1849	2 1 $5\frac{1}{2}$
1805	3 0 4	1850	2 2 1
1810	3 12 0	1851	2 0 9
1815	3 8 0	1852	2 3 $4\frac{1}{2}$
1820	3 10 $4\frac{1}{2}$	1853	2 13 1
1821	2 18 10	1854	3 0 $0\frac{1}{2}$
1822	1 19 $5\frac{1}{2}$	1855	2 18 9
1823	2 2 $7\frac{1}{4}$	1856	2 14 1
1824	2 2 $8\frac{1}{4}$	1857	2 12 $10\frac{1}{2}$
1825	2 19 $6\frac{1}{2}$	1858	2 10 $2\frac{1}{2}$
1826	2 17 8	1859	2 13 $3\frac{1}{2}$
1827	2 15 $4\frac{1}{2}$	1860	2 17 $5\frac{1}{2}$
1828	2 10 $7\frac{1}{4}$	1861	3 0 4
1829	2 6 $3\frac{1}{2}$	1862	2 17 $3\frac{3}{4}$
1830	2 3 6	1863	2 16 $10\frac{1}{2}$
1831	2 4 $3\frac{1}{2}$	1864	3 2 $8\frac{1}{2}$
1832	2 6 $2\frac{1}{4}$	1865	3 12 7
1833	2 6 6	1866	3 5 4
1834	2 3 9	1867	3 10 0
1835	2 0 $7\frac{1}{2}$	1868 (to 31st of March)	3 10 0

(Signed) THOMAS WILSON,
Capt. Supt. Greenwich Hosp.

February 18th, 1868.

The meat contracted for is of "prime" quality, the beef being almost entirely without bone, and the mutton consisting entirely of legs and loins. T. W.

I need not dwell much upon later prices, for I see in this room many who are in a position to speak with authority upon this point, but to bring the figures down to our own time, I will insert here a brief note of the London market prices of last winter, and those of seventeen years ago.

Description of Meat.	Prices per 8 lbs. Winter of 1850-51.			Prices per 8 lbs. Winter of 1866-67.			Mean increase in Price.	
	Min.	Max.	Mean.	Min.	Max.	Mean.	Per 8 lbs.	Per Cent.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	
Beef	2 6	4 0	3 3	3 6	5 2	4 4	1 1	33·3
Mutton	3 0	4 4	3 8	3 10	6 2	5 0	1 4	36·3
Veal	2 8	3 8	3 2	4 6	5 6	5 0	1 10	57·9
Pork	3 0	3 8	3 4	3 2	4 2	3 8	0 4	11·1

By which we see that beef and mutton have increased in price 33·3 and 36·3 per cent. respectively, in about the sixth of a century. At this rate, where should we be in 1968?

If further proof were wanting, that meat, as a primary necessity of our national existence, costs very considerably more than we can afford to pay for it, I need only point to those panaceas for all British sorrows—letters in the *Times*, which have for many months past almost consoled the writers for the condition of their butchers' bills on the one hand, while they did good service in awakening public attention on the other.

I was speaking on the same subject to a friend, not long ago, when he remarked, "Why don't the people eat fish, if meat is so dear and so scarce? I have seen more fish thrown away, or allowed to decay for manure, within a few days, than would be required to keep Southampton in animal food for a month." And this observation brings us to another subdivision of our subject—the supply of fish. Here, again, the same melancholy story holds good—the supply is but a fraction of the demand—while, in addition, we are forced to the humiliating confession that many thousands of tons of fish are being thrown away and absolutely wasted after they have been caught, in a country where 23,000 people die annually from insufficiency of food. Moreover, it is not only that fish, as a rule, is dear now, as compared with former times (when it was by no means uncommon for articles of indenture to contain a clause stipulating that the apprentice was not to have salmon for dinner more than two or three times a week!*), but we have the anomaly constantly occurring of a starving population in one part of the country, simultaneously with the absolute destruction of many tons of nutritious food in another.

TABLE SHEWING THE NUMBER, WEIGHT, AND VALUE OF THE FISH CONDEMNED AND DESTROYED AT BILLINGSGATE IN 1867.

Name of Fish.	Quantity condemned.	Weight.	Value.
		lbs.	£ s. d.
Salmon	75 fish	750	50 0 0
Cod	31,683 ,,	316,830	3,973 0 0
Haddock	170,964 ,,	341,928	4,274 0 0
Soles	2,688 ,,	672	67 0 0
Mackarel	2,880 ,,	2,880	30 0 0
Herrings	94,473 ,,	18,895	190 0 0
Sprats	47 bushels	...	...
Eels	...	730	10 0 0
Plaice	115,951 fish	115,951	386 0 0
Dabs	86,938 ,,	14,729	37 0 0
Whiting	199,330 ,,	66,443	1,660 0 0
Mullet	483 ,,	322	12 0 0
Turbot	224 ,,	896	112 0 0
Cod roes	2 bushels	...	...
Smelts	114,788 fish	5,740	574 0 0
Brills	292 ,,	...	3 13 0
Bream	188 ,,	...	...
Gurnets	60,000 ,,	...	...
Ling	505 ,,	...	...
Skate	323 ,,	...	...
Thornbacks	6,426 ,,	...	...
Caplins	...	120	3 0 0
Shrimps	9,320 gallons	...	466 0 0
Lobsters	840 fish	1,260	1 0 0
Crabs	1,242 ,,	1,242	1 5 0
Sturgeon	1 ,,	...	...
Trout	99 ,,	125	...
Cat fish	36 ,,	...	...
Mussels	100 bags	...	...
Whelks	97 bags	...	...
Pike	7 fish	...	...
Sardines	2 barrels	...	...
Hake	5 fish	...	...
Dorys	5 ,,	...	...
Winkles	141 bags 42 bshls.	...	...
Cod sounds	..	560	...
Dry salmon	40 fish	280	9 0 0
Lampreys	...	20	...
Colefish	46 fish	...	...
Preserved lobsters in tins	135 tins	135	3 7 6
Dry cod	...	15,680	196 0 0

NOTE.—The value has been inserted only in those instances where the opinions received were tolerably concordant. I have great pleasure in acknowledging the kind services of Mr. Henry Graham in connection with this table.

* Parish books of Kingston-on-Thames.

* I am indebted for information on this and other points to J. H. Latcham, Esq., of Bristol, whose kind services I desire to acknowledge gratefully.

It is excessively difficult to obtain anything like accurate information respecting the annual consumption of fish in this country, but the supply is manifestly quite unequal to the wants of the population; and although it is now probable that our national fisheries will be developed upon an organised system in future years, a considerable period must necessarily elapse before this source of "animal food" can be restored to its legitimate position. With the view of avoiding all temptations to political discussion in this room, I have decided to refrain from offering any observations on the management, or mismanagement, of our fisheries upon the present occasion, but I may appropriately refer here to the sound and practical treatise upon "The Sea Fisheries of Ireland," issued within the last few days by John R. Blake, Esq., M.P. for Waterford, as containing a large amount of most useful information, and numerous valuable suggestions, which, if carried into effect, can scarcely fail to give additional employment to one section of the community and increased supplies of food to all.*

Mr. Blake, in his "Summary and Appeal to Government," says:—"The best argument in favour of Government adopting the means for the resuscitation of the Irish Sea Fisheries recommended by the late Select Committee is the fact that, with upwards of 2,200 miles of coast, the seas abounding with fish, with a hardy, courageous population, ready to engage in any industry affording the means of life, nearly half the supply required for their own consumption is drawn from other countries. The whole capture (under £350,000 worth a year) would not supply London for one month. This is the more extraordinary when down to a comparatively late period large sums were paid by foreign nations for the privilege of fishing on the Irish coasts; that the latter were long preferred by English and Scotch fishermen to their own; and that Ireland, after supplying her own wants, exported large quantities of fish."

After reverting to the causes of the "decline and fall" of the fisheries, Mr. Blake concludes his suggestions for their improvement in these words:—"A free grant of a single shilling is not asked. A loan of fifty thousand pounds (including £10,000 for curing-houses) on approved security, is all that is suggested. That it would take some time to bring things right there can be no doubt, but that the above sum, spread over a number of years and kept circulating, would ultimately bring the fisheries to a satisfactory position, by encouraging the formation of small local companies (the most likely to succeed in Ireland) and assisting the individual fishermen to obtain better boats and gear, is believed by those most competent to pronounce. With this, of course, the present outlay on harbours should continue, and an effective department organised for the control and direction of the fisheries."

* After dwelling in forcible language upon the peculiar capabilities of Ireland for supplying not only herself, but other countries with fish, and the several causes which induced a decline in this trade, Mr. Blake gives the following succinct synopsis of the condition of Irish fisheries during the last half century:—

"1818-9.—Fisheries suffering from depression after the Union, and just before the new board had commenced operations; 27 vessels, 188 men.

"1830.—Last year of existence of board, and stimulus of bounties and loan funds; 13,110 vessels and boats; 64,771 men and boys.

"1845.—2,371 first-class vessels; 17,512 second-class.

"1846.—Immediately before the famine, 19,893 vessels; 113,078 men and boys.

"1848.—15,932 vessels and boats, representing 1,449 of 15 tons and upwards, and 14,483 under 15 tons; 70,011 crews, consisting of 66,150 men and 3,851 boys.

"1866.—9,444 vessels and boats, and 637,479 crews, consisting of 1,247 vessels of 15 tons and upwards, and 8,197 boats under 15 tons; 37,479 men, and 3,184 boys.

"Number of miles of maritime boundaries—2,346, extending through $451\frac{5}{6}$ parishes; population of district in 1841—1,854,965.

"It will be seen from the foregoing that although all encouragement was withdrawn in 1830, the coast population must have made tremendous efforts to avail themselves of the fisheries, from the great increase in the number of craft and fishermen between 1836 and 1846. Notwithstanding the comparatively large number in the latter year, the best authorities pronounced that there was ample employment for more than double the vessels and men then employed."

From personal inquiries, and information I have specially collected, I am of opinion that our English, Scottish, and Irish Fisheries might be, if carefully and judiciously developed, increased to 3, $2\frac{1}{2}$, and $5\frac{1}{2}$ times their present degree of productiveness respectively, while at the same time it would be possible materially to decrease the number of (able-bodied) paupers in the three kingdoms.*

Another variety of animal food—that derived from the feathered tribe—calls for a passing notice at our hands, but chiefly we may observe how small a proportion it bears in comparison with meat and fish. My estimates are that London consumes nearly 22,000,000 lbs. of poultry (including larks) annually, and that the entire kingdom does not account for more than 26,500,000 lbs.; except as a speciality, therefore we may fairly ignore birds almost completely in reckoning up the nation's food.

Something like 1,300 millions of eggs are annually consumed in the United Kingdom, and I have no doubt but that quantity will steadily increase for some time to come.

Reverting for a moment to animal food as a whole, there are yet two points upon which I hope to acquire much information to-night from the practical authorities present in this room. The first is of insufficient supplies accorded to us, and credited in the national food account, how much is destroyed or rendered useless before it reaches our mouths?

In a communication I had the honour of making to this Society in 1861, † I stated this quantity in the metropolis to be about 9·5 per cent., and later inquiries have not modified this opinion, considering bad meat (from all causes) as waste, whether it is actually destroyed or not; taking the entire country, however, this proportion may be lowered to 7·25 per cent., according to my calculations. The other question referred to just now is this,—in what manner is a country affected by a supply of animal food totally inadequate to its requirements?

Now, I will candidly admit that I have committed this query to paper from a purely selfish motive. There must be many around me on the present occasion who have had special opportunities of forming opinions thereon. In 1846 Dr. Farr read an elaborate paper before the Statistical Society of London, on the "Influence of Scarcities and High Prices of Wheat on the Mortality of the People of England,"‡ in which he demonstrated that, taking all England, for every 13 deaths that occurred in the years when the average price of wheat was low, 14 persons died (out of the same population) in the years when corn was dearer, while in Lancashire and Cheshire, under similar circumstances, the deaths were seven and eight respectively. Taking meat prices as the index of mortality, the stubborn statistics pointed in the same direction, inculcated the same lesson, which may be reduced to the legend—that the rate of mortality rises with the cost of food-staples, or, in other words, that they who take a fraction off the price of meat save the lives of thousands of their countrymen. Nor does the relation stop here, for if we can trace a connection between cheap food and life, dear food and death, it follows that the mental and physical powers of a nation must be largely influenced by the character of its food supply. Of this fact in its broad bearings we find instances everywhere, food having always played an important part in the formation or modification of race-character. Every country has, if we trace it rightly, its own peculiar standard of nutrition, upon the due preservation of which depend greatly the health and welfare of its people.

The very limited time at my disposal to night, and the very expansive nature of the subject I have the honour

* This part of the subject may, perhaps, be specially treated of hereafter, should a fitting opportunity occur.

† "On Food, its Adulterations, and the methods of detecting them."—*Journal*, Vol. IX., p. 153.

‡ *Journal of the Statistical Society of London*, Vol. IX., p. 168.

of inviting you to discuss, forbid my dwelling longer upon what might be termed the population-effects of food supply, but, however much our opinions may vary as to degree, I am sure we are all ready to admit that the "Roast Beef of Old England" is a very good thing indeed, with one serious drawback—we can't get enough of it.

Now comes the question—How can we most readily increase the supply?

1st. What margin is there for the development of our own beef and mutton?

The area of the United Kingdom amounts to 77,394,433 acres, which is made up in this manner:—

Country.	Area capable of Cultivation.	Total Area.
	Acres.	Acres.
England	29,086,000	32,342,000
Scotland	11,215,000	19,723,930
Ireland	17,025,280	19,441,744
Wales	3,647,000	4,752,000
Channel Islands	549,690	1,119,157
Total	61,522,970	77,378,831

Mr. Joseph Fisher, of Waterford (to whom I beg to express here my appreciation of his great courtesy), puts the case thus, taking 61,000,000 of acres suitable for cultivation:—

"If about one-half of the area were farmed on the four-course system it would give annually about 20,000,000 acres of grain, 10,000,000 of green crops, and 10,000,000 acres of clover. If the portion under grain produced only three quarters per acre, and that one-sixth were deducted for seed, it would leave 50,000,000 qrs. for the support of a population of 30,000,000. We should thus be independent of foreign countries for our supply of grain.

"Then as to meat. If each acre produced 20 tons of green crops, and that each ton of turnips yields 14lbs. of meat, then the green crops would produce 2,800,000,000lbs. of meat, or at the rate of 90lbs. for each person, being three times as much as is now consumed. This would leave 10,000,000 acres of clover, 21,000,000 of arable pasture land, and 16,000,000 acres of waste land for rearing cattle and sheep and producing milk and butter."*a*

A consummation devoutly to be wished for, but, during the next few generations, it is somewhat doubtful as to where the capital would come from. We may, it is true, slowly improve our meat production, but simultaneously our increasing requirements will grow at a quicker pace.

Turning to our neighbours for assistance will do but little good, I fear, as long as the present system of transit arrangements and packing continues. Moreover, there are not too many who can afford to send us meat at all sufficiently near at hand to do so at a moderate cost. In the following Table I have given what I believe to be the most accurate and comprehensive view of the live stock existing in the principal countries, which has yet appeared.*b* It may, perhaps prove useful in the after-consideration of our subject, but time will not permit a dissertation upon it in detail. On comparing the British imports of live stock during the last few years *c* we do not find anything particularly encouraging, and on referring to the statistics of the coun-

TABLE

SHEWING THE AREA AND POPULATION (ACCORDING TO THE RESPECTIVE LAST RETURNS) AND THE NUMBER OF LIVE STOCK (W. L. SCOTT, SPECIAL ESTIMATES FOR 1868) IN THE CHIEF COUNTRIES OF THE WORLD.

	Name of country.	Total area. English sq. miles.	Population.	Cattle.	Sheep.	Swine.	Goats.
Countries Exporting Meat.	Australia	2,449,596	1,268,400	185,000,000	290,000,000	...	...
	Canada	346,860	2,507,657	...	...	4,940,000	...
	Argentine Republic	800,000	1,171,800	17,492,000	72,319,000	260,200	1,482,280
	Uruguay	Information conflicting	342,000	13,084,500	8,879,000	248,900	32,680
	Other South American States	...	...	about 27,000,000	(?)	(?)	(?)
	United States	...	...	16,250,000	40,500,000	14,700,000	...
	Russia	7,612,874	73,992,373	26,000,000	47,700,000	13,400,000	...
	Prussia and other States	137,066	22,763,198	14,560,000	25,600,000	5,900,000	...
	Austria	238,148	31,865,000	11,750,000	17,850,000	8,650,000	270,000
	France	207,480	37,472,732	15,200,000	41,250,000	6,740,000	...
	Denmark	14,790	1,600,551	1,800,000	2,880,000	675,000	...
	Turkey*	189,920	15,500,000	9,750,000	†	†	†
	Netherlands	13,464	3,667,866	1,392,000	1,180,000	321,500	137,000
	Belgium	11,267	4,836,700	1,420,000	590,000	447,000	210,000
	Norway	121,779	1,600,000	†	†	†	†
Countries Importing Meat.	Italy	98,154	21,921,000	3,940,000	11,100,000	4,330,000	900,000
	Great Britain	122,823	30,152,000	9,300,000	34,560,000	4,940,000	2,500
	Sweden	168,042	4,022,580	2,645,000	2,150,000	630,000	...
	Spain	190,325	15,658,500	3,750,000	23,940,000	4,620,000	...
	Portugal	36,310	4,035,350	1,200,000	†	†	†
	Switzerland	15,540	2,534,242	1,150,000	573,000	341,500	372,000

* Turkey in Europe only.
† Not received in time.

a "Where shall we get Meat?" By Joseph Fisher. London: Longmans and Co. A treatise containing much valuable information, but a little inconveniently arranged, and not furnished with an index.

b Compiled expressly for "The Food Resources of the British Empire."

c The imports of animals into the United Kingdom since 1861 were as under:—

	Cattle.	Sheep & Lambs.	Pigs.
1862.	97,887	299,472	18,162
1863.	121,483	338,415	27,137
1864.	119,174	353,100	...
1865.	...	713,084	...
1866.	223,216	762,620	117,083
1867.	171,238	504,514	45,566

TABLE

Shewing Number of Animals in the Countries Watered by the Rio de la Plata, and its Tributaries.

Name of State.	Name of Province.	Estimated Number of Animals in 1865. (*Extracted from "The River Plate as a Field for Emigration."*)							Estimated Number of Animals, 1867-8. (*Compiled especially for the Author.*)				
		Cattle.	Sheep.	Swine.	Goats.	Horses.	Mules.	Asses.	Cattle.	Sheep.	Swine.	Goats.	Horses, Mules and Asses.
Argentine Republic.	Buenos Ayres	6,800,000	50,000,000	115,000	5,000	1,800,000	25,000	5,000	7,470,000	58,600,000	122,000	4,700	2,310,000
	Entre Rios	2,500,000	6,000,000	...	...	600,000	7,000	500	3,150,000	5,815,000	6,700	1,880	826,000
	Cordoba	...	...	...	...	...	...	...	1,880,000	3,110,000	1,600	700	194,000
	Corrientes	2,000,000	1,000,000	4,500	10,000	375,000	25,000	35,000	2,650,000	2,040,000	2,200	11,000	490,000
	Catamarca	185,000	80,000	2,500	121,000	40,000	15,000	25,000	300,000	132,000	2,150	105,000	122,000
	Mendoza	210,000	230,000	8,500	70,000	71,000	5,000	2,500	282,000	345,000	8,500	83,000	90,000
	Salta	255,000	150,000	2,500	95,000	50,000	15,000	34,000	400,000	321,000	2,200	116,000	138,000
	San Luis	31,000	160,000	...	285,000	96,000	5,000	8,600	52,000	134,000	2,150	317,000	145,000
	Santiago	...	...	...	...	...	...	...	46,000	240,000	3,200	250,000	312,000
	Tucuman	275,000	90,000	30,000	25,000	85,000	12,000	10,000	362,000	282,000	34,500	258,000	120,000
	Other Provinces, Pampas, &c.	...	...	...	...	...	...	...	900,000	1,300,000	75,000	335,000	3,400,000
	Total Argentine Republic	**12,256,000**	**57,710,000**	**163 000**	**611,000**	**3,117,000**	**109,000**	**120,600**	**17,492,000**	**72,319,000**	**260,200**	**1,482,280**	**8,147,000**
		Estimate for 1861. (*Extracted from "The Republic of Uruguay, Geographical, Social, and Political."*)							Estimates for 1867-8. (*Compiled especially for the Author.*)				
		Cattle.	Sheep.	Swine.	Goats.	Horses.	Mules.	Asses.	Cattle.	Sheep.	Swine.	Goats.	Horses, Mules and Asses.
Republic of Uruguay or Banda Oriental.	Monte Video	4,000	2,000	6,000	500	3,000	1,000	...	14,500	11,000	7,800	950	9,800
	Florida	900,000	1,200,000	15,000	700	130,000	6,000	...	1,470,000	2,780,000	22,000	1,100	215,000
	Canelones	500,000	80,000	16,000	500	10,000	1,800	...	170,000	220,000	15,000	650	20,800
	San José	520,000	330,000	21,000	1,500	50,000	8,400	...	785,000	630,000	40,000	2,700	84,000
	Colonia	410,000	500,000	5,400	2,000	130,000	3,000	...	710,000	880,000	5,000	3,000	148,000
	Maldonado	500,000	50,000	5,000	600	70,000	3,000	...	678,000	270,000	6,800	900	95,000
	Salto	756,000	300,000	12,000	4,000	330,000	14,000	...	1,000,000	415,000	14,000	5,200	390,000
	Tacuarembo	1,500,000	12,000	10,000	600	125,000	58,000	...	2,350,000	42,000	17,000	1,100	274,000
	Soriano	506,000	700,000	13,500	1,800	114,000	6,000	...	497,000	850,000	18,000	3,100	181,000
	Durazno	500,000	70,000	1,300	500	45,000	1,800	...	656,000	114,000	2,700	950	62,000
	Paysandú	750,000	214,000	14,000	2,700	60,000	6,600	...	1,200,000	415,000	18,000	3,100	82,000
	Cerro Largo	1,300,000	120,000	2,000	600	300,000	4,000	...	2,410,000	270,000	4,100	730	486,000
	Minas	400,000	40,000	5,000	2,000	90,000	3,000	...	384,000	83,000	21,000	3,200	151,000
	Various, not before mentioned	...	...	...	...	...	...	...	760,000	1,100,000	20,000	6,000	220,000
	Total Republic of Uruguay	**8,096,000**	**3,618,000**	**126,200**	**18,500**	**1,457,000**	**116,600**	...	**13,084,500**	**8,879,000**	**248,900**	**32,680**	**2,318,600**
Brazil	Empire of Brazil*	...	...	...	...	...	...	...	...	...	...	...	...
Paraguay	Republic of Paraguay†	...	...	...	...	...	...	...	15,800,000	23,000,000	315,000	not received.	not received.

* The Returns and Estimates for Brazil not received in time. † Detailed accounts not yet received.

tries who send us the animals, there appear to be more symptoms of a diminished than of an increased supply for the future. The cattle-plague, and the necessary restrictions its ravages have called forth, have doubtless exercised exceptional influences, which, however, are now passing away, but if Norway, Belgium, and the Netherlands have, in point of fact, a deficiency of meat, rather than a surplus, it is plain that any we may obtain can only be brought here by the superior attraction of British gold, in other words, that it will be difficult to get cheap meat from those countries in quantities sufficient to produce any appreciable difference in the consumption of animal food here. Italy is not likely to be able to help either herself or anyone else for some time to come, but Prussia, Austria, and France may do good service, if on our part we turn our attention to transit and market arrangements both of which require strict supervision. In the first place, if foreign animals are to be imported at all, it is clearly our duty to provide for their health and comfort—on which the nutritive value of the flesh so entirely depends—in the best possible manner, which is certainly not done at present. I could multiply instances of the deaths and diseases among live stock, produced by stormy weather, in combination with arrangements which can only be likened to the "horrors of the middle passage" in the old slave-trade period; but as it is a bad plan to make statements which some people might think exaggerated while there is a chance of shifting the responsibility on to the shoulders of somebody else, I will simply give an extract from the paper of Mr. C. S. Read, M.P., delivered at the Central Farmers' Club not long ago. After speaking of the preliminary sufferings of the bovine race, when packed—almost as closely as if they were already "salted down"—in the hold of the vessel, Mr. Read proceeded:—"Well, gentlemen, I can tell you what cattle suffer in a storm. It so happened, that in the autumn of 1863, while a very stiff gale was blowing off the east coast, though nothing like such a storm as we have had within the last day or two, there came two steamers, laden with cattle and sheep, into the port of Lowestoft. One of these vessels was the *City of Norwich*, the other was the *Tonning*. In the *City of Norwich* there had been 354 oxen, of which 179 were destroyed, and 460 sheep, of which 222 were dead; while out of 350 oxen in the *Tonning* 170 were destroyed. All the remaining animals were more or less injured and bruised. That case does not appear to be a very exceptional one. On taking up a number of the *Daily Telegraph* last October, this statement met my eye. In the *City of Norwich*, the same vessel that I have already mentioned, 7 sheep had just died on the voyage; in the *Troubadour* 24 sheep; in the *Taurus*, 2 oxen; in the *Swan*, from Bremen, 51 oxen and 20 sheep. It is added that one or two animals were constantly found suffocated on arrival or thrown overboard during the voyage. A little variety is given to these details by the fact that in January the *Moselle*, from Antwerp, had 20 calves frozen to death."

This method of procedure in relation to our food supplies can hardly be considered one of the "means proposed for increasing them," looking at the matter from an economic point of view, and leaving out the humane element entirely; and I hope that our discussion to-night will give due prominence to this portion of the subject, and that some valuable suggestions for the construction of cattle ships will be made.

Another drawback upon the importation of animals from abroad, is the danger of importing a host of diseases as well, besides making the cattle plague* chronic in this country. For this the remedies have been already proposed, and may be defined thus:—A thorough system of inspection, a moderate quarantine, and, lastly, the establishment of special "foreign cattle markets" at the chief ports of entry. As the only instance we need consider, to begin with, let us take London. I have been at some pains to ascertain the main features of the existing state of things, and I can hardly conceive that, except where petty interests would endeavour to blindfold common sense, any opposition could be shown to the reforms so greatly needed.

* The last outbreak of which has caused about 140,000,000 lbs. of meat to be lost for use as food.

As regards the position of the proposed market, various suggestions have been made, but although I have carefully and independently considered, upon their own merits, all that have been laid before me, I have no hesitation in giving the preference to the site proposed by Mr. James Odams, who, I hope, will give some detailed information respecting it to-night.

"The site in question consists of fifteen acres, situated on, and with six hundred feet of frontage to, the Thames, and with a like frontage to the Great Eastern Railway. It is within twenty-five minutes of the City, by either the Blackwall or the North Woolwich Railway; within ten minutes of Greenwich; within ten minutes of Woolwich; and within fifteen minutes of the Deptford Victualling Yard."*

Through the kindness of Mr. Odams, I have the pleasure of exhibiting a sketch of the site and its surroundings, which shows at a glance its general situation, and the transit advantages of the proposed plan, far better than I could describe them.

Under the most favourable circumstances, however, I think it must be admitted that the importation of live meat (if I may use the expression) will never increase sufficiently to supply the wants of our population, unless we go further off to obtain it, and this I am decidedly of opinion is simply impracticable. The difficulties, disadvantages, and expenses attending the shipment of animals, from short distances only, form a serious tax upon the result, and any extension of the sea voyage could only increase the catalogue of evils we have previously touched upon.

A foolish question was put to me last month, for it was—"Why cannot some chemist or other discover a means of producing meat, or the nutritious part of it, say from coal-tar or some refuse, and so do away with all killing of poor dumb animals?" A most humane idea, certainly, as well as an absurd one. It is true that essence of pine-apple, as fragrant as that extracted from the yellow fruit of the anana, can be obtained from crude potato-oil and rancid butter—I have a specimen here; that port wine which will deceive an importer can be manufactured in a moment by mixing this fluid with water; and that tartaric acid, quinine, and many other substances can be synthetically built up, but science is powerless to call into existence a single particle of organized matter, unless aided by the wondrous principle of life. As we cannot hope, then, to manufacture meat, where from, and how shall we obtain it? In the upper part of the table (page 259), already referred to, we see evidences of the presence in other lands of vast stores of animal food, a fraction of which, were it only here, would strengthen our people, diminish our poor-rates, and almost make the East of London happy. The entire question now concentrates into one sentence—how is meat, or any similar product, to be prevented from undergoing that curious change we call putrefaction? According to the records of the Patent Office, it would appear that nothing could possibly be easier—in fact, that there are several hundred ways of doing the thing; but, unluckily, in the great majority of instances, patent specifications are of about the same value as their waxen seals, a very moderate percentage of them being of any real utility, while they have not brought us any meat worth speaking of up to the present time.

It would take an entire session of this Society to describe at length the various processes for the preservation of food which have been suggested from time to time, but there are several which are, in my opinion, likely to prove of very great utility, and one which appears to

* From "Why have a Foreign Cattle Market on the Thames?" By Jas. Odams.

possess all the necessary qualifications for increasing our supplies of animal food.

I have for some years past examined pretty narrowly into this branch of the inquiry, and I may venture to state that there are but few preservative processes I have not practically tested.

Thinking that such a concise review might be acceptable at this juncture, I have arranged in a table, at pp. 263 *et seq.*, the more prominent elements of the patent for preserving food that have been taken out in this country, from 1691 to 1855, in a convenient form for inspection and comparison. The principal points in more recent patents I have referred to in the body of the paper.

Before reviewing the various methods which have been brought forward for the preservation of animal food, it may be well to give a passing notice to the putrefactive fermentation itself.

Everbody knows that when a piece of meat (or other animal substance) is exposed to the air for any length of time, certain peculiar changes take place in its structure and appearance, which are familiarly described by the words, "souring off," "tainting," "going bad," and the like, while its nutritive powers become gradually impaired, and it acquires a fœtid odour and a repulsive taste, which at last renders it totally unfit for human food. For a long time nothing more was known respecting the phenomena of putrefaction than that it was in a great measure an oxidizing process, resembling in some degree the behaviour of saccharine solutions under similar circumstances, but the cause of this was hardly hinted at, until the admirable researches of M. Pasteur. This distinguished savant showed that the putrefactive fermentation is induced or set up by the development of certain minute fungi, in the same way that the vinous fermentation is occasioned (or at least stated to be so) by the growth of the yeast-plant.* Then comes the question—Where do these little microscopic plants come from? a question which has caused very considerable discussion between those who believe in their spontaneous generation, and those who do not.

No organic body will undergo decomposition except there be a sufficiency of moisture and oxygen present for the development of these tiny organisms, together with a suitable temperature; take away any one of these three necessaries, and no change will take place, while the presence of all three is incapable of determining putrefaction, unless some of the spores, or little seeds of the fungi we are referring to, are also at hand. These infinitesimal invisible particles are always present—in air and water even—ready to develop themselves at the first moment that the necessary conditions for their growth present themselves. At temperatures below about 34·5° Fahr. their vital germ seems dormant and unable to expand, while it appears to be entirely destroyed if exposed for a short time to an amount of heat represented by 320°. There are, however, some substances which have the property of taking away, or absorbing, these germs; among them are cotton wool and charcoal in various forms. I have in this tube some cotton (previously dried at about 280°) closely packed, and a current of air passed slowly through the tube no longer possesses, so to speak, any putrefying qualities, and with proper precautions some organic bodies can be kept unchanged in an atmosphere so prepared. Charcoal is even more effective, particularly the granular form† I have described elsewhere, and that prepared by the Silicated Carbon Filter Company at Battersea.

In practice it is simply impossible to exclude the minute cells or nuclei of vegetable life in an absolutely perfect manner, so the experiment is useless for commercial purposes.

The products of the decomposition of meat, &c., have not been very attentively studied, except, perhaps, by Dr. Crace Calvert and myself. We have, however, no time for discussing them at present, as the various processes that have been brought out for the preservation of animal substances now claim our special attention. They may be best considered, I think, if we attempt a kind of rough arrangement, and divide them into the following classes:—

1st. The frigorific class, or those which take advantage of the fact that neither organic development nor putrefactive fermentation can really take place while the temperature is below or about the freezing point. To this division belong the methods of keeping meat, &c., in ice or freezing mixtures, the construction of ice-safes, &c. These are all necessarily of very limited application.

Upon some of the American railways currents of refrigerated air are employed for the purpose of keeping meat, &c., during its lengthened transit; but as far as I can learn no very large profits have resulted from this arrangement. Quite recently a plan has been proposed to import fresh meat from Australia into this country by means of iced chambers, so constructed that no portion of the ice shall come in contact with the meat. This scheme has already been noticed in the *Journal*, but I must confess, personally, my belief that it will fail, in the commercial sense, as many similar propositions have failed before. The meat, when it gets here, would, firstly, have cost too much; it would be excessively liable to decomposition on the removal of the cooling atmosphere, in the next place; and, lastly, I cannot help agreeing with Dr. Thomas Cattell, that its wholesomeness as an article of food would be seriously impaired.

If we take a piece of the fibrous portion of flesh, from which all the soluble matter has been removed, and divide it into three pieces, we have the means of observing the action of both heat and cold upon its structure by persistently freezing one portion for some days, boiling the second piece in water for a few hours, and examining the third microscopically, at the expiration of the requisite time. Upon submitting the two other portions of meat-fibre, or syntonine, to a similar magnifying power we shall find that they no longer compare with the original, but, nevertheless, very greatly resemble each other; that which has been boiled presents considerable structural contraction, toughness, and opacity, which the frozen specimen also exhibits, although in a less degree, perhaps, while both are rendered far more insoluble in dilute acids and alkalies. If we determine the nitrogen in each instance, also, we discover that a loss of this element has occurred, both in the boiled and frozen portions. From these facts, and from some others, I believe that frozen animal food cannot be considered nearly so nutritious as that in the ordinary condition, but I have no doubt that Dr. Cattell will give us some information upon this point.

Under the second head we may class the desiccating processes, which include all methods for robbing food products of their natural moisture to such an extent that there is not enough remaining to sustain the vitality of organic germs, or to permit the products of decomposition to remain in solution. To this valuable and important class belong the various modes of drying food products by means of heat, pressure, absorbents or centrifugal force. Many useful and ingenious processes have been founded upon this principle, and it is not too much to say that most people are indebted to it for a portion of their food nearly every day.

Messrs. Chollets' patent compressed vegetables combined with various meats, and an English patent, too, which preserves potatoes and other vegetables by forcing them while moist through small apertures in metallic plates and then drying the long threads thus produced, are good representatives of this class, as is also the so-called "flour of meat." All these have a certain limited sphere of usefulness, but are wanting both in cheapness and in nutritive power.

3rd. The enveloping class must comprise all those inventions which seek to prevent decomposition by placing

* *Mycoderma cervisiæ.*

† British Pharmaceutical Conference, 1867. "On Granular Charcoal," by Wentworth L. Scott.

TABLE

SHEWING THE VARIOUS PATENTS FOR THE PRESERVATION OF FOOD THAT HAVE BEEN TAKEN OUT IN GREAT BRITAIN FROM 1691 TO 1855 INCLUSIVE.

Date.		No.	Name.	Object of Patent.	Method of effecting it.	Observations.
1691	Oct. 7	278	Thomas Porter and John White	Preserving "flesh, fowle, and fish."	No description given.	
1763	July 29	793	Alexander Cockburn	Curing salmon with spices.	Boiling with cloves, mace, pepper, salt and vinegar.	Favourite method of preserving fish at the present day.
1780	Dec. 30	1,275	John Graefer	Drying and preserving vegetables.	Boiling in brine, and then drying by sun, stove, or steam heat.	
1791	Feb. 8	1,791	William Jayne	Preserving eggs.	Submersion in mixture of lime, salt, and cream of tartar in water.	
1793	Feb. 19	1,933	John Donaldson	Preserving animal and vegetable substances.	Additions of farina or mucilage, and drying.	Of little practical value.
1800	Sept. 11	2,441	Benjamin Batley......	Curing and preserving herrings and sprats.	Gutting the fish, and salting with "bay-salt, saltpetre and molasses," afterwards packing in casks with additional "pickle."	The foundation of the present system of salting and curing fish.
1801	Jan. 20	2,465	Do. do.	Curing and preserving other fish.	Do. do. do.	Do. do.
1807	June 13	3,051	Francis Plowden	Preserving meat and other comestibles.	Covering or encrusting with "essence or extract of meat."	
1810	Feb. 26	3,310	Augustus de Heine...	Preservation of food.	Placing in vessels furnished with valve, and exhausting the air.	Vacuum processes exploded, from difficulty of perfectly excluding air.
	Aug. 25	3,372	Peter Durand	Preserving animal and vegetable food.	Putting in closed vessels, and afterwards heating the same.	Does not effect the object proposed.
1812	July 16	3,585	James Walker	Preserving food and other substances.	Making tubes of "tough and flexible metal," for enclosing the substances referred to.	
1817	Aug. 5	4,150	Ludvig Granholm ...	Preserving animal and vegetable products.	Pouring in hot fluid, jelly, and melted fats, to exclude air from containing vessels.	Or coating joints with suet and storing in brine.
1819	Mar. 23	4,350	Æneas Morrison	Do. do.	Cooking the articles in vessels, which are closed air-tight during the operation.	Gave the hint for all the other "provisions in tins" of the present day.
1820	June 20	4,480	John Vallance	Preserving hops.	Packing in metal or wood cases under hydraulic pressure.	Has not been generally adopted.
1825	April 23	5,156	Thos. Alex. Roberts	Preserving potatoes and other vegetables.	Cutting or otherwise destroying the "eyes or germs."	Of no practical utility.
1827	July 12	5,523	Robert Vazie	Preserving preparation of corn.	Various contrivances for protecting wheat and grinding corn.	The "conical" arrangement of flour mills probably founded upon this patent.
1828	Jan. 31	5,614	Donald Currie	Preserving grain and other substances.	Enclosing in air-tight vessels, exhausting and replacing the air with carbonic acid.	Precisely the same as the "new invention" of M. Loüel.
1833	June 1	6,432	Pierre Antoine Angilbert	Preserving meat and vegetables.	Patent relating to methods of rendering vessels air-tight.	
1834	Nov. 13	6,711	Daniell Rutter Long	Preserving carcases.	Injecting "antiputrescent" preparations into the blood-vessels.	The foundation of a series of "injection processes."
1835	Mar. 11	6,787	William Newton	Preserving "animal milk."	Adding sugar, and evaporating to a paste or dry cake.	Useful in a limited way.—product of unpleasant flavour.
1836	Mar. 21	7,036	Louis Elizee Seignette	Preserving meat, fish, &c., for navy use.	Exhausting the air, or extraction of its oxygen, &c.	Not now in use—too complicated.
1839	June 20	8,117	John Wertheimer ..	Preserving animal and vegetable substances.	No specification enrolled.	
1840	Feb. 8	8,378	Do. do. ..	Do. do. do.	Heating in cases with "one or two small holes," a special burner being used for closing the apertures.	The "burner for excluding air" afterwards disclaimed. Founded on an erroneous supposition.
	Aug. 8	8,597	Downes Edwards.....	Improvements in preserving potatoes and other vegetable substances.	Potatoes cooked, peeled, and forced through small holes in a cylinder by means of a piston, and the "threads" so formed dried.	Disclaimed as regards "other vegetable substances."
	Oct. 13	8,658	Charles Payne	Salting animal matters.	Forcing brine to penetrate by means of an air-pump.	Effective, although seldom used now.
	Nov. 25	8,717	Charles Grellet	New modes of treating potatoes.	Cooking potatoes and then reducing to dry meal, cakes, &c.	Not so valuable as No. 8,597.
1841	Jan. 6	8,776	Henry Gunter	Preserving animal and vegetable substances.	Cooking in tin cases with minute aperture, which is ultimately closed by a drop of solder.	Similar in principle to a number of others.
	Mar. 8	8,873	Stephan Goldner.....	Do. do. do.	Both these patents are similar to Nos. 8,378 and 8,776, but claim a "chemical bath" of "nitrate of soda or nitrate of lime" for heating the tins.	
	Mar. 8	8,874	John Wertheimer ...	Do. do. do.		
1842	Jan. 27	9,240	Henry Benjamin, Henry Grafton...	Preserving animal and vegetable matters by freezing.	Use of a mixture of ice and salt, or other freezing mixture.	Specially applicable to the preservation of fish.
	April 6	9,312	John Bevan	Preserving articles of food.	Application of a vacuum chamber in connection with vessels containing the articles to be preserved, concentrated solution of gelatine being then allowed to replace the air.	Effective when perfectly carried out, but too costly for general use.
	Aug. 3	9,435	Samuel Carson.........	Preserving meat or animal substances.	Use of injection, exhaustion, constant or intermittent pressure, or centrifugal force for causing "pickling or preservative liquids to permeate"	Many of the patentee's claims previously patented.
	Oct. 8	9,487	Claude Edward Deutscher	Improvements in materials for cementing, &c.	Gums, resins, &c., dissolved in naptha, oils, alcohol, turpentine, &c., may be used for preserving provisions by coating the containing vessels.	Exhibits no points of novelty except in minor details.

Date.		No.	Name.	Object of Patent.	Method of effecting it.	Observations.
1843	Mar. 24	9,677	Alfred Hooper Nevill	Preparing lentils for food.	Separating husk, making "flour of lentils," with or without addition of curry powder.	A well-known and useful preparation, far preferable to the "Revalenta Arabica."
	Dec. 5	9,970	James Cooper	Improvements in apparatus, &c.	Constructing jars and other vessels for cooking and preserving.	
1844	Mar. 28	10,126	Robert Davidson Wm. Symington	Drying and hardening wood and vegetable substances.	Application of currents of heated air to the desiccation of "sugar, coffee, starch, wheat," and other vegetable products.	Extensively adopted with several modifications.
	Sept. 19	10,332	Michael Fitch	Producing and applying preservative substances.	Conducting the distillate from oak and other woods into solution of salt, sugar, saltpetre, &c.	Acts by virtue of the acetic and tarry products (kreosote, &c.); especially adapted for fish.
1845	Jan. 28	10,496	Wm. Trueman Yule	Drying animal and vegetable substances.	Use of dry air currents, and of fragments of chloride of calcium for keeping same dry.	Has been useful in a limited sense.
	July 21	10,781	John Ling	Constructing ice safes.	Double-casing with non-conducting material prevents the ice from melting too rapidly.	Largely adopted even at the present day.
	Nov. 4	10,922	Samuel Carson	Preserving eggs.	Packing eggs in cases, exhausting the air, and partly cooking.	Will not accomplish the object intended.
1846	Mar. 5	11,120	Robert Warington ...	Preserving various substances.	Coating with condensed meat-gravies, gelatine, fats, or otherwise, or submerging in glycerine, treacle, oils, &c., &c.	Patent claims too comprehensive; the processes are simple and useful.
	June 12	11,240	Robert Rettie	Improvements in manufacturing fuel, and purifying, compressing, and extracting various substances and fluids.	Use of double box, the lower portion connected with exhausting apparatus, the upper with reservoir or liquid; may be employed for salting meat, &c.	Of no particular value as applied to food.
	Sept. 17	11,372	Wm. Edward Newton	Preserving fruit and vegetables.	Arrangement of an ice-house.	On same principle as J. Ling's safe.
	Oct. 15	11,414	William Palmer	Purifying and preserving fats.	Melting, straining, pressing, salting and packing in bladders.	No point of interest presented.
	Oct. 17	11,420	John Ryan	Preserving organic and other substances.	Carbonic acid, and other gases, acetic and pyroligneous acids, kreosote, &c.	Specification contains some curious absurdities.
1847	May 6	11,691	John Horsley	Preservation of meat.	Solution of acetate of ammonia, injection or soaking.	Although volatile, this preparation gives an unpleasant flavour in practice.
	May 14	11,703	Thomas Shipp Grimwade	Preserving milk.	Addition of nitre, evaporation in vacuo, and sealing the solid in air-tight bottles.	Costly, and of an unpleasant taste.
	May 29	11,726	Francis Bernard Bokaert	Do. do.	Addition of carbonate of soda, and heating to 212° in corked bottles	Ineffective except for a few days.
	Oct. 7	11,892	Jules Jean Baptiste Martin de Lignac	Do. do.	Straining, evaporating at 186° F. to one-sixth of its bulk, sealing up product in tin vessels, and exposing to 210° for ten minutes.	A slight step onwards, but the milk is liable to deposit lumps of butter, and to acidity.
	Nov. 6	11,947	Robert Davidson Wm. Symington	Preservation of meat, vegetables, and other edible substances.	Improvement on former patent in certain details, and cutting meat in thin slices and drying until it ceases to lose weight, mixing eggs with flour or farina, and drying.	Undoubtedly useful, but in a limited sense only.
1848	May 26	12,166	Felix Hyacinthe Folliet Louis	Preserving milk.	Addition of sugar and evaporating to dryness.	Improved and worked for some years at Misson.
	Aug. 21	12,250	John Bethell	Preserving meat, corn, beer, wines, milk, &c.	Grain of all kinds is dried by superheated steam, meat is treated with brine, mixed with wood naptha or pyroligneous acid, and then either dried at 170° F., or packed in casks with compressed carbonic gas, the liquids are secured in strong vessels and charged with "compressed carbonic acid."	Patent could not hold valid on all points, but possesses some interesting and useful details.
	Dec. 21	12,381	John Trowis...... John M'Simes ...	Packing lard, &c.	Packing in muslin or calico, coating with gelatine or starch paste, and lastly dipping into alum and salt.	Possesses several advantages over the usual bladder, which, however, it has not superseded.
1849	Mar. 28	12,548	John Britten...........	Various, including preservation of corn, &c.	Constructing apartments with perforations for forcing hot air through.	Similar to many other patents.
	Nov. 17	12,850	William Brindley ..	Various, including preservation of vegetable substances.	Placing between oiled papers, and stoving at 250° to 300°.	Simply impracticable as regards food.
1850	Nov. 12	13,338	Etienne Masson	Preserving vegetable substances.	Drying and compressing vegetables, &c., and sometimes grinding them to powder, peas and beans scalded and then dried.	Valuable, but superseded by more recent methods.
1851	Jan. 30	13,447	James Murdoch	Preserving animal and vegetable substances, &c.	Drying by hot air, and injecting with solution of nitre and the chlorides of sodium and aluminium.	Has proved no better than other injection patents.
	July 3	13,680	Charles Payne	Drying animal and vegetable substances, &c.	No special description given.	
	Aug. 21	13,723	James Roberton	Improvements in preparing printing dyes and albuminous extracts, &c.	Extracting meats by pressure, &c., evaporating extracts to dryness; may be mixed with farinas as for food.	An attempt at the *Extractum Carnis* of our own day.
	Sept. 4	13,732	Baron Chas. Wetterstedt	Preserving animal and vegetable substances.	Mixing with flour, and drying and enclosing in air-tight vessels.	This and the succeeding process somewhat resemble that of Dr. Hassall and others.
	Sept. 5	13,741	Gail Borden, jun. ..	Preserving flesh, &c.	Meat is macerated (with steam) strained, mixed with flour, &c., and baked in form of biscuits.	Useful for home or expeditionary purposes.
	Dec. 3	13,845	Richard Archibald Brooman	Improvements in applying electro-chemical action for manufacturing purposes.	Forming an antiseptic compound in the meat itself; for oils and syrups acetate of magnesia is used.	Description thoroughly absurd and process ineffective.

Date.		No.	Name.	Object of Patent.	Method of effecting it.	Observations.
1852	Oct. 12	351	Louis Constant Alexandre Vittraut	Preserving grain, seeds, &c.	Use of double chambers, warm air, and carbonic acid.	Useless and absurd.
	Oct. 22	486	Julien Boilesve	Preserving vegetable substances, &c.	Revolving sieves, in air-tight chamber and condensing chlorine gas.	Practical as regards the destruction of insects only.
1853	Jan. 15	106	Chas. Hippolyte Vion	Various, including production of ice.	Production of food by saline freezing mixture.	
	Jan. 31	246	Chas. Cowper (a com.)	Preservation of butter, meat, fish, &c.	Use of carbonic acid gas evolved in any manner.	Has been patented over and over again.
	Feb. 25	477	William Symington	Preservation of milk, &c.	Putting up in air-tight vessels and exhausting the air.	Same principle as many others.
	Mar. 2	520	Alexis Soyer	Preparing and preserving soups.	Storing various meats, and sealing the concentrated gravy, &c., in bottles.	This is the celebrated "Osmazone Food."
	April 29	1,041	Thomas Collins Bousfield	Cutting and chopping vegetable substances.	Use of revolving blades for cutting and preserving roots, &c.	No point of novelty or interest.
	April 29	1,042	Do. do.	Drying and preserving vegetables and plants.	Exposing in chambers heated by grates and flues.	
	June 10	1,418	Henry Ed. Symons...	Improvements in preserving meat.	Forcing refrigerated air-currents over meat by fans, &c.	This invention, now public property, is on the same principle as that recently proposed by Mr. Mott for importing meat from Australia.
	June 13	1,448	Alexander Robertson	Improvements in vessels for storing edibles.	Chambers with air-tight doors or valves, and exhaustion.	
	June 16	1,467	Peter Armand de Fontaine Moreau	Preserved milk and other substances.	Forming a vacuum in containing vessels by usual means.	Covered by previous patents.
	Sept. 24	2,205	William Farmer	Preserving provisions.	Use of double vessels, outer one to contain water.	Both useless and absurd.
	Oct. 5	2,278	Henry Stevens	Preparing and preserving vegetable substances.	Steaming, mashing, and drying in warm air.	Covered by previous patents, *e.g.*, 8,697, Aug. 8, A.D. 1840.
	Oct. 12	2,348	Charles Scott Jackson	Preserving seeds, roots, &c., from mildew, &c.	Use of soluble zinc-salts, principly the sulphate.	Useful in preparing potatoes for seed.
1854	Jan. 31	231	Arnold Morel Fatio .... Francois Verdeil	Preserving animal and vegetable substances.	Cooking by steam, and afterwards drying in stoves or in "a vacuum apparatus."	General want of novelty.
	Mar. 9	570	Hippolyte Launy ...	Do. do. do.	Introduction of sulphurous acid gas into containing vessel.	This and succeeding one make "sulphurous acid gas" public property.
	July 12	1,534	Auguste Edouard Goradoux Bellford	Improvements in preserving animal substances.	Solution of sulphurous acid of gas with $\frac{1}{100}$ of hydrochloride acid; sealed corks.	
	July 21	1,600	Toussant Delaboure .... Leon Bonnet ...	Preservation of meat in natural state.	Drying by machine similar to the "linen-drying machine," coating with concentrated gelatine and drying.	
	Aug. 5	1,719	Charles Frederick Stansbury (a com.)	Improvements in air-tight vessels.	Forming annular groove near top, and excluding air.	Superseded by the caoutchouc ring.
	Aug. 26	1,874	Correntin Marie Perronde Kerwood	Preserving meat, &c.	Partly cooking, soaking in vinegar and salt, and sealing in tins.	No point of novelty.
	Oct. 20	2,242	Louis Auguste Chem ... . Francois Fredk. Pillias..	Do. do. do.	Scalding, dipping in solution of sal-ammoniac, and drying in stove at 138° F.	Of no practical utility.
	Dec. 7	2,572	Ferdinand Cellier Blumenthal ... Maximilian Louis Joseph Chollet	Do. do. do.	Various claims, including drying by hot air or vacuum, powdering, and redrying; also forming "meat tablets," or by pressure, and afterwards cutting them.	Carried on on large scale—very valuable for army, navy, and expeditionary purposes.
1855	Jan. 6	36	Toussant Delaboure .... Angeline Bonnet	Preserving meat, poultry, bread, eggs, vegetables, and pastry.	Coating with a "preserving varnish," obtained by boiling them (gelatine) and exposing to a dry current of air.	Trenches upon the ground occupied by preceding, which is better.
	Jan. 11	70	Louis Jacques Hevé	Preserving meat and fish.	Cutting in strips, and drying, first in stove then over oil of vitriol.	
	Jan. 13	95	Gustav Warnecke ..	Preserving fruit and vegetables.	Use of a "saline vapour bath" (!) washing, drying, and pressing.	A patent absurdity.
	Jan. 19	153	Matthew Boulton Rennie	Preserving animal and vegetable substances.	Coating with "gelatine and jelly, mixed with albumen and alcohol."	Similar to many former processes.
	Feb. 5	269	Ebenezer Hartnall ...	Do. do. do.	Coating, first with gelatine and treacle, then with same and charcoal powder	The double coating and use of charcoal powder a slight improvement.
	Feb. 20	375	Jean Wothley	Preserving meat.	"Dusting" with sugar and salt, pressing out juices, and packing in double casks, with melted fat in all interstices.	A costly, complex, and wasteful process.
	Feb. 21	381	George Nasmyth......	Preserving animal and vegetable matters.	Use of volatile fluids* to expel air from recesses, which are afterwards sealed.	*Such as alcohol, ether, &c.
	Mar. 8	519	John Taylor	Preserving eggs, &c.	Placing in moulds or shapes, and filling with plaster of Paris.	Will not answer.
	Mar. 29	695	Francois Joseph Auger	Preserving vegetable substances.	By means of "diastase," dipping in decoction of malt, and drying.	Ineffective.
	April 30	965	Edward Acres	Desiccating and cooling air, &c.	Passing hot air over cold surfaces, to deposit its moisture thereon, and applying same to drying and preserving farina.	Object better accomplished by other means.
	May 1	971	James Torbitt	Preservation of a constituent of the potato.	Utilisation of the "fibrine" after extraction of starch.	The cellulose (not "fibrine") is useless for breadmaking as proposed.
	June 9	1,320	Masta Joscelin Cooke	Preserving meat, milk, vegetables, &c.	Boiling under pressure, pulping, thickening, and pressing into cakes, &c.	Inferior to Chollett's process.
	July 12	1,559	John Bethell	Preserving meat, fish, fruits, &c.	Drying at from 90° to 100° F.	No point of novelty.
	July 16	1,590	Wm. Henry Tayler..	Improvements in sealing preserve canisters.	Screw-cap lid, with caoutchouc ring, and fusible cement.	
	July 18	1,608	Walter Christopher Thurga	Preserving the fluid part of eggs.	Beating up, spreading on trays, and drying at low temperature.	Useful; similar to Mr. C. Lamont's recent process.
	July 21	1,650	Alfred Tooth	Preserving and curing entire animals.	Injecting solution of saline substances.	The "Morgan" process is identical with this.
	July 21	1,651	George Henry Perry	Improvements in vessels or cases.	Screw-cap cover.	Very like Tayler's (see *ante*).

Date.	No.	Name.	Object of Patent.	Method of effecting them.	Observations.
1855 Aug. 7	1,788	George Nasmyth	Preservation of food.	Use of carbonic acid gas, alone or with alcohol vapours.	
Aug. 25	1,923	John Avery	Improvements in exhausting and closing vessels.	Certain valve arrangements and exhausting pump.	
Sept. 19	2,116	Richard Archibald Brooman	Preserving animal and vegetable substances.	Drying, exposing to sulphurous acid gas, and coating with albumen, with molasses, and decoction of molasses.	No novelty in any point except the mallow root, which is useless.
Oct. 4	2,223	Francois Modeste Demait	Do. do. do.	Hanging in chamber with fire on which sulphur, chloride of lime, and "flowers or roots" is thrown.	Absurd, ineffective, and injurious.
Oct. 9	2,258	Stephen Goldner	Improvements in apparatus for cooking and preserving.	Relating chiefly to arrangements for heating the metal cases, in trays, &c.	
Oct. 27	2,404	Joseph Hands	Preserving animal and vegetable substances.	Nitrous and sulphurous acid gases, binoxide of nitrogen, separate or mixed.	Of no value whatever.
Oct. 30	2,422	Jules Jean Baptiste Sylvain... Martin de Lignac	Preserving animal substances.	Drying in hot air, compressing into boxes, filling interstices, soldering on lid, and heating.	Applicable chiefly to sardines, &c.
Oct. 31	2,430	Thomas Shipp Grimwade	Preserving milk.	Adding alkali and sugar, evaporating at 160° pressing and powdering.	In extensive use for many years, although covered by Louis's previous patent.
Dec. 11	2,800	René Simon Bouettt .... Henri Emile Isidore Donein ...	Preserving meat, &c.	Coating with collodion.	Costly, and effective for a short time only.

as it were a protecting shield or bulwark between the organic substance—such as meat—and the oxidizing influences of the atmosphere, and may be subdivided into "hermetically sealed provisions" in tins, canisters, bottles, or jars, and "encrusted" or covered-up articles. The former division has long, and, to a certain extent, favourably been known. It has answered specific purposes for military, naval, and exploring expeditions, but the objections to it are, that (in tin cases) it frequently imparts metallic flavour to the food, which it overheats, to the detriment of its nutritive power, and again it is too costly. In the second division will be found meats &c. preserved by being coated with a film of wax, paraffin, stearine, gelatine, gutta-percha, caoutchouc, xyloidine (collodion), &c., or kept covered with syrup, glycerine, oils, spirit, &c. The same objections, modified according to circumstances, likewise apply here, with the addition of others; the preservative coating, if broken at any point, however small, loses at once its protective powers. In illustration of this, I may mention that I made the experiment of inserting a small tube of platinum into a piece of lean beef, and immersed the latter in melted paraffin at 240° F.; upon taking out the meat, it was of course perfectly coated, and had no access to the air except through the narrow tube ($\frac{1}{20}$ in. diameter). In the course of a few days, however, decomposition set in from the point of insertion of the tube, and gradually extended; oxidation once set in at that point, it rapidly assumes the mastery over the whole. Many of these films, too, are, to a certain extent, permeable by, or porous to, gases, and are, therefore, not to be depended upon.

Of this class, I may point to the Redwood patent process as a representative of one division, and to the Australian "beef without bone," in tins, specimens of which are before you, as belonging to the other. In the list of patents (see Table, pp. 263, &c.), appended herewith, you will observe a great many which make tins, jars, or other vessels, which are sealed after expulsion of the air, their speciality, and that of Æneas Morrison (March 23, 1819) was probably the first patented process of this kind. The general method of procedure is now to place the meats, cut into small pieces, in tin canisters with a little water, the top plate or lid of the canisters being next soldered on, airtight, with the exception of a small aperture at the top. The tins of meat are then removed to a water bath—that is, are plunged, to about three-quarters of their height, into a solution of chloride of calcium, of such strength that the boiling point is about 280° Fah. The water in the tins of course boils at its usual temperature, 212°, and the steam thus generated rushes violently out through the little hole before mentioned, of course completely expelling the air. At the expiration of from 20 to 30 minutes a workman approaches the rows of canisters, with a ladleful of melted solder in one hand and a large sponge full of cold water in the other. He applies the latter to the small orifice, through which the steam is escaping, in such a manner that a slight condensation takes place, and then removing the sponge, allows a drop of solder to fall exactly upon, and completely close the aperture of the tins, which are instantly removed from the bath. Of the result of these operations there are several specimens before you.

The Redwood process consists in completely immersing the meat to be preserved in fluid paraffin, and allowing the same to remain for some time at a temperature of about 240°, 28 degrees above the boiling point of water; they are then removed, and on cooling are found to be coated all over with paraffin, and although the meat is, in my opinion, spoilt by the overcooking it receives, it will keep sweet for some little time while the waxy film remains intact. The process is, as may be seen readily, too troublesome and expensive for extensive use, while a slight abrasion of the surface, or even pin-prick, will suffice to lay bare a surface to the air, from which decomposition may set in very speedily. Quite recently the protective coating has been rendered somewhat more effective by the superposition of a layer of glycerine and gelatine.

4th. We may call this the deoxidating class, which necessitates the addition of some chemical substance, solid, liquid, or gaseous, which having in itself a very great affinity for oxygen will rapidly absorb it, and thus prevent the meat or other substance from becoming oxydised. Various chemical compounds have been employed for this purpose, but their use is attended with danger of flavouring the food and of altering its chemical characters.

The fifth, or antiseptic class, includes those methods of food-preservation which depend upon the addition of some substance which, by a simple property known as catalysis, prevents or arrests oxidation or putrefaction by its mere presence, undergoing no change in itself, or but very little. To a greater or less extent salt, sugar, creosote, carbolic acid, ether, chloroform, essential oils, and various salts and gases, possess this property, and are constantly employed for the purpose, either separately or as mixtures. The numerous applications of "cured" or "salted" meats are well-known and appreciated, as the several forms of salt beef, salt pork, bacon, ham, tongues, bath chaps, salt fish, &c., abundantly testify. In the case of ham, bacon, tongues, &c., they are greatly improved if, after salting, they are submitted to the

influence of wood or peat smoke, during which process a minute quantity of acetic acid and creosote is absorbed, which imparts a peculiar but agreeable flavour, while it acts as a most powerful preservative. The presence of even a very small amount of creosote will entirely prevent putrefaction, while it has no great action beyond that of an astringent when taken internally.

In the long run, however, no one could live healthily on creosoted food, while the ordinary salting process robs meat of a too large proportion of its organic and mineral constituents, and renders the flesh itself hard and indigestible. Numerous modifications of the curing processes have been suggested, and one which has been patented several times over offers some advantages; it consists mainly in injecting brine into the veins and arteries of animals immediately after slaughtering them, the entire capillary system being thus quickly and effectively permeated with salt, thus avoiding the waste of the brine-tub process, which Dr. Marcet was at such pains to utilize. He found that a very large quantity of albumen, an important substance called kreatine, and other soluble principles, were always left behind in the liquor when meat was salted, and he endeavoured to recover them by a process called dialysis. The attempt was only partially successful, but it led to a valuable suggestion, viz., that meat, previous to salting, should be enclosed in a membrane of some kind, such as bladder or parchment-paper. By this simple plan much nutritive matter can be retained in the meat, which is cured quite as effectually.

In drysalting, various herbs, spices, &c., are often rubbed in with the powdered salt, as a means of varying the flavour. Tropical climates, however, test the powers of any preserving process, and accordingly we find that salting affords but little protection against the oxidising and fermentive powers of an Indian sun. In many parts of India and in some of the southern states of America, it is found necessary to modify the ordinary salting process, which is there conducted in this wise:—A hole is dug in the ground about five or six feet deep, and carefully lined with boards; in this the meat and salt are closely packed, and over all a layer of boards is placed afterwards, covered with earth or mud: this is the favourite system in South Carolina, where, according to Mr. H. Clark, meat is often kept thus for many weeks. An Italian process has been brought before the French Academy lately, in which the preservative composition is a mixture of alum and gum-benzoin, both powdered, in which the meat is laid. In the case of beef it was reported to answer, but the mutton was but imperfectly preserved.

Of the chemical antiseptics, there is at the present time but one which appears to possess the necessary qualifications for preserving meat cheaply, easily, effectively, and without either injuring the nutritive qualities or imparting an unpleasant flavour; I allude to that patent on which the process of Messrs. Medlock and Bailey (of which numerous illustrations are now before you) is founded—the bisulphite of calcium, or, as it is commonly rendered, the bisulphite of lime.

It is remarkable that sulphurous acid has frequently been employed alone for the preservation of meat, but has failed in all instances from its volatile nature, causing it to be dissipated too soon to be any real protection. The sulphites of sodium and potassium, in solution, have likewise been patented for the like purpose, bat their unpleasant flavour, their action upon the meat itself, and the injurious nature of the purgative sulphates formed by their oxidation, have precluded their use in quantities calculated to influence the "food of the people" in any great degree; moreover, their antiseptic action is not so certain as that of the preparation I would specially introduce to your notice.

The neutral sulphite of lime is only slightly soluble in water, and its antiseptic properties are by no means so marked as those of the bisulphite, which contains double the amount of sulphurous acid, is perfectly soluble, and, when oxydised, is merely converted into sulphate of lime—a substance perfectly harmless and inert.

In this preparation, I believe we have a means of converting to our use the enormous meat stores of Australia and South America, and I look forward with confidence to seeing beef and mutton imported for sale at 2½d. to 3d. per pound, of a quality equal to any we can now procure.

At page 260 is a Table, showing the number of animals in the various provinces of the Argentine Confederation and of Uruguay. The first supplies of meat from these countries we shall probably receive from the estancia, Nueva Allemagna, of Messrs. Prange, a plan of which, showing its convenient situation, and the fine irrigating land for breeding purposes, accompanies this paper.

I have prepared a number of specimens (now before you) with this solution; they have been preserved for periods varying from six weeks to as many months; and among them you will find some mutton treated under the immediate superintendence of the Food Committee of this Society in November last—some canvas-backed ducks, prairie-hens, clams, oysters, &c. (prepared by D. D. Williamson, Esq., at New York, about the middle of January), "lamb's sweetbread," treated with bisulphite on the 31st August last, which I exhibited at Dundee in September, 1867, and various other eatables.

I would also beg to draw your attention particularly to these samples of fish, contributed by Mr. Edward Acres, of Youghal, near Cork, as sufficiently demonstrating what could be done in this department. Mr. Acres, to whom I am indebted for a large amount of most important information, tells me that immense quantities of fish are frequently captured in the Bay of Youghal, but that, there being no adequate demand at the moment, the large surplus of the same—from 50 to 100 tons sometimes—has to be quickly destroyed, as is often the case elsewhere.

I sincerely hope that the bisulphite of lime may prevent such wholesale destruction of nutritive animal food, which, to my thinking, seems a reproach to our civilization, a satire upon our science, when we know that so many will spend hours in turning over dust-heaps—I have seen the poor wretches at their melancholy task—for the purpose of extracting any tails or bones of fish to which some fleshy portions might adhere. These, an old woman in Whitechapel told me some years ago, "makes an old crust more filling," and her scanty meal certainly must have had a flavour about it!

I append some analyses of meat, both in the fresh condition and after it had been preserved by the process to which I am referring—they may serve to show that no diminution of nutritive value is occasioned by the use of the bisulphite.

The Natural Condition.

Description of Meat.	Water.	Total dry matter.	Nitrogenous matter.	Carbonous matter (fat).	Mineral matter (ash)
	per cent.	per cent.	per cent.	per cent.	per cent.
Beef	57·4	42·6	14·6	23·3	4·7
Mutton	48·5	51·5	13·7	34·6	3·2
Veal	63·2	36·8	17·1	14·9	4·8
Pork	44·7	55·3	9 3	44·2	1·8

Preserved with Bisulphite of Lime.

	per cent.	per cent.	per cent. †	per cent. †	per cent. †
Beef	49·2	50·8	14·1	23·5	4·9
Mutton	46·7	53·3	13·6	34·5	3·4
Veal	56·4	43·6	16·6	15·3	4·9
Pork	43·1	56·9	9·3	44·1	2·0

In the columns marked thus † the results are calculated as if the preserved meat contained the same proportion of water and dry matter as the fresh.

Mr. Ede, of Her Majesty's Victualling-yard, Deptford, has most courteously forwarded a specimen of bisulphitized beef for your inspection, and I dare say will afford us some information respecting it, and also the ordinary methods of preparing meat for the use of the navy, and the importance of securing a plan which will enable us to treat meat without employing a large excess of salt as at present. As regards the details of the process itself, I am sure there are many persons in the room—practical authorities—who can speak of its use in their establishments, and far more to the purpose than I can, although I shall be happy to reply to any questions in relation to this or other processes. I cannot conceive that anything more simple could be devised, as regards the application of the bisulphite, as no tins or other vessels are required for its use, and thus no metallic flavour can be imparted to the meat.

As a recent source of animal food, the extract of meat asks for a little attention at our hands, but I will not detain you long to-night on account of it, as I have arranged to prepare a special paper upon this subject during the present year. A few observations and results, however, will appear in the *Journal*, as I have adopted a mode of comparing the *extractum carnis* of different makers, based upon the proportions, however, of an important meat-principle called kreatin, and specimens of the chief varieties of the extract are before you. As long as we look upon the preparation not as a staple food, but as a most valuable and convenient auxiliary, we cannot go far wrong, but I regret to say that various statements have been made to the effect that the nutritive portions of an entire bullock can be put into the very portable form of a small jar or canister—a proposition of self-evident absurdity.

Having been requested to mention a rough-and-ready method of testing the *extractum carnis*, I may observe that when a little of the preparation is mixed with a small quantity of sulphuric acid (previously diluted with twice its weight of water), and gently heated, there is evolved a peculiar odour, which at once enables an idea to be formed of the kind of meat which has been used in preparing it. The extract is now manufactured in very large quantities in South America, Australia, and in this country. Specimens of all these varieties are before you.

I have not referred to charqui, as that subject has already received much consideration at the hands of this Society, but will simply point to the "Oliden" dried beef on the table, as being the best form of this class of preparations with which I am acquainted.

In concluding this very imperfect notice of our supplies of animal food, I am fully conscious of my utter incapability of doing justice to the subject, especially in the brief space of time allotted on these occasions. I have, however, the consolation of knowing that the several points I have endeavoured to lay before you in my brief crude manner will be enlarged upon, and acquire an interest not their own, from the valuable observations of those whose special experiences will enable them to speak with authority upon the subjects included in the title of this paper.

I should like, however, to ascertain the opinions of this Society, particularly upon the following points:—

1. Whether it would be advisable to take steps for the establishment of a ministerial department for the cognisance of food and agriculture, similar to that existing in the United States.

2. What arrangements for the separation of foreign cattle and other animals would be the most convenient one, and

3. What experiments, upon a practical scale, should be instituted, in order to determine the best method of applying the bisulphite of calcium process, or any other, to the importation of meat from Australia, South America, and elsewhere, in a sound and wholesome condition.

I have to express my best thanks to a number of gentlemen who have liberally supplied me with information, suggestions, and specimens, both numerous and valuable; and I desire specially to express my obligations to Charles Adams, Esq., the honoured representative of the United States, and to several other distinguished members of the diplomatic corps; also to Mr. John Graham, of Notting-hill, and to the various inventors, patentees, and merchants, who have enabled me to illustrate these observations with the specimens before you.

DISCUSSION.

Mr. Rudkin said he had been for many years engaged in catering for the public, and in so doing had been impressed with the conviction of the importance of the question now under consideration. The economy in food was also a point of great importance. He estimated that the waste which occurred in establishments where ten persons were provided for was sufficient for the support of at least four additional people; and in the private establishments of merchants engaged in business in London two or three dogs were often kept on the bones and remains of meat sent from the table, which would furnish nutritive soup for a great number of people. The true secret of economy in this respect was the "stock pot," which was to be found in every French house, although it was a very difficult matter to introduce it into this country. Passing to the subject more immediately before them, the author of the paper had touched upon a question on which he (Mr. Rudkin) had personally had some experience—that was the supply of foreign meat to be consumed in London. He was connected with the Corporation of London, and had had under his charge, with others, the regulations affecting the supply of foreign cattle for the metropolitan market. His own opinion was, that any attempt to place restrictions on the importation of foreign cattle into this country would have the effect of increasing the price of meat, and the attempts now being made to establish a foreign cattle market separate from the English market were, in his judgment, most unwise; nothing could bring cheap meat but free and open competition. If they had foreign cattle in one market and English cattle in another, they would cease to have that open competition which existed at the present time. If they looked at the statistical returns, they found that during a certain portion of the year there was a large supply of cattle from abroad; and during another portion we received comparatively few. The result was, that at the Copenhagen Cattle-market the English animals had, practically, the monopoly of the supply during a part of the year; and at this season the price of meat was invariably high. During the autumn, from Midsummer-day to the middle of November, there was an immense influx of foreign cattle, which had a great effect in reducing the price of meat. The statistical returns for the last twenty-five years showed that this was so. The consequence of the regulations imposed by the Orders in Council in respect of the late cattle plague was to cause a large number of animals to be slaughtered in Germany and other places on the Continent, and the effect of that on the market here was that for three or four days in a week there was an immense influx of this poor quality of beef and mutton, a large quantity of which arrived in bad condition, and had to be destroyed. His own opinion was that under the system of unrestricted competition the English producer would get a better average price for his meat than he did under existing circumstances. It would be better, also, for the foreign producer, because it opened to him a certain market for his produce. The meat would not be destroyed by the action of the weather, and the result would be a more constant and better supply for the consumer.

Mr. B. Venables hoped this subject would be dealt with by the Government in such a way that the people of this country would see that they were being treated in the fairest manner on the important question of increasing

the supply of foreign cattle brought to this country. One point was of especial importance, viz., the mode of transport of cattle from abroad to this country. He thought the Government should interfere to have vessels so constructed as to mitigate to the fullest possible extent the great loss of animals which frequently occurred on the passage; such a saving of the lives of the cattle would be a great public benefit. He trusted we should never return again to the days of protection. If we had had protection during the last twelve months, he was convinced the price of meat would have been tenpence or a shilling per lb. The immense importation of foreign cattle had alone tended to keep down the price, and if we attempted to put restrictions of any kind upon the foreign producer he would send his cattle to those countries where there was a free and open market for them. He was certain it would be prejudicial to the community if a separate market for foreign cattle was established in another district of London, because the animals would be sent there for the purpose of being slaughtered, and the consequence would be to throw the trade into a few hands, and competition would be destroyed, while the live market would be practically monopolised by the English producer. We were only now recovering from the effects of a serious disaster amongst the cattle of this country, and though there was no doubt the disease was brought from abroad, yet they found it prevailed in parts of the country where no foreign cattle ever approached, and that remark especially applied to the establishment of Miss Coutts, where they might suppose every possible precaution against infection was taken, yet the disease found its way there. That visitation he trusted had now ceased in the country, but he ventured to express a hope that a greater mischief would not be introduced by placing restrictions upon the foreign cattle trade.

Mr. Payne agreed with those who had preceded him as to the vast importance of the subject before them. There was at the present time on foot what he considered a dangerous movement for a new and separate market for foreign cattle. He felt persuaded if that were carried out the effect of it would be to make meat dearer. The question was, would there be, in the proposed new market, any live market at all; would it not be converted into a large abattoir? Only a few large dealers would then buy the meat, and it would not meet the wants of the butchers who only killed their three or four bullocks per week, because all the animals must be slaughtered on the spot. The result would be that a few of the large carcase dealers would purchase at their own price and prevent competition. That was giving an advantage to the English producers, which they ought not to have in the interests of the general community. The necessity of providing markets for the people was another question, which required a good deal of consideration. He believed they could not do better for the masses of the people than to give them the fullest advantage of the costermonger system. Let the costermonger have free scope, and he would serve the people at the lowest possible prices; but if they placed difficulties and restrictions in his way his prices must be raised. He believed if new markets were formed they would be failures.

Mr. Dixon remarked that so much had been said with regard to the unrestricted admission of foreign cattle, that he thought the question as to how the home supply was to be protected from disease should not be lost sight of. It was generally admitted that the rinderpest came from foreign countries, and it was known to have existed in Hungary and Russia from time immemorial. We wanted every head of cattle that could be brought from abroad; but care must be taken to have them in a state so as not to bring disease among our own home stock. On the subject of the importation of dead meat from abroad, he submitted that thousands of carcases were sent from Aberdeen to London, where they arrived in good condition for the market; there were equal facilities for bringing dead meat from the continental sources of supply, and he believed it was a matter of indifference to the foreign producers whether they sent the live animals or the carcases to this country, so long as they obtained fair prices for their produce. The great question was to increase the supply of meat, both home and foreign. If the proposed plan of slaughtering foreign cattle at the spot where they were disembarked would prevent the risk of another visitation of disease, it was the duty of every Englishman to hold up his hand for it. He did not agree with Mr. Rudkin that the price of meat was lower during the season of the largest importations of foreign cattle into London. Butchers would tell them that the cheapest time for meat was in the spring of the year, when foreign meat did not come in, because they then got a larger number of English animals, who carried a greater weight of flesh. He submitted it was their duty to do all they could to prevent the introduction of disease among our home stock, and at the same time to encourage as much as possible the importation of foreign supplies. The foot and mouth disease of cattle, as well as pleuro-pneumonia, had almost disappeared in this country, and he had no doubt the restrictions placed upon foreign cattle had greatly tended to that result, and it was to be remarked that the price of meat had gone down since those restrictions had been imposed. This was a question which ought to come before Government, and he hoped it would be fairly argued and dealt with in a practical manner for the benefit of the community at large.

Mr. Morris said, being connected with Australia, a part of the world where they had a surplus of cattle, he had been much interested in the subject brought before them this evening, but he must say he hardly thought the author of the paper had solved the question of how they could successfully bring dead meat to this country from such distances as Australia and the River Plate. The importance of the figures laid before them could not be over-rated, for if the average consumption of meat in this country was only $3\frac{1}{2}$ lbs. per head per week, while in Australia it was 10 lbs.—(the rations served to the labouring men were 15 lbs. per head)—to feed the people of this country at that rate would consume the whole stock of Great Britain in one year. That fact alone showed that the people here were not sufficiently fed, and he might say he had been much disappointed with the physical appearance of the labouring population here. Contrasted with the same class in Australia, they were pigmies, even in comparison with those who had been only a few years in that country. These facts showed the necessity for introducing into this country large supplies of food. He begged to inquire, with reference to the specimens of meat preserved by the bisulphite process, whether the experiment had been carried out on a sufficiently large scale to warrant the application of it to meat sent from Australia to this country, and he ventured to submit that if preserved in liquid, whatever the process might be, the meat would lose its flavour. Anyone tasting the meat on the table would find it was without flavour, which he thought arose from its being preserved in some fluid. The great point was to know whether the process had been merely applied to single joints, or whether it was one which could be employed for a large bulk of meat packed closely, so as to admit of its being carried out on a scale that would make it commercially remunerative. He did not agree with the author, that meat from the Plate or Australia could be sold in this country at $2\frac{1}{2}$d. per lb.; he thought the price was likely to be nearer 4d. per lb. He would be glad to hear the grounds on which the author of the paper had arrived at the conclusion that meat frozen lost its flavour, and was liable to rapid decomposition when thawed. If the temperature was lowered below 32° the movement of the particles was arrested, no fermentation could go on, and the meat remained in exactly the same condition as when it was first frozen. This was shown in the remains of animals discovered in Siberia. It appeared that no one had thought of enclosing the meat in vessels, and then

submitting it to the action of cold. If that were done, he would guarantee that the meat would remain in the same condition and retain its flavour. He had himself tasted meat which had been for twelve months without being in contact with ice, and it was the same as if it had been fresh cut by a butcher. He would also be glad to hear Mr. Scott's grounds for the conclusion that frozen meat deteriorated more quickly on being thawed than meat which had not been frozen. If the meat had been allowed to remain in contact with moisture while being frozen, this might occur. It was a subject of the greatest importance that some means should be devised of sending meat from Australia in good condition to this country. It was of better quality than most English meat, for the Australian beef and mutton were of richer flavour than those of this country, so much so, that since he had been here he had been struck with the insipid character of the meat, as compared with that of Australia. Meat intended for exportation should not be over-driven just before being slaughtered. The animals taken to Sydney had to be driven 130 miles almost without food, and that tended to set up a feverish condition, so that that meat would not be proper for exportation; but in the districts of Queensland, Victoria, and New Zealand, there were exhaustless supplies of good meat, if only they could discover a means by which it could be brought into the markets here.

Mr. Graham, in reply to the inquiries of Mr. Morris, with regard to the bisulphite of lime process, said the joint of meat alluded to had not been prepared for shipping purposes, but was merely produced to show what was the effect of dipping the meat into the liquid for only a short time. In the importation of meat from Australia and other distant countries, the patentees had not as yet had much experience, but they hoped to find out the least amount of treatment which would effect the object they had in view. The Food Committee of the Society of Arts had had before them that day a joint of meat which three months ago was steeped for only 2½ minutes in concentrated bisulphite, and then put into a cask and headed up, with a small portion of the liquid at the bottom. The joint had kept perfectly sweet for three months, and he believed it would have remained so as long as the cask was unopened. The Committee were about to send two or three casks of meat, prepared in the same manner, to the Conservatory at Kew Gardens, as a further test of the process in a high temperature. He wished to state that the butchers of London had materially aided in the development of the practical results which had been obtained from this process. Experience had shown that better results were produced by steeping the meat in the pure bisulphite for a very short time than for a longer time in a diluted solution. Some casks of meat prepared in London had been sent out to Australia, and had no doubt arrived there by this time. If the experiment was successful, it would certainly be as easy to send meat from that country to this as it was to send it from England there. In November last an experiment was made under the supervision of the Food Committee, in which the carcases of two sheep were, immediately after being slaughtered, and the blood-vessels cleansed by water, injected with a solution of the bi-sulphite; a leg of that mutton had been cooked that day and it was perfectly sweet. He believed if carcases of meat were to be sent from Australia the injection process would have to be resorted to.

Mr. Jones thought the current of thought should be directed rather to the increase of the quantity of the home production than to bringing meat from abroad. He had under his own management a few acres of land, on which were formerly kept only five head of cattle; he now kept nineteen; and if that same increase was made general, we should be independent of foreign supplies of meat, as well as, in a great measure, of grain; inasmuch as the more cattle there were kept the more manure would be produced for the increased fertilization of the land. He thought it would be very much to be regretted if foreign cattle were to be allowed to mix again with our own, half ruining the farmers of the country. He suggested that an advantageous outlet for the locked-up capital of the country would be afforded by advances of money to farmers, in whom they had confidence, to enable them to farm better, and add to the productive capabilities of the country.

Mr. W. L. Scott, in reply to the observations upon the paper, said, with regard to what had fallen from Mr. Rudkin as to the manufacture of soup in large quantities, he thought it would not be found to suit the *physique* of the English people so well as it did that of their neighbours across the channel. Mr. Venables' remarks, with reference to the importance of constructing special ships for cattle, he fully endorsed, and he hoped they would fall on fruitful soil in that room. Mr. Dixon showed very properly that if they went on importing cattle without taking due precaution against disease, on the one hand they might have 60,000 cattle brought in and, on the other hand, they might destroy the same number of our own cattle of double the weight, which would be "six of one" and "a dozen of the other," and we should be seriously the losers. Mr. Morris made some remarks, which were partly replied to by Mr. Graham. With regard to the deteriorating effects of freezing upon meat, he (Mr. Scott) could only say that the results he had stated were derived from actual experiments made by himself. The deterioration of the meat consisted in its being rendered, to a great extent, indigestible, and it produced dyspeptic effects upon persons who ate it. Moreover, on exposure to the air, the frozen meat decomposed much sooner than meat which had not been so treated. With reference to Mr. Graham's remarks upon the injection of carcases with bisulphite, he thought the simpler process of soaking the meat would be found to answer best; and with regard to the transmission of large quantities of meat from Australia, if it were packed in canvass bags, casks might be dispensed with, and he would guarantee that the meat would arrive in this country in good condition. Mr. Jones's remarks as to the desirability of a portion of the locked-up capital of the country being applied to the improvement of agriculture, would, no doubt, commend themselves to many; but the misfortune was no one knew where to lay their hands on that capital, or where to find people who would advance their money, trusting to providence and good crops for the return of it.

The Chairman, in proposing a vote of thanks to Mr. Scott for his paper, said, with regard to the question of markets, the Food Committee of the Society was considering that subject, and if any gentleman had any suggestions to offer to them an opportunity of doing so would be afforded upon his communicating with the secretary. The Committee had already gone into many of the questions brought forward this evening, and they were at present engaged in testing the results of Messrs. Medlock and Bailey's process of preserving meat. It was not to be understood that the committee had made up their minds on the merits of that or any other process; but when they had concluded their investigations their opinions would, of course, be embodied in a report. With regard to Mr. Morris's proposal for sending frozen meat from Australia, the Committee would be happy to hear that gentleman's views on the subject. He had now to make a proposition which he was sure would be warmly responded to, viz., that their best thanks be given to Mr. Scott for the paper he had read. He had introduced a very important subject to their attention, and had brought before them a vast amount of interesting information, and in every way he deserved the expression of their gratitude for the very valuable paper he had read.

The vote of thanks was then passed and acknowledged.

The paper was illustrated by various specimens of meat, fish, and game, preserved by Messrs. Medlock and Bailey's process; also by specimens of meat, &c., preserved by

Professor Redwood's process; and by that of the Australian Meat Company. Numerous samples of *extractum carnis* and other preparations of meat were also shown.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—At a meeting of the Central Committee of this Union, held in Leeds on the 13th inst., Mr. E. Baines, M.P., president, in the chair, on the motion of Mr. Thomas Wilson, vice-president, seconded by Mr. James Hole, hon. sec., it was unanimously resolved—"That the report of Mr. Henry H. Sales, the agent of the Union, on technical education in Yorkshire, be laid before the Government." "That the Central Committee, in submitting this report to the Government, beg to recommend that a Royal Commission or Parliamentary Committee be appointed to make an inquiry into the present state of technical education in this country and on the Continent, with a view to devising such methods for its improvement in England as may render it more commensurate with the wants and conducive to the prosperity of this great manufacturing community." "That the Central Committee think it their duty to draw the special attention of the Government to the want of properly trained and qualified teachers of science in this country, and to the consequent inefficiency of the scientific instruction given in mechanics' and other popular institutions and evening classes, which are otherwise capable (with efficient teachers) of rendering the most valuable aid to practical science." "That the Central Committee would also express their belief that technical colleges or schools, of a superior kind, might, with the greatest advantage, be established in the principal centres of manufacturing industry in the United Kingdom."

NATIONAL EDUCATION.

The following summary of the opinions which peers and members of Parliament have lately expressed on national education, will be useful at the present time:—

Acland, T. D. (M.P. for North Devon).

October 2, 1867 (at West Buckland).—In favour of rating.

Akroyd, E. (M.P. for Halifax).

January 8, 1868 (at Halifax).—In favour of technical instruction by means of mechanics' institutes.

February 6, 1868 (at Halifax).—In favour of developing the existing means of education, and against compulsory legislation.

Baines, E. (M.P. for Leeds).

October 11, 1867 (at Manchester).—In favour of extending present system (but without interference in religion); of further half-time measures, and of permissive rating.

October 31, 1867 (at Huddersfield).—In favour of establishing schools for technical instruction in several manufacturing centres.

November 27, 1867 (about) (at meeting of Associated Chambers of Commerce).—Remarks on the deficiency of technical instruction.

December 30, 1867 (at Leeds).—In favour of state interference in technical instruction.

Baxter, W. E. (M.P. for Montrose).

September 10, 1867 (at Dundee).—In favour of rating, and of entirely secular instruction in aided schools.

Bazley, Thomas (M.P. for Manchester).

October 12, 1867 (at Manchester).—In favour of compulsory education.

January 16, 1868 (at Manchester).—In favour of compulsory rating.

Beach, Sir M. E. (M.P. for East Gloucestershire).

September 26, 1867 (at Cirencester).—In favour of more liberal grants to rural schools; against employment in agricultural work of children under 12 or 13, but against the half-time system in rural districts.

Bright, Jacob (M.P. for Manchester).

January 15, 1868 (at Manchester).—In favour of compulsory rating in places where schools are wanted.

Bright, John (M.P. for Birmingham).

February 5, 1868 (at Birmingham).—Against state interference in technical instruction, and against compulsory measures of education.

Bruce, Right Hon. H. A. (M.P. for Merthyr Tydvil).

November 12, 1867 (at Merthyr Tydvil).—In favour of extended operation of conscience clause, and against compulsory measures at present.

December 11, 1867 (at Halifax).—In favour of local rating and local organisation ("permissive system"); of the department (Science and Art) system, and of opening the universities to all.

Canterbury, the Archbishop of.

January 28th, 1868 (at Tunbridge-wells).—In favour of the denominational system, with a conscience clause, and against compulsory measures.

Childers, H. C. E. (M.P. for Pontefract).

November 8th, 1867 (at Pontefract).—In favour of a compulsory, or of a "national" system.

Clinton, Lord E. P. (M.P. for North Notts).

January 27th, 1868 (at Mansfield).—In favour of compulsory attendance.

Cork, Earl of.

October 8th, 1867 (at Bath and Wells Diocesan Board).—In favour of the voluntary system, supplemented by state aid, but without the requirement of a teacher's certificate.

Cowper, Rt. Hon. W. (M.P. for Hertford).

November 8th, 1867 (at Romsey).—In favour of compulsory rating, and of Irish system as regards religious instruction.

Crossley, Sir Fras., Bt. (M.P. for West Riding, North).

November 20th, 1867 (at "London Tavern").—In favour of the extension of the Factory Acts to rural districts, and against rating.

Cecil, Lord Eustace (M.P. for South Essex).

December 31st, 1867 (at Maldon).—Against compulsory measures, and in favour of religious instruction in primary schools.

De Grey and Ripon, Earl.

October 31st, 1867 (at Huddersfield).—In favour of rating, and of utilising educational endowments.

Dixon, George (M.P. for Birmingham).

January 15th, 1868 (at Manchester).—In favour of compulsory education.

January 23rd, 1868 (at Society of Arts).—In favour of state aid to technical instruction.

Estcourt, Rt. Hon. T. Sotheron.

January 28th, 1868 (at Tunbridge-wells).—In favour of the denominational system, with a conscience clause, and against compulsory legislation.

Fawcett, Henry (M.P. for Brighton).

January 27th, 1868 (at Brighton).—In favour of extending the Factory Laws to every branch of industry.

Forster, W. E. (M.P. for Bradford).

November 27th, 1867 (at meeting of Associated Chambers of Commerce).—In favour of adopting the continental combination and system combined with local enterprise; advocating state interference in technical instruction, and deprecating the delay of a commission.

January 15th, 1868 (at Manchester).—In favour of

compulsory rating in districts where means of education are wanting.

September 10th, 1867 (at Bradford).—In favour of secular instruction.

Fortescue, Right Hon. Chichester (M.P. for Louth Co.).

September 28, 1867 (at Dundalk).—In favour of the Department of Science and Art system.

Gibson, Right Hon. T. M. (M.P. for Ashton).

January 28, 1868 (at Ashton).—In favour of utilising the present denominational system, and of rating for purely secular instruction, of conscience clause, and of Mr. Bruce's scheme generally.

Gladstone, Right Hon. W. E. (M.P. for South Lancashire).

December 18, 1867 (at Oldham).—In favour of conscience clause, and of state aid to secular schools.

December 20, 1867.—Religious difficulties "must be put out of our way."

Göschen, Right Hon. J. G. (M.P. for London).

January 15, 1868 (at Manchester).—In support of Mr. W. E. Forster's views).

Grant Duff, M.E. (M.P. for Elgin, &c.).

September 6 (at Dundee).—In favour of rating and of extension of half-time system.

Granville, Earl, K.G.

August 27, 1867 (at Manchester).—In favour of extended means of science instruction.

August 28 (at Hulme).—In favour of extending the operation of the conscience clause.

Graves, G. R. (M.P. for Liverpool).

December 13, 1867 (at Liverpool).—In favour of further discussion before legislating.

Hartington, Marquis of (M.P. for North Lancashire).

October 18, 1867 (at Accrington).—In favour of extending the present system with modifications.

Hope, A. J. Beresford (M.P. for Stoke-on-Trent).

January 28, 1868 (at Tunbridge Wells).—Against compulsion and rating.

Hughes, T. (M.P. for Lambeth).

January 8, 1868 (at Halifax).—In favour of compulsory education, and of improved means of technical instruction.

Lichfield, Earl of

December 26, 1867 (at Stoke-on-Trent).—In favour of extending the half-time system.

Lowe, Right Hon. R. (M.P. for Calne).

November 1, 1867 (at Edinburgh).—In favour of state aid to secular instruction, of local rating and management, and of compulsory establishment of schools where needed.

January 23, 1868 (at Liverpool).—In favour of conscience clause in every school receiving state aid, of local management under central control (and management of inspection, &c.), and proposing to defer measures for compelling attendance.

Lowther, W. (M.P. for Westmoreland).

January 8, 1868 (at Appleby).—In favour of compulsory education, and of establishing technical schools.

Moncreiff, Jas. (M.P. for Edinburgh).

November 2nd, 1867 (at Edinburgh).—In favour of liberal educational measures for Scotland, and against its being made a party question.

Osborne, Bernal (M.P. for Nottingham).

November 11th, 1867 (at Nottingham).—Doubting feasibility of a compulsory rate.

Oxford, Bishop of.

January 28th, 1867 (at Culham).—Against compulsion and rating.

Russell, Earl, K.G.

January 23rd, 1868 (at Society of Arts).—In favour of compulsory education.

Samuelson, B. (M.P. for Banbury).

January 10th, 1868 (at Birmingham).—In favour of state interference in technical instruction.

January 16th, 1868 (at Manchester).—Against the half-time system.

Stansfeld, James (M.P. for Halifax).

December 10th, 1867 (at Dewsbury).—On the difficulty of educating the obscure poor in large towns.

December 11th, 1867 (at Halifax).—Against permissive measures.

January 8th, 1868 (at Halifax).—In support of Mr. Forster's views as to the compulsory establishment of schools.

February 4th, 1868 (at St. James' Hall, London).—In favour of compulsory attendance.

Sykes, Colonel (M.P. for Aberdeen).

September 10th, 1867 (at Dundee).—In favour of compulsory education.

Villiers, Right Hon. C. P. (M.P. for Wolverhampton).

December 30th, 1867 (at Willenhall).—In favour of the American system, and of technical instruction by means of Mechanics' Institutes.

Walter, J. (late M.P. for Berks).

October 15th, 1867 (at Culham).—In favour of payment on results in all primary schools, and against the secular system.

Wilson Patten, Col. (M.P. for North Lancashire).

October 18th, 1867 (at Accrington).—Against the secular system, and in favour of technical instruction.

Manufactures.

Proposed Iron Trade Conference.—During the last twelve months the attention of the iron trade has been invited to many features connected with the relations of this industry to foreign competitors, to the development of the iron manufacture in other countries; to proposed methods for improving the quality and economical production of iron and steel, and to many subjects of considerable importance to the interests of the British iron trade. It is therefore thought that a conference of British iron manufacturers might advantageously be held during the next general meeting of the associated chambers of commerce in London, say on or about the 6th of March next, when such subjects as the following might be discussed:—Statistics of Home and Foreign Iron Trade:—Measures to be adopted for obtaining reliable statistics of the coal, pig iron, malleable iron, and steel trades of Great Britain, and other countries where these industries are located. Desirability of requesting the Board of Trade to undertake the enquiry, by means of the consular service, or by special commission. Foreign Competition:—Natural advantages possessed by our foreign competitors: advantages resulting from better methods of manufacture, economical processes, utilization of waste products, or cheaper labour. Manufacture:—Means suggested for increasing the effective work of men employed in the different branches of iron manufacture; for encouraging greater efficiency and economy in the puddling process; for extending the application of machinery to the iron manufacture; for securing skilled managers in the several departments of the manufacture. Legislation:—Enactments in operation or proposed which press upon the iron trade: measures considered desirable to get introduced by the legislature. Labour:—Information bearing upon experiments which have been made with a view to promote better understanding between employers and employed. An interchange of opinions upon the above subjects, between the leading members of the British iron trade, will no doubt tend to elicit much valuable information.

Commerce.

Beetroot Sugar. — There are 63 manufactories of sugar in Lithuania, Podolia, and a part of Bessarabia, of which half are also refiners. The smallest use from two to four presses, the largest 22. 3,200,000 hectolitres of beetroots are bought for the manufactories. The largest manufactory belongs to a company of shareholders, who buy the beetroots of the neighbouring proprietors, and beetroots generally realise 3fr. 50c. the korsee, a measure equivalent to 1 hectolitre 28. Nearly 9,000 workmen are employed, whose wages amount to about 16 millions of francs. Almost all the sugar not consumed in the country is sold to Russia. There are 1,428 distilleries, in which a large number of workmen are employed, and their manufacture represents the value of 80 millions of francs. This industry has developed considerably. In the provinces, where the soil was suitable for the cultivation of potatoes, the proprietors drew from that source almost all their revenue. But since the increase of the tax on the manufacture of spirits many manufactories have been compelled to close. The manufacture of alcohol from beetroot is not practised in Poland.

Colonies.

Savings Banks in Victoria.—The returns for the year ending 30th June, 1867, show that the total amount received from depositors during the year was £348,554 19s.; the total amount of repayments to depositors £406,799 6s. 11d.; and the total amount of interest allowed to them was £22,653 17s. 2d. The total number of accounts opened during the same period was 6,102 (of which number 1,298 were old accounts reopened); and of accounts closed, 5,829. The interest paid to depositors on accounts closed during the twelve months, as also the interest carried to the credit of depositors on accounts open at 30th June last, was computed, as ordered by the Commissioners of Savings Banks, at the uniform rate of four per cent. per annum, that being the maximum rate allowed by the Savings Banks Statute 1865. The total amount of depositors' balances at the 1st July, 1866, having been £642,028 13s. 2d., and at 1st July, 1867, £606,438 2s. 5d., the difference is a decrease of £35,590 10s. 9d. The total number of depositors' accounts open at 1st July, 1866, having been 16,985, and at 1st July, 1867, 17,258, the difference is an increase of 273. The average balance of each depositor was £35 2s. 9½d., the average amount of the deposits was £8 12s. 7½d., and of withdrawals £13 15s. 7¼d. per depositor.

Notes.

Exhibition of Applied Art in Paris.—The Minister of the French Imperial Household has announced to the Committee of the Paris Union Centrale that, after the closing of the exhibition of the works of living artists, which opens on the 1st of May and closes on the 15th June, the Palais de l'Industrie will be placed at the disposition of the committee. The latter propose to organise a tripartite exhibition on a large scale, comprising:—1st. A collection of objects exhibiting the application of art to industrial purposes; 2nd. The works of all the schools of design in France; and, 3rd. a collection of Oriental productions, ancient and modern. The date is not yet mentioned, but it can scarcely be earlier than August. This exhibition will supply an excellent opportunity of judging of the general value of art-education and art-workmanship in France.

Horse Show in Paris. — The Société Hippique Française is fitting up the ground floor of the Palais de l'Industrie in the Champs Elysées, the use of which it has acquired for five years, for an exhibition to take place during the first fortnight in April. The central portion is being prepared for the exercise and showing of the horses, and tribunes are being erected for visitors. There will be stable room for about five hundred horses, and prizes awarded to the amount of 60,000 francs (£2,400). The society held an exhibition of the same kind and in the same place the year before last, but it is understood that future shows are to be of a much more extensive kind. The main object of the society is, we believe, to induce improvement in the breaking and management of horses for riding and driving. Military horsemanship forms a feature of the plan, and the officers of the cavalry schools took an active part in the former exhibition.

MEETINGS FOR THE ENSUING WEEK.

Mon......Social Science Assoc., 8. "Report on some of the Matters now under the Consideration of the Royal Commission on Judicature."
R. Geographical, 8½. Mr. C. R. Markham, "Geographical Results of the Abyssinian Expedition to Jan. 22nd, 1868."
Actuaries, 7. Mr. Makeham, "On the Values of Annuities Certain."

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8. 1. Renewed discussion on "The Supporting Power of Piles, &c." 2. Mr. C. P. Sandberg, "On the Manufacture and Wear of Rails."
Ethnological, 8.
Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."

Wed ...Society of Arts, 8. Mr. Hyde Clark, "On a Daily Mail Route to India."
Geological, 8. 1. Mr. C. Babbage, "Notes on the Formation of the Parallel Roads of Glen Roy." (Communicated by the President.) 2. Mr. D. Mackintosh, "On the Origin of smoothed, rounded, and hollowed Surfaces of Limestone and Granite." 3. Mr. D. Mackintosh, "On the Encroachment of the Sea in the Bristol Channel." 4. Mr. D. Mackintosh, "On a Striking Instance of apparent Oblique Lamination in Granite." 5. Mr. T. M'K. Hughes, "On the Two Plains of Hertfordshire and their Gravels."
Archæological Assoc., 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
Philosophical Club, 6.
Mathematical, 8.
Royal Inst., 3. Professor Tyndall, "On the Discoveries of Faraday."
Society of Fine Arts, 8. (In Great Room of Society of Arts.) Mr. F. Y. Hurlstone, "On the Pictures of James Barry, R.A."

Fri.......Quekett Microscopical Club, 8.
Royal Inst., 8. Mr. A. Vernon Harcourt, "On Chemical Actions."
R. United Service Inst., 3. Commander Philip H. Colomb, R.N., "The Naval Department of the French International Exhibition of 1867."

Sat ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 10th December, 1867.*

6. Official Liquidators—Return.
24. Thames River—Correspondence.

Session 1867.

566. Chain Cables and Anchors—Return.

Delivered on 11th December, 1867.

12. Bill—Sale of Liquors on Sunday.

Delivered on 12th December, 1867.

Public General Acts—Cap. 1 to 6.

Delivered on 13th December, 1867.

18. Foreshores—Memorandum.

Session 1867.

518. Tenure (Ireland) Bill—Lords Report.

Delivered on 19th December, 1867.

24. (i.) Thames River—Return.
36. Hops—Return.

Delivered on 19th December, 1867.

38. Augmentation of Benefices—Return.
East India Communications—Communication from Baron Baude.

Session 1867.

431. (A. vi.) Poor Rates and Pauperism—Return (A).

Delivered on 23rd December, 1867.

10. Storm Warnings—Papers.

Session 1867.

538. Navy (Ships "Frederick William," &c.)—Correspondence.

Delivered on 24th December, 1867.

25. Bill—Metropolitan Foreign Cattle Market.

Abyssinia—Pamphlet and Appendices relating to the Routes in.

Delivered on 27th December, 1867.

Trade and Navigation of the United Kingdom with Foreign Countries and British Possessions—Annual Statement.

Delivered on 28th December, 1867.

13. Education—Letter.
29. East India (Cession of Berar)—Correspondence.
31. Mortality and Marriages (Scotland)—Return.
32. St. Andrew's University Graduates—Return.
34. Insolvent Debtors—Returns.
42. Postal Contracts—Return.
44. Militia—Return.

Delivered on 31st December, 1867.

Session 1867.

46. (xi.) Trade and Navigation Accounts (30th November, 1867).

Delivered on 3rd January, 1868.

23. Navy (First Class Boys, &c.)—Return.
28. Rangoon and Western China—Memorials, &c.
28. (i.) Rangoon and Western China—Survey Report.

Session 1867.

564. Vessels not Armour Plated—Return.

Delivered on 6th January, 1868.

Session 1867.

468. Wexford Harbour—Mr. Coode's Report, &c.
478. (i.) Army (India and the Colonies)—Index to the Report.
496. (i.) Mines—Index to the Report.

Delivered on 9th January, 1868.

11. Dwelling Houses—Return.
40. Poor Law (Walsall Workhouse)—Report.

Session 1867.

223. (i) Courts of Law, &c., Part II.—Return.

Delivered on 11th January, 1868.

13. Bill—Compulsory Church Rates Abolition.
39. Ceylon—Extracts of Despatch.

Session 1867.

562. Navy (Boys and Seamen)—Return.

Delivered on 15th January, 1868.

24. Bill—Public Schools.

Delivered on 16th January, 1868.

25. East India (Engineers' Establishments, &c.)—Return.

Patents.

From Commissioners of Patents' Journal, February 14.

Grants of Provisional Protection.

Beer-engines—328—B. Hayne.
Blinds, window sun—329—W. E. Newton.
Boilers—365—J. West.
Boilers, &c., incrustation in—384—J. Webster.
Bolts, nuts, and washers—340—H. Chapman.
Bones, treating—364—J. H. Johnson.
Boot and shoe lasts—304—W. March, jun.
Boot and shoe lasts, supports for—370—W. Wallis and G. Mant.
Boots and shoes—322—J. Grimes.
Bottles, feeding—192—T. G. F. Dolby.
Bottles, feeding—332—J. Thompson.
Brakes, self-acting—316—W. E. Newton.
Bread, &c., cutting—324—M. A. Hamilton.
Bridges, suspension—344—S. E. Howell.
Buckets, metal—334—C. H. Adames.
Candles—291—C. E. Brooman.
Casks, &c., forcing liquids from—380—T. Cook.
Chimneys, sweeping—368—H. B. Wright.
Clog soles, &c., manufacturing—390—R. J. Jones.
Colouring matters—225—C. E. Brooman.
Cotton balls, &c., manufacturing—388—R. D. McKellen.
Engines—217—W. E. Newton.
Engines—325—W. Hartnell and S. Guthrie.
Engines—337—J. H. Johnson.
Engines—347—A. M. Clark.
Engines, cleaning carding—359—J. Tolson.
Engraving machines—349—G. Moulton.
Fabrics, cutting into lengths—341—J. Mitchell, jun., & G. T. Graham.
Fans, rotary blowing—323—H. Aland.
Fire bars—374—J. Lewis and R. and E. Alston.
Fire escapes—348—G. Clarke.
Flax, &c., hackling and scutching—362—J. Combe and J. Barbour.
Food, preserving—376—J. Dewar.
Furnaces—319—W. R. Lake.
Furniture expanders, &c.—396—H. Moore and J. Hamilton.
Fuses, percussion—386—J. Pettman.
Gas, &c.—351—A. M. Clark.
Glass, substitute for—345—J. Livesey.
Grain, &c., heating and drying—360—J. and W. Weems.
Gunpowder, &c.—342—E. Bolton.
Hat covers—3086—W. E. Gedge.
Head, &c., coverings for the—355—D. Murray.
Horse-shoes, &c.—398—J. Hay.
India-rubber, &c., cutting washers of—373—E. Grether & M. Bailey.
Iron and steel—303—W. H. Richardson and W. Beardmore.
Iron and steel—321—J. Radcliffe.
Iron, &c., removing impurities from—327—T. Rowan.
Iron ores, &c., treating—352—H. Aitken.
Ladders, &c.—3460—S. L. Worth.
Lamps—382—T. Scott and R. Mowat.
Lamps, miners'—375—L. Desens.
Lamps, miners' safety—203—E. Thomas.
Leggings, &c.—367—W. R. Lake.
Light, regulating and increasing artificial—292—G. N. Sanders.
Liquids, manufacturing—335—E. Fleet.
Locomotion, &c., aërial—392—M. P. W. Boulton.
Looms—243—J. Goulding.
Looms—366—C. Richardson.
Lozenges, &c., embossing, &c.—294—A. Pickering.
Madder, extracting colouring matter from—227—C. E. Brooman.
Mattresses, &c., spring—361—M. A. Wilson.
Motive-power machines—300—A. C. Pilliner and J. C. Hill.
Motive-power, transmitting—346—J. Frame.
Mowing and reaping machines—394—W. E. Newton.
Pavement—296—W. R. Lake.
Photographic apparatus—363—J. M. Domenech and F. P. Jonte.
Refrigerators—377—R. Morton.
Ships, steering—343—G. L. Scott.
Sinks, &c.—351—R. C. Smith.
Spinning or twisting apparatus—378—E. A. Morgan.
Spinning, &c., machines—320—B. Dobson, W. Slater, and R. Halliwell.
Stoves, hot-air—358—B. Ford.
Stoves, &c.—372—R. A. Jones.
Sulphur, &c., burning, &c.—270—A. MacDougall.
Threshing machine frames—314—C. Riley.
Tubes, metallic—350—J. V. Jones and G. J. Williams.
Valves—205—J. F. Spencer.
Valves, &c.—357—C. E. Brooman.
Winding machines, &c.—262—J. and T. A. Boyd.
Wood, tobacco, &c., cutting—298—J. Brown.
Wood, &c., turning and cutting—336—J. Walker and J. Hudson.
Wool, &c., cleansing, &c.—318—J. H. Johnson.
Wrenches—333—A. M. Clark.

Inventions with Complete Specifications Filed.

Metals, heating and welding—444—W. B. Adams.
Railway switches, &c.—443—W. R. Lake.
Spikes, split—442—W. R. Lake.
Water-closets, &c.—436—J. A. Nicholson.

Patents Sealed.

2355. J. Day and W. Dorber.
2358. R. Joseph.
2367. M. Frow.
2371. W. W. Pocock.
2373. W. R. Goulty.
2378. C. E. Brooman.
2391. C. E. Hall.
2410. J. G. Marshall.
2511. W. H. Kitson.
2537. D. Payne.
2565. J. Whittome.
2575. J. Davies.
2749. T. Weston.
3346. W. R. Lake.
3500. W. R. Lake.

From Commissioners of Patents' Journal, February 18.

Patents Sealed.

2374. T. Tunstill.
2386. H. Cridland.
2387. A. S. Stocker.
2390. W. Bostock.
2392. W. Thomas.
2393. J. Robinson and J. Smith.
2394. G. Luyckx.
2395. C. W. Siemens.
2397. J. Goucher.
2398. J. M. Napier.
2399. J. Mangnall.
2400. T. Widdowson.
2404. S. Lynes.
2405. R. King, J. Lowden, and W. Gartside.
2409. J. and F. J. Jones.
2412. T. W. Lawson.
2423. G. Allibon and E. Wilson.
2424. J. Cash and J. Cash, jun.
2427. J. Hanson.
2433. F. J. Cleaver.
2447. J. E. Boyce and R. Harrington.
2460. A. Stewart.
2471. A. M. Clark.
2501. W. Weldon.
2516. J. S. Henderson and J. Macintosh.
3095. W. Day.
3322. S. Amphlet & J. B. Fenby.
3471. S. Goldstein.
3526. J. R. Baillie.
3. W. R. Lake.

Patents on which the Stamp Duty of £50 has been Paid.

384. D. H. Barber.
387. C. Atherton and A. H. Renton.
401. R. W. Thomson.
402. L. H. G. Ehrhardt.
437. R. H. Emerson.
443. E. B. Wilson.
404. W. Adams.
432. M. Lane.
436. G. T. Humphris.
408. E. J. C. Welch.
510. J. G. Hughes.
416. R. J. Jones.
450. J. Thompson.
469. J. Graham.
473. J. G. N. Alleyne.
508. W. S. Mappin.
507. S. Whitfield.
451. R. Smith.
452. R. Hill and R. Tushingham.
816. L. A. Leins.

Patent on which the Stamp Duty of £100 has been Paid.

399. J. H. Johnson.

Journal of the Society of Arts.

FRIDAY, FEBRUARY 28, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

March 4.—"A Workman's Views on Technical Education." By Mr. John Randall, one of the Artisan-Reporters on the Paris Exhibition.

March 11.—"On Courts of Arbitration, and the Principles of Co-operation, as means of bringing into Harmonious Action the Interests of Capital and Labour." By Thomas Beggs, Esq.

March 18.—"On Railways and their Management." By Robert F. Fairlie, Esq.

March 25.—"On Horse as an Article of Food." By A. S. Bicknell, Esq.

Cantor Lectures.

The last course for the present Session will consist of four lectures, "On Chloride of Sodium, the products obtained from it, and their applications to Arts and Manufactures," to be delivered by Dr. F. Crace Calvert, F.R.S., on Friday evenings, commencing on the 13th March.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose will be forwarded to each member.

Institutions.

The following Institution has been received into Union since the last announcement:—

Handsworth Working Men's Club.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Committee on Technical Education.

In compliance with the resolution passed at the Conference held on the 23rd and 24th of January, the Council have appointed a standing Committee, "to take such steps as may give effect to the resolutions passed at the Conference, to support all such well-advised schemes for Technical Education as may be brought before it, to send such deputations to the Government as may seem expedient, and to re-assemble the Conference when desirable," and the following gentlemen have consented to serve upon it:—

Samuel Andrews (Auditor Society of Arts).
T. C. Archer (Edinburgh Museum of Science and Art).
John Avery (Mayor of Birmingham).
A. S. Ayrton, M.P.
John Barber (Mayor of Nottingham).
John Marsland Bennett (Manchester Chamber of Commerce).
Professor Robert Bentley (King's College, London, Member of Council of the Society of Arts).
The Hon. and Rev. S. Best.
D. Roberton Blaine (Member of Council of the Society of Arts).
Antonio Brady (Member of Council of the Society of Arts).
Dr. F. Crace Calvert, F.R.S.
Edwin Chadwick, C.B.
Harry Chester (Vice-President of the Society of Arts).
J. J. Colman (Mayor of Norwich).
Robert Coningsby.
Thomas Connolly.
Sir Daniel Cooper, Bart. (Member of Council of the Society of Arts).
J. T. Dexter (Public Museums and Free Libraries Association).
George Dixon, M.P.
A. Field (Birmingham Chamber of Commerce)
George Godwin, F.R.S.
S. R. Graves, M.P.
Thomas Gray (Board of Trade).
George Griffith, M.A. (British Association).
John Gulson (Mayor of Coventry).
George Harrison (Edinburgh Chamber of Commerce).
William Hawes, F.G.S. (Chairman of Council of the Society of Arts).
The Hon. Auberon Herbert.
Robert Hogg, LL.D.
C. Wren Hoskyns, (Vice-President of the Society of Arts).
Robert Hunt, F.R.S. (Royal School of Mines).
Professor Huxley, F.R.S.
A. H. Layard, M.P.
Professor Fleeming Jenkin, F.R.S. (University Coll.).
The Rev. W. C. Lake.
W. W. Lee (Mayor of Wakefield).
Professor Leone Levi (King's College).
The Earl of Lichfield.
Prof. G. D. Liveing (Cambridge University).
F. N. Menzies (Highland Agricultural Society).
Lord Robert Montagu, M.P.
The Right Hon. Sir John S. Pakington, Bart., M.P., (Vice-President of the Society of Arts.)
Dr. Playfair, F.R.S.
Wyndham S. Portal.
Hodgson Pratt.
Dr. David S. Price.
Richard Redgrave, R.A.
Thomas Roe, jun. (Mayor of Derby.
Prof. J. E. Thorold Rogers (Oxford University).
The Earl Russell.
J. Scott Russell, F.R.S.
Rear-Admiral A. P. Ryder.
B. Samuelson, M.P.
Trelawny Saunders.
P. L. Simmonds.
Alderman and Sheriff D. H. Stone (Member of Council of the Society of Arts).
Dr. John Storrar.
The Rev. Dr. Temple (Rugby School).
Seymour Teulon (Treasurer of the Society of Arts).
Captain Henry Toynbee (Board of Trade).
Thomas Twining (Vice-President of the Society of Arts).
Richard Whiteing.
G. F. Wilson, F.R.S.
J. S. Wright (Birmingham Chamber of Commerce).
M. Digby Wyatt.

John Yeats, LL.D. (Middle School, Peckham).	The Archbishop of York (Vice-President of the Society of Arts).
James Young (Bathgate Chemical Works).	

The Committee held its first meeting on Wednesday, the 26th February. There were present:—W. Hawes, Esq., Chairman of the Council, in the chair; A. S. Ayrton, M.P.; E. Chadwick, C.B.; H. Chester; R. Coningsby; T. Connolly; J. T. Dexter; Geo. Dixon, M.P.; Geo. Godwin, F.R.S.; S. Graves, M.P.; Thomas Gray; The Hon. Auberon Herbert; Dr. Hogg; Professor Fleeming Jenkin, F.R.S.; Rev. W. C. Lake; Professor Leone Levi; Wyndham Portal; Hodgson Pratt; Dr. David S. Price; J. Scott Russell, F.R.S.; Admiral Ryder; B. Samuelson, M.P.; Trelawny Saunders; Dr. Storrar; S. Teulon; Capt. Toynbee; G. F. Wilson, F.R.S.; M. Digby Wyatt; J. Yeats, LL.D.; the Archbishop of York.

The Committee resolved:—

"That a sub-committee be appointed to prepare a scheme of Technical Education calculated to promote the advancement of the Arts, Manufactures, and Commerce of this country; the sub-committee to consist of the following:—R. Coningsby; T. Connolly; W. Hawes; The Hon. Auberon Herbert; Professor Huxley, F.R.S.; Professor Fleeming Jenkin, F.R.S.; Professor Leone Levi; J. Scott Russell, F.R.S.; Admiral Ryder; B. Samuelson, M.P.; Dr. Storrar; and the Archbishop of York; with power to add to their number."

Twelfth Ordinary Meeting.

Wednesday, February 26th, 1868; W. S. Fitzwilliam, Esq., late Member of the Supreme Legislative Council of India, and subsequently Colonel W. H. Sykes, M.P., F.R.S., presided.

The following candidates were proposed for election as members of the Society:—

Lewis, Thomas Hayter, 9, John-street, Adelphi, W.C.
Hollest, W., Leigh-house, Farnham.
Thomas, Wesley Henry, 6, Water-lane, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Dickinson, John, 12, Haymarket, S.W.
Griffith, George, Woodside, Harrow.
Mathew, E. W., Wern, Carnarvon.
Wilkins, John, 48, Hungerford-road, N., and Took's-court, E.C.

The Paper read was—

ON A DAILY MAIL ROUTE TO INDIA.

By Hyde Clarke, Esq., Cotton Commissioner in Turkey.

The desire of improving the communications between England and India has given rise to many projects, and occupied the time of many distinguished Englishmen. Two names particularly stand forward, that of General Chesney, as the pioneer of the Euphrates route, and that of Lieut. Waghorn, in connection with the Egyptian route. On the latter, English enterprise has been particularly successful, for by steam navigation and by railways, it has been brought to such a stage of advancement that the French have been stimulated to co-operation, and have engaged in the great work of the Suez Canal.

Local circumstances have hitherto given the preference to Egypt over the Euphrates, and this latter route remains unused, notwithstanding surveys, agitation, and a steam expedition on the rivers. Events have, however, been moving in its favour. Railways have been creeping in from the interior to Bombay, steamers have been run from Bombay to Bussorah, and communicate with Bagdad, while from London railways have advanced to the Lower Danube, and are now promised beyond it. If, therefore, the intervals can be bridged over, we get, step by step, continuous railway communications from London, with an intervening steamboat transit, which will in itself bring about the day when the locomotive will run from the opposite shore of the Continent to Calcutta, and even the frontier of China.

The plans for accomplishing communication by the Euphrates Valley, have been either by steam navigation, or by railway, steam navigation being limited to the river, railway transit being proposed throughout from London, or simply to fill up the Valley route. Thus there are various claims of priority. General Chesney is the parent both of steam and railway routes from the Euphrates, having commenced his labours in 1830. The progress of railways in Europe led to projects of railways for through communication. In 1842 Mr. Wm. Pare, a gentleman of great activity in the railway world, published a plan for a Calais, Constantinople, and Calcutta Railway. Mr. Alexander F. Campbell, formerly of the Royal Engineers, proposed to the East India Company, a system of railways on the wide gauge to India, under dates 6th of September, 1843, 25th March, 1845, and 25th April, 1845. His map was published by Mr. Wyld, in 1851. Mr. John Wright, in 1849, took up the same subject. The title of his work was "Christianity and Commerce, the Natural Results of the Geographical Progression of Railways." Dr. James Bowen Thompson, a zealous promoter of the Euphrates route, and who died at Constantinople while advocating it, exhibited in the Great Exhibition of 1851, a plan for a railway from London to Calcutta.

The chief competitors for the through line of railway by the Euphrates have, however, been Mr. W. P. Andrew and Sir R. M. Stephenson. Each claims priority. Sir R. M. Stephenson appears to have paid cursory attention to the subject in 1850 and 1851, but he adopted the alternative project of a Persian route. In 1859, on the ground of ill-health, he abandoned the agitation. Mr. Andrew, in conjunction with the Euphrates pioneers, has continuously prosecuted the Euphrates Valley Railway, and has casually advocated a through line. Credit must be given to Sir R. M. Stephenson for the part he took in these discussions, and which created at the time great interest in the public press.

For practical labours the public is greatly indebted to General Chesney, and next to him to Captain Lynch, R.N., who has kept the undertaking alive; also to Mr. W. F. Ainsworth, General Estcourt, Lieutenant Murphy, and Captain Campbell, I.M. Of late years the prominent promoter of the Euphrates route has been Mr. Andrew, who, in 1857, was the organ of a powerful deputation to Lord Palmerston, who has been the representative of the Euphrates Valley Railway Company, and who continues to urge the subject on the Imperial and Indian Governments, and on the public.

The time has now come when the agitation must assume greater proportions than a mere Euphrates Valley route; the economical conditions have greatly altered. We are no longer limited to a consideration of the steam transit between Trieste and Brindisi and Scanderoon, for we may hope confidently for a railway to Constantinople; and if we take up the matter seriously, we may more easily obtain a through line from Constantinople to Bussorah than a half-way line from the Mediterranean to that port. The leading fact is that the political circumstances are altogether altered from what they were ten years ago. India has come home to us at length, for its vast development has produced a great impression on the public mind here. We are no longer afraid of the Suez Canal, but the Egyptian route is not now felt to be

so reliable nor is it so much in favour. Telegraphic movements have become the precursors of railway routes; and the telegraph has made the central line by the Euphrates familiar to us. It would have familiarised us with the Persian route, but the downward bearing of Russia equally towards Turkestan, India, Persia, and Turkey, has produced a powerful sensation on the minds of England and India, nor have European events been without their influence. We feel we must have more resources, more than one expedient, safety for the present, security under future contingencies.

Hence the middle route to India from many causes is brought prominently before us. It is not a rival to any line; it is certainly not one to the Suez Canal now, any more than it was in 1857, when M. Lesseps said, "I have personally maintained, and I shall continue to maintain, that the Euphrates Railway will be a benefaction to countries now disinherited." The Egyptian route will not be injured and abandoned on the opening of the middle route. It has its own peculiar advantages, but so has the middle route, which will do even more than the Egyptian route in the opening up of little frequented countries, and in the impulse it will give to the commerce of the world.

The middle route has this characteristic, that, beyond even the Suez Canal, it can claim to be a European undertaking. It must greatly benefit this country; but it will benefit directly or indirectly every country of Europe. In the silk trade alone it will confer direct advantage on France and Italy, in opening up Asia Minor, Mesopotamia, and Persia, and it will carry to the sealed up East the manufactures of France, Belgium, Holland, Switzerland, Prussia, Saxony, and Austria; for if we talk of a railway from London to Asia, it is no less a railway likewise from Paris, Lyons, Rouen, Mulhausen, Brussels, Liège, Verviers, Utrecht, Geneva, Berlin, Elberfeld, Nuremberg, Augsburg, Leipsic, Vienna, and Pesth. It will open new markets for every manufacturing town in Germany, and for their growing trade with the East.

It will give to them and to us a daily mail for all India, and a proportionate acceleration for China, Japan, Java, Sumatra, Cochin China, the Philippines, and Australia. The French have mails to China, and their growing possessions in Cambodia; the Hollanders to the Netherlands East Indies; and Spain to Manilla. Thus, in one way or another, the nations of Europe have a great stake in the development of this route; and it is to be hoped, as all will profit on its completion, so all will assist in its realisation. Do what we will for our own good, we must benefit others; we must open the way for others, as we have done in Egypt and elsewhere. Let us, therefore, invite and welcome the co-operation of others.

Of the lines of railway from London and the European capitals, constituting the great railway system, it is unnecessary to say more than that they now reach Basiash on the Danube, near Belgrade, on the Turkish and Servian frontier. For the junctions with Constantinople, a route of about 500 miles, which will pass through Adrianople, has been granted by the Sublime Porte to a combination of English, Belgian, and Hungarian capitalists, represented by Messrs. Vander Elst and Co.

In the condition of Turkish finance there are difficulties to be encountered, which may cause modifications of arrangements and delays, but it may now be felt assured that this line will be completed. The Ottoman Government is resolute on carrying out its railway system, and will find some resources. This line is, however, a political and commercial necessity for the newly-restored state of Hungary, and very great efforts will be made by that patriotic people to accomplish their purpose, and secure their frontiers against their several enemies. Austria is not altogether dead to enterprize, and her government and capitalists will give their assistance. This railway is represented at Constantinople by two distinguished men, Count Zichy and General Eber. According to the latest official advices the arrangements with the government have been complete and the works will be begun at an early date on four points. The chief engineering works are in the passage of the Balkan. The line passes through countries having considerable resources, which will be further developed by a railway, and if the financial measures be honestly and rationally conducted, the line will in a few years be remunerative. Until that period the Ottoman Government will be able to meet the guarantee through the increase of its own revenues, resulting from the expenditure of capital on the works and the working of the railway. A bridge across the Bosphorus, between the Rumeli Hissar and Anadoli Hissar, or Castles of Europe and Asia, has been projected by Mr. M'Clean, late President of the Institution of Civil Engineers; and a plan was also exhibited at the Paris Exhibition in 1867, and illustrated in the *Engineer*, of February 14th, by Herr Rüppert, a distinguished Austrian engineer.

The line from Constantinople, and its Asiatic suburb Scutari, to Bagdad and Bussorah, of 1,400 or 1,500 miles, is granted by the Ottoman Porte to a company represented by Mr. L. Greig and the Hon. Randolph Stewart, Messrs. Sharpe, Stewart, and Co., and Baron Winspeare. The route has to be decided on survey, for which two years are granted, and is roughly traced by Izmid, Kutahiah, Afioon Kara Hissar, Koniah, Ak Serai, Yenisheher, Kaisarieh, Aleppo, the Euphrates Valley, Bagdad, and Bussorah, with a branch to Skanderoon, Seleucia, or Suedia.

The guarantee of the Government is limited to five per cent. on £12,000 a kilomètre, or £20,000 a mile. The special funds set apart are the postal subsidies and transport of mails, the Indian telegraph receipts, and one per cent. transit duties. At the present moment the guarantee in its simple state will not allow of capital being raised, nor do the *concessionnaires* propose to resort to any of the accustomed modes of financing. Having got what may be called the collateral guarantee of the Ottoman Government,—not an absolute guarantee of five per cent., but a guarantee to make up the revenue of the company to that rate in case of deficiency,—it is the business of the *concessionnaires* to make effective the revenues appropriated to them.

The first of these consists of the postal subsidies to be negotiated with the several Governments. These Governments are our own Indian Government, that of the Netherlands Indies, those of Australia, that of Persia, Muskat, England, France, Holland, Belgium, North Germany, Switzerland, Italy, Saxony, and Austria.

The second consists of telegraph business and subsidies from several Governments and commercial communities.

The third consists of the transit duties.

The fourth consists of the revenues of the railway itself, local passengers, through traffic, the transport of troops, and the carriage of goods.

In aid of all these comes the general guarantee of the Ottoman Government.

The question, therefore, is whether, with all these resources, and such further aid as may be obtained from friendly quarters, the funds can be provided; and this presents no insuperable difficulties, if there be but a real conviction on the part of those interested, of the true value of the undertaking, and the urgency of its execution.

From Bussorah mail steamers run to Bombay, but these only afford accommodation to the local trade between India, Bussorah, and Bagdad, and yet this is sufficient to justify the Government of India in maintaining this service. It may be conceived that the Government can afford a larger subsidy to carry letters further, and to open up the trade with the Mediterranean and with Europe. If Bagdad and Bussorah are now of such importance to India for local purposes, they will become still more so when their ports and markets are enriched by the advantages of railway communication.

Bombay has opened or has in progress lines of railway, which connect it with the great Indian system, and give it

access to Calcutta, Madras, and all the main stations. The traveller from Europe would, on reaching Bombay, proceed at once to railway stations in the interior, for which a voyage to Calcutta and Madras would entail circuitous travelling.

Such is the present state of the route from London to Calcutta.

The sources of income on which the Constantinople and Bussorah Company have to rely have already been enumerated. It may be useful to make some estimate of them.

The railway, it may be assumed, passing in many parts through an undeveloped country, cannot for a long time pay of itself, nor will the through traffic be sufficiently large to yield a dividend. Under these circumstances, the net income may be taken during its early years at 2 per cent. The capital may be assumed at £20,000,000; it may by economy be less; it may by delays and misfortunes become larger. Two per cent. per annum on £20,000,000, gives £400,000.

The Indian telegraph already yields a profit to the Ottoman Government. It may be taken, on the completion of the line, at £100,000.

The transit duties may be taken on £5,000,000, imports and exports, or £100,000 per annum. The trade to South Persia would follow this route; also that to Muskat, the Mekran, and the Arab ports on both shores of the Persian Gulf. The transit duties would be levied on valuable articles exported from England, France, &c., to the countries named, to India, China, Japan, the Archipelago, Manilla, and many eastern regions, and on imports from them. Thus we have—

Traffic	£400,000
Telegraph	100,000
Transit duties	100,000
	£600,000

The question is what England and India can afford to give as a postal subsidy, leaving the other mails as matters of subsequent arrangement; the French, Spanish, Netherlands, Belgian, North German, Saxon, Swiss, Italian, Austrian, and United States mails.

Can our governments afford to risk £200,000 in subsidies to secure the great advantages dependent on this undertaking? The first help to answering this is, that a great increase of postal revenue will result from the acceleration and more frequent transit of the mail. If this be taken at £100,000, it leaves only £100,000 as the amount of effective subsidy, in substitution of other subsidies, to be divided between England and India, to be diminished by other mail receipts, and to be ultimately extinguished by the development of the railway system, and the augmentation of the transit duties.

Thus the effective liability of the home treasury is reduced to a casual £50,000 a year, or some comparatively small amount. For this our empire will obtain great political advantages, a greater assurance of European peace, a further guarantee against invasion or revolt in India, an immense commercial development, readier correspondence with the increasing markets of the eastern world, a speedier and more convenient transit for our merchants, officials, civil and military, and soldiers to India and the adjoining regions.

To secure these advantages more effectually, the railway must be constructed as cheaply as possible—that is, for ready money, and not for Lloyd's bonds; it must not pass into the hands of financers; there must be wholesome supervision over the contracts, construction, and expenditure; there must be a low capital cost and cheap working, so that our commercial and political travellers may have to pay only reasonable fares. To effect all this the line must be assimilated to the Indian system; it must not be financed on the Turkish guarantee; but it must have a solid English or European guarantee of 4 per cent., in the shape of a postal subsidy, in principle assimilated to that of the Peninsular and Oriental Company, securing not direct political but direct postal advantages to our Government, making the rate of its contribution dependent on the earnings of the line, and ultimately assuring either our direct participation in the profits, or our indirect benefit in the reduction of charges.

Will France, will Austria, will Hungary participate in this undertaking, from which each is to derive so much? Will France neglect this opportunity for upholding her position in the eyes of Europe, one still more honourable to her than even the patronage of the Suez canal? The question is whether these countries will leave the whole share of the prosecution of these works to the English. This appears inconsistent with the attitude of France. Originally assisted by English capital and English experience her railways were begun, but they were completed by French industry, and she has since extended her railway operations outside to Austria, Italy, and Spain. A nation which has never loved to be left behind—which has followed us to India, to China, to Egypt—will not leave to us the sole conduct of railways in Turkey, or the sole development of Persia, a country in which she has so long sought to acquire trade and influence. French capitalists have tried singly, or in conjunction with English capitalists, to carry out the Adrianople railway; and they will claim their due share in its companion enterprise, which is to connect Paris and Constantinople with the Indian Seas.

In fact, this great enterprise is not one calculated to excite European jealousies, but to contribute to European union. It will be a new bond among the cabinets of Europe, a common tributary to the industry and commerce of each nation.

Such, it is to be hoped, will be the result produced, and, as the undertaking is represented by an able and energetic man of great public spirit, the Hon. Captain Stewart, there is every prospect of its claims being efficiently advocated. Captain Stewart has addressed a memorandum to the Earl of Derby on the claims of the undertaking, which shows very forcibly the importance to national interests of its immediate completion and of liberal support being afforded to it by Her Majesty's Government.

The constructive questions of a line as yet only partially or roughly surveyed cannot be fully dealt with, but enough is known to declare the practicability of the undertaking.

With regard to the plan, the geographical features of Asia Minor limit the course to be chosen both on the north and south of that peninsula. Even on starting from Constantinople or Scutari, after coasting the Gulf of Izmid to the town of that name, a difficult country has to be approached. This has, however, been in part surveyed, and in part examined by English engineers, while the whole line from Scutari to Izmid and Eski Sheher has long since been carefully planned under the direction of the former *concessionnaire*, Mr. James Landon. From Izmid there are two routes across the central plateaux, one by Hajgi Hamzah and Boli, the other proceeding by Kutahiah, and so by Afioon Kara Hissar, Koniah, Ak Serai, Yenisheher, Kaisarieh, by the valley of the Halys and plains of Nigdeh, or whatever may be found the best route to the Koolak Boghazi, the Syrian or Cilician Gates, the great pass through Taurus.

The passage of the Koolak Boghazi will be the great work on the line, and it is one which will require the most care and expense. Since the time when it was first considered, the execution of the railway passages over the Alps and the Ghauts have materially contributed to lessen the responsibility of such an enterprise.

Questions then arise as to the connection of the line with the Euphrates, and as to the direction of the branch from that line to the Mediterranean shore, so as to make the Euphrates Valley line an alternative route, in case of need, either by through railway communication with Europe, or by steamer. The routes surveyed for General Chesney's Company, under the direction of Sir John Macneill, have been from Seleucia or Suedia to Aleppo.

As this makes needful the construction of an expensive harbour, and the Ottoman Government prefers a connection between the fine port of Skanderoon or Alexandretta and Aleppo, although across a heavy pass. They therefore caused it to be surveyed, at my request, by Col. Messoud Bey, who has reported fully in its favour.

From Aleppo onwards to Bagdad and Bussorah the route presents the usual features of a line in a great southern river valley.

No sound estimate can be made of the expense, as the distance even is not known. An estimate of 100 miles for the Scutari and Izmid concessionnaire gives £8,000 to £10,000 per mile, but the country beyond is heavier. The estimate of the Euphrates Valley section is given at the same rates, for 850 miles, as those of the Scutari and Izmid. Taking these as 100 miles and 850 miles, or 950 miles together, and the total length as 1,500 miles, although it may prove only 1,400, we have a remainder of 550 miles, which, if we take at £15,000, would cost £8,250,000.

Estimates:—

	£	£	£
Scutari and Izmid...	800,000	1,000,000	1,000,000
Izmid and Aleppo...	8,250,000	8,250,000	11,000,000
Euphrates Valley...	6,800,000	8,500,000	8,500,000
Totals ..... £	15,850,000	17,750,000	20,500,000

In the last estimate the cost of the Asia Minor heavy section is taken at £20,000 a mile, and the others at £10,000; £12,000 a mile would bring the total cost up to £22,000,000. The total cost appears to be within the limits of £16,000,000 and £25,000,000. The smaller sum we can hardly, under all contingencies, hope to stop at, the larger we may try to avoid, and the capital may be taken at £20,000,000.

The line can be begun at several points simultaneously, namely, at Skutari, Izmid, the plain below the Koolak Boghazi, Skanderoon, Aleppo, Bagdad, and Bussorah; all very heavy works in the interior of Asia Minor can be begun early or together. A great advantage of the geographical situation is that the line touches the sea at its ends and middle, affording convenient places for landing plant, rails, and engines, thereby facilitating the works. In case of need, some further point on the river may be used as a point for operations.

The question of labour, as to which anxiety was formerly expressed, has been solved by the operation of the railway companies in Turkey, which have organised labour on the English system. The lines existing in Turkey are the Danube and Black Sea, or Kustenjeh, 40 miles; the Varna and Ruschuk, 140; the Ottoman, Smyrna, and Aidin, 82; and the Smyrna and Cassab, and Bournabat branch, 62; total 250. On these works have been trained a large body of labourers of all kinds, and a number of managers, sub-contractors, and foremen. So far as staff is concerned, a thousand miles of railway can be put in hand, and labourers can be found. The old hands will serve to train labourers in the new districts, as yet untried, and in case of any refractory or unwilling population, it will be replaced by imported labour. There is no real ground to expect refractory Arabs, or that any population will not work for high wages. Besides local labour, the northern districts will be supplied by Armenians and Croats, the middle districts by Armenians and Greeks from Candia, Rhodes, and other islands, and the southern portion, besides local and imported labour from accustomed supplies, will most likely receive labourers from refractory tribes or from India. The earthworks and masonry will be executed by native labour as well as in Europe, and the line will be as well laid.

Attacks from Arab tribes are not to be feared by bodies of stout and organized labourers, for whom military aid can be made available, but in all likelihood in the most disturbed districts the labourers will work unarmed. Imagination is one thing, but the practical experience of railway works is another. Brigands and outlaws there will be, but most will be employed as labourers, teamsters, and woodmen, the most crafty as gangers, petty contractors, and dealers; the most lazy as loafers and beggars, and they will little contribute to the annals of murder and robbery. The chiefs of predatory tribes will be engaged in numerous speculations in milk, beasts of burden, cutting timber and sleepers, and turning to their own profit the labour of every man and woman of their tribes.

The progress of the works will be regulated by the same circumstances as at home, the supply of money, the supply of labour on economical conditions, the supply of timber and other materials, and the skill in battling with administrative and constructive difficulties.

From the Ottoman Government every assistance is to be expected. The government and its officers have not interposed vexatious administrative delays in railway construction, but have acted on the principle of encouraging these undertakings. The Sultan has a settled and earnest desire to promote railways, and is seconded by his ministers. The Council of Public Works is directed by French and English engineers. The commissioners appointed to supervise the lines have been chiefly Europeans, and instead of exercising an interference with the managers and engineers, they have confined themselves to co-operating with them and with the local authorities in promoting the execution of the works.

Money being provided, there is no more difficulty in carrying on railway works in Turkey than in any country in the world, indeed it may be said less than in many countries.

With regard to the advantages of completing the railway communication, the direct advantages are so great that it is not necessary to dwell on the political advantages. Everything that improves and insures our commercial correspondence with India must give us political advantages; everything that contributes to the material well being of Europe is a greater security from danger, and further guarantee of peace. Thus the European junction with Constantinople will throw open to enterprize 500 miles of country in Roumelia of great resources, hitherto of little profit to the community, and by so doing increase the stability of Turkey and the well-being of Austria and Hungary.

The Asia Minor portion of the Constantinople and Bussorah Railway will do the same service for that great peninsula; it will connect the great cities on the caravan routes, and open for them outlets to the sea, now only to obtained by long and troublesome canal transport down the river valleys to Smyrna, or across the mountain ranges to Adalia and the ports of Tarsus. The productive countries of the interior are now so pent up that only their richer produce of opium, silk, and cotton can get to the sea, but the railway reaching the midland districts at a point not more distant than Manchester or York from London, will allow bulky objects to be shipped, for which beasts of burden are now wanting. Thus a development of traffic will take place beyond the immediate region of the railway; caravan traffic will be intercepted or become tributary, while new outlets will be fostered. The interchange of commodities between these districts will be carried on upon a larger scale, and the westerly immigration of Armenians, Turkomans, and Koords seeking industrial employment will be increased, and the nomad tribes be further arrested.

When the western regions are unsettled the nomad tribes set further towards the west, but as cultivation extends the nomads are driven back, or become cultivators or townsmen. Thus a railway intersecting Asia Minor in the course proposed would exercise a material influence on the well-being of the eastern countries of the peninsula, assisting the government in its efforts to regulate the turbulent tribes. The same remarks apply in a great degree to the Euphrates section, and on a course of 1,500 miles will be constituted as it were a telegraphic current

for the propagation of civilisation, in what once were the empire states of the eastern world. Pontus, Armenia, Babylon, Media, and Persia would be restored, if not to their historic power, at all events to rivalry with their ancient prosperity.

If in Asia Minor, which has on the line traversed some evidences of its former well doing, this influence would be great, still more would it be exercised on the neglected valleys of the Euphrates and the Tigris. The immediate effect produced by a railway in developing a backward country is more particularly due to the nature of the railway itself. It is not on an increase of population, as supposed, that these results are dependent, though an increase of population does take place, but on an increase of the absolute produce, and on the realisation of that produce for export. To a country where the largest iron-worker is the shoeing-smith and the gipsy, and where all implements of labour and manufacture are wooden and rude, the railway supplies metal, tools, implements, and machines. Thus, the produce of the field and the forest is augmented. What it does in the distribution of capital is still more. The agriculturist, always in debt to the trader, and in bondage for small sums to the chandlers' shop keeper, is visited by the larger native capitalist of the towns, and gets greater advances on more favourable terms; and the same agency sets up mills and factories. If there is a demand for produce for the European market, opium, cotton, or madder, the English merchant comes into competition with the native, and his agents make advances more liberally, and at easier rates. It is by throwing open the interior easily and safely to the native and European merchant, that capital, intelligence, and enterprise are brought to the doors of each cultivator. It is thus that the provinces of Smyrna, Magnesia, and Aidin have already largely benefited from railway communication. The Government, too, becomes stronger, and has better means of coping with gang robberies, and restraining the vexations of nomadic and predatory tribes.

It is more particularly by its peculiar mode of transport that a railway relieves a country. What is taking place in the Abyssinian expedition is the key to the commercial conditions affecting remote districts in Asia and South America. The mule, laden with forage at Annesley Bay, eats most of his forage on the road to Senafe and on his return, and leaves but a small reserve at Senafe. So is it with the transport of grain; even the hardy camel must be to some extent fed, and so must his attendants, and thus, after a certain distance, his own load will be consumed. Thus, in all these countries, transport absorbs food for a large number of camels, mules, horses, buffalos, and oxen, and the men attendant upon them, while the consumption of cereals consequent upon railway transport, is small. Agriculture therefore gains, on the introduction of a railway, not only this economy of food, but the liberation of men and beasts for the further cultivation of produce. If the produce remained the same, at Konieh, for instance, the exportable produce would be greater, but the fact is the total produce would be greater had it railway transit. In corn alone, to be shipped at Constantinople, it is acknowledged by all who know that the increase of production in the interior would be enormous. The railway, therefore, tends in every way to increase the existing traffic and to create new resources.

In the single article of cotton, too, a great augmentation would take place on the line of fifteen hundred miles; if in the spring, the agents of a few European houses could readily and speedily traverse the country to arrange advances for sowing, and if in the autumn they could get in their produce from the growers, have it ginned by English gins, and be assured of its rapid transmission to their own warehouses in the ports of shipment. In India, the impulse of railway transit has caused a production beyond the present means of the railways to transport.

So far as to the ancient world, which would be restored to our enterprise, and yet we must not dismiss it without a special reference to Persia. It has always been a great object with English as with French adventurers to communicate with Persia. Now no means which have been devised will effect this so surely as through railway transit. At present, in every direction, Persia finds difficulties in exporting her productions. On the east she is barred; on the north she has only the Caspian, or circuitous routes through Russia, before she can reach the seats of consumption; on the north-west she has long caravan routes to reach the Black Sea at Trebizond, or the Levant at Aleppo or Scanderoon; on the south the Persian Gulf only affords a long sea voyage to Europe. As just shown, Persia by the railway will not only obtain a means of exporting produce, but will obtain capital, capitalists, the appliances of production, the means of internal development, and a protection against foreign aggression. Whether English or French preponderate there, one policy must be pursued in maintaining Persia against Russia. We shall be handsomely recompensed if we can receive the productions of a country as populous as Spain and richer, and supply her with our manufactures.

There is an old ally of ours, the Imam of Muskat, or Sultan of Oman, at the southern mouth of the Gulf. His relations with the Arabs on both coasts are extensive; and while we increase his power, we may look forward to a diminution of local disorder, and an increase of Arab commerce.

The advantages of this route as a postal and passenger route depend on its directness and thereby shorter length, and on its rapidity of transit.

The distance from London to Bussorah by railway will be about 3,600 miles, and the distance from Bussorah to Bombay about 1,600 miles (1,584). The transit, being slower in the beginning, may be expected to improve.

	Hours.	Days.
London to Bussorah at 25 miles per hour ...	144 ...	6
Sea voyage to Bombay at 10 ,, ...	160 ...	$6\frac{2}{3}$
Total		$12\frac{2}{3}$
London to Bussorah at 30 miles per hour ...	120 ...	5
Sea voyage to Bombay at 10 ,, ...	160 ...	$6\frac{2}{3}$
Total		$11\frac{2}{3}$
London to Bussorah at 30 miles per hour ...	120 ..	5
Sea voyage to Kurrachee ...	120 ...	5
Total		10

The transit to Calcutta may be represented as by the quicker route 16 days, but to be reduced to 13 days on the junction of the Indian railways.

Where a reduction of transit tells most materially is by its double effect in reducing the course of post. Thus the single post to Bombay will be 12 days instead of 22, or a saving of $9\frac{1}{2}$ days, and the course of post will be 25 days instead of 44, plus the interval of mails, or say 51 days. Thus, in a year, 15 sets of letters or communications can be despatched, instead of seven.

The advantages to passengers are of a corresponding nature, for in case of need it will be possible to get to and from London and Bombay in a month. In these calculations no account is taken of the ultimate completion of the railway system from Bussorah to India, nor of the Indus Valley Railways, which will further facilitate and shorten the communication with the Punjab and the North-Western Provinces of India. When this takes place the distance between London and Calcutta will be performed in from ten to twelve days, and ultimately, most likely, in a still shorter period.

Thus, in whatever light this important measure be regarded, it is found to be fraught with great advantages to this empire and to the world at large.

DISCUSSION.

The SECRETARY read the following communication from Sir Arthur Cotton:—"As to the present arrangements for the postal communication with India, I consider that the essential mistake is the attempting to combine the conveyance of passengers generally with that of the mails. These two things I consider incompatible, because the very high speed required for the mails is both too expensive for the great mass of passengers, and is inconvenient also for them. The result of attempting to combine the two is, that the speed is too low for the mails, and the cost and inconvenience too great for the passengers. We know what speed can be obtained on the ocean, by what was accomplished by the blockade runners during the late war, which had a speed of about 18 knots, or more than 400 miles a-day. There are, I believe, many of these vessels still for sale, and I am assured that they were most faithfully built, so as to be quite fit for ocean navigation, as, indeed, was abundantly proved. When the renewal of the Peninsular and Oriental Company's contract was under consideration, I took the liberty of writing to the Secretary of State on this subject, but it was impossible to get the matter really discussed. The plan I should propose at present would be to carry the mails by rail to Brindisi, in two and a-half days; thence to the northern end of the Suez Canal, 850 miles, in two days; through the Canal, 100 miles, in small, fast steamers, in six hours, and thence to Bombay 3,000 miles, without coaling at Aden, in eight days, total 13 days. This can certainly be done, because these speeds are accomplished in other places; but I know of no reason why higher speeds should not be attained, as the steamers would have to carry nothing but their engines and fuel. By such a means, of course all passengers who are pressed for time, and would not mind some inconvenience, might go at higher charges, while the mass of travellers might travel at such a speed as would be most suitable for them considering the cost, for it is certain that nine-tenths of them would prefer travelling cheaper though at a lower speed; but this mischievous contract with the Peninsular and Oriental Company leaves people no choice. There can be no possible question, now that the Suez Canal is in operation, that this is the line by which not only the mails, but also all passengers ought to go, as it involves the least possible inconvenience, even in its present state, the canal steamers running alongside of the ocean steamers, and receiving and delivering with only two transfers of the simplest kind, instead of four or six much more inconvenient transfers, as they now go by rail. For this service there would be no occasion for steamers of 2,000 and 3,000 tons; the blockaders would be amply large. It would require one from Brindisi to Alexandria, and three on the other side for a weekly mail, with one or two spare ones on each side. I am not able to state the expense of this, and there is no necessity for it, because no possible cost would be too great for so vast an object as bringing the two halves of this great empire nearer together. An expense of a quarter or half a million a year in such a case is in fact utterly insignificant. If those to whom time is most valuable could go quicker, and those to whom it is an object to reduce the cost (the case of nine-tenths) could go slower, the intercourse between India and England would be very greatly increased. The Suez Canal, even in its present state, is of incalculable value to England, and it is madness not to make all the use of it possible. This arrangement for the mails may be made at once, and it might be extended to two or three times a week; but there cannot be a question that arrangements should be at once commenced to provide for a still more rapid and frequent communication. The line for such, I think, must unquestionably be the direct one from the Mediterranean to Bagdad. Having travelled by it, I can state that its facilities for a railway exceed that of any other line in the world. For hundreds of miles there is a hard surface of earth, without one foot perceptible variation of level, or a single watercourse. The cost of such a line would be very little more than that of the rails and sleepers. If it commenced near Acre, it would cross Syria by the plain of Esdraelon, and there would be no one serious obstacle the whole way. Before the rail was carried beyond Bagdad, the time by this route to Bombay would be about 8 days, but the rails might be continued to the mouth of the Persian Gulf. And there is nothing whatever to prevent much higher speeds on water than I have here supposed. In fact, I believe vessels have actually been run at the rate of nearly 30 miles an hour, and, in this case, there should not be any question about cost, because the value of speed in the communication between a country whose income is 600 or 700 millions a-year and its dependency, having an income of about 300 or 400 millions a-year, is far beyond any possible cost. The income of the Atlantic telegraph, about half-a-million a-year, shows indisputably the enormous value of speedy communication between two countries having even only commercial, without imperial, connection, even when it does not provide for passengers and mails; and the sum already expended on railways in India, now about 100 millions, including interest, cost of land, &c., shows what the English public think of the importance of improved communication with the interior of India. The authorities are still providing six or eight millions a-year for this purpose, and certainly the facilitating communication from this to India is of ten times more importance. The imports and exports of India for the year ending 30th of April, 1865, were 120 millions, including treasure, so that the commercial relations alone would justify a vast outlay, even leaving out of our calculations the far greater interests involved in the imperial connection. At present, the debt of India, including railway liabilities, is not more than three years' revenue and most assuredly many additional hundred millions, if judiciously expended, will much more than increase its power of paying the interest of such sums. And it is equally certain that this point of improved communication between India and England is one of the things in which money may be most judiciously and safely expended."

Mr. HYDE CLARKE read a note from Mr. R. Montgomery Martin, expressing his inability from illness to attend, and his firm conviction that the through line would be carried either by Mesopotamia or Persia.

Mr. W. P. ANDREW was in hopes he should have heard some remarks from gentlemen present who were personally acquainted with the countries proposed to be traversed by these railways. He did not entirely agree with all the views expressed in the paper, though he quite endorsed the statement that there were few countries which presented less difficulties than Turkey to the introduction of railways, if the money could be found. The finances of Turkey were not in such a flourishing condition that they could raise 25 or 30 millions of money for such a purpose. He agreed with the author of the paper that the proposed railway would not only be a great advantage to the Turkish empire, but also to this country, as connecting it with India, and, indeed, to the world at large. It would be a pledge of peace; it would enable us to bring either of our armies to bear, either in Europe or in Asia, and the more our power was augmented in that part of the globe the better it would be for the progress and the liberty of the world. But how was the money to be raised? His own views on this subject had been repeatedly expressed in the public prints, and had been placed before successive Governments of this country; he still adhered to those views, which were that the line for us to make was that from Seleucia, through Mesopotamia, to Bussorah, at the head of the Persian Gulf. A capital of eight or ten millions would be sufficient to complete that line. We should then have a terminus at each end on the open sea, under the protection of our own guns. That line would enable

us to have rapid means of communication—not to send passengers with the same rapidity as by the proposed through line, but it would enable us to send our guns and troops, and to communicate with India in twelve days. That would be a great advance on the present state of things, and it was a proposition which any ministry might recommend to the House of Commons. The through line would be in time of war quite useless; we could send neither men nor guns; and it was only in times of profound peace that it could be used either for postal or passenger communication. It would, no doubt, be of the greatest importance to Austria, and he had no doubt that empire, rising from her late tribulations, would give aid to the undertaking. France might also join in promoting it, but the line he desired to see carried out was that by the Euphrates Valley, which would bring us into connection with the Mediterranean and the head of the Persian Gulf. He could not sit down without thanking Mr. Clarke for the handsome terms in which he had alluded not only to himself but to his venerable friend Gen. Chesney. Allusion was also made in the paper to M. Lesseps' favourable opinion of the Euphrates Valley railway. Ten or eleven years ago he received from M. Lesseps, and the other distinguished French gentlemen with whom he was acting, a pressing invitation to join in the Suez Canal project, accompanied by a promise that if he consented to do so they would, on their part, co-operate in promoting the Euphrates Valley line, so as to make these great highways to the East one great international concern. He expressed a desire to receive that communication in the spirit in which it was offered, but circumstances beyond his control as an humble individual prevented him from accepting those proposals. If he had been permitted to accept them, he had no doubt, instead of now pleading the cause of the Euphrates Valley line, as he had done for many years, it would have been by this time an accomplished fact.

Mr. W. S. Fitzwilliam said he knew the country as far as Bagdad thirty years ago, and everything that had been stated by Mr. Andrew during the last ten or twelve years had been fully borne out by his experience. He must say Mr. Andrew deserved all credit for the exertions he had made in promoting the line from the Mediterranean to the Persian Gulf. He only regretted that the government of this country had not assented to his proposals, so that that line might have been carried out.

Mr. Austin (Chief Engineer of the Smyrna and Casaba Railway, and late of the East Indian Railway), from his personal knowledge of this portion of Asia, and having been engaged in the construction of one line of railway there, agreed with the views expressed by Mr. Clarke with reference to the proposed line to India. That country was now becoming so civilized, and the effect of railways in civilizing a people was so great, that he had no hesitation in saying that a line could be carried through Affghanistan to Cabul with great advantage to the country. He did not agree with Mr. Andrew's views with regard to the Euphrates Valley line: for this reason—that it would not, in his opinion, have a local traffic of £10 per mile per week, whereas a line from Constantinople to Scanderoon, forming a continuation of the Euphrates Valley, would produce a revenue of £30 or £35 per mile per week, and would be almost self-supporting. That line would pass through a mineral country, in proximity to innumerable forests, from which timber could be procured for the construction of the railway, and supplies of coal could be obtained in the district. He had been burning in his own house a species of cannel coal brought from the northern part of Asia Minor which, though not the best for locomotive purposes, would be more economical, from its being obtained so cheaply, than fuel sent out from England. In establishing a complete overland route from England to India, he decidedly gave the preference to to the proposed line from Constantinople to Bussorah. He believed the sum of 18 millions would be sufficient to make the railway from Scutari to the Persian Gulf, not including a bridge over the Bosphorus. The line with which he was connected (the Smyrna and Casaba), which had not been opened two years, had a revenue of £35 per mile per week from local traffic during certain seasons of the year; but not at the present season, because the camel traffic was suspended from the mountain passes being flooded. The line was 58 miles in length, with a branch of three miles. It had been constructed at a cost a little over £13,000 a mile, and it had gradients of 1 in 100. His own estimate was that the net revenue of the proposed line to India would be at least £600,000 per annum from traffic alone, to which would be added the postal subsidy. The commercial prospects of the undertaking were therefore of the most encouraging and satisfactory nature.

Mr. Gerstenberg remarked that it had been very properly suggested by the first speaker that the great difficulty in the way of such projects as this was the procuring of the necessary capital to carry them out. There was another important question to be solved; that was, if the traffic existed, would it be profitable? No doubt any railway in Turkey, at the estimated cost given, would be remunerative in the future; but the cost of railways was rarely within the estimates, and, therefore, a considerable margin must be allowed. One item of income calculated upon by Mr. Clarke was £100,000 a year from telegraphic despatches. The first item of revenue was the subsidy from the various European governments; that, in his (Mr. Gerstenberg's) opinion, was the only tangible guarantee, because the Turkish finances were at so low an ebb, in spite of their commercial honesty hitherto, that it was impossible to place any great reliance upon their guarantee. The Turkish Government had hitherto paid its obligations to English capitalists with great punctuality, and no doubt it would continue to do so as long as it could keep borrowing a larger amount than it could pay back. The chief source of guaranteed revenue, therefore, would be the subsidies of the European governments. The question, however, was—would those subsidies be granted? They knew it was a very difficult thing to get the European Governments to agree upon any point, and were they likely to do so on this? Therefore they must not look too sanguinely to getting any European guarantee. The second source of revenue was the local traffic of the railway. That might be regarded as almost without limit as soon as the resources of the countries were developed, but this would take a longer time than the capitalists of the present day would care to wait for. Mr. Clarke anticipated a yearly net revenue of £100,000 from telegraphic messages, but the whole revenue of the Persian Gulf cable for the last year was only about £140,000; it should be mentioned, however, that there was a project in the field for establishing a more direct telegraphic communication between London and the East Indies, which would be carried out under the superintendence of the Russian Government, and the execution of it was to be entrusted to that very able electrician, Mr. Siemens. When that was completed messages could be sent from London to Bombay without interruption. When, therefore, they looked at the fact that the telegraph generally preceded the railway, he took the liberty of suggesting to the author of the paper that he should use the influence he possessed, in commercial as well as scientific circles, in promoting the telegraphic enterprise to which he (Mr. Gerstenberg) had alluded from England to the East, as the natural precursor of the railway project which he had so ably advocated in his paper.

Mr. Jones said, they must all wish success to Mr. Clarke's project as far as Turkey and Asia Minor were concerned, but with reference to India, and communication with the East, he thought the advantages had been over-stated. They had just heard of the telegraphic enterprise between Calcutta and London, by which a message could be sent in one hour, at a cost of £3 10s.,

the present charge being £5. To the extent that telegraphic facilities were increased, he thought the necessity for rapid postal communication was diminished. The value of postal communication had its limits. At present they could send a letter to Bombay in fifteen days. The Peninsular and Oriental Company were under a contract rate of speed of nine miles an hour, but under stress and pressure their vessels were able to work at fourteen miles per hour, which might be increased even to 30 miles an hour, but the cost of the extra speed was so great that it was not worth the while of the government to pay the extra amount which was demanded. With a speed of 14 miles an hour the passage could be made in 15 days. By the Euphrates railway it could be done in 12 days; but railway transit was expensive, and the Peninsular and Oriental Company carried five times as cheap as the railway could do. On the next Saturday the first vessel would start, under the new contract, for the weekly communication between England and India, so that they had already in their hands that which would accomplish nearly as much as the Euphrates railway without troubling any foreign nation except Egypt.

The Hon. Capt. STEWART thought the ideas of the last speaker with reference to the telegraph to India were rather mythical. He had told them it was proposed to send messages from London to Calcutta in one hour. He would ask whether any gentleman present had received a telegraphic message even from Edinburgh in that time? They had been told this evening that steamers might be driven at 30 miles an hour, but he believed the highest speed ever attained was 17 knots per hour, and the wear and tear of even a speed like that must be very great. With reference to railways they knew that the limited mail could go from London to Edinburgh in ten hours, and there was no reason why, under careful supervision, with good locomotives and a good railway, the same speed should not be attained in other parts of the world. They had been told this evening by an eminent authority (Sir Arthur Cotton) that it was undesirable that passengers should travel at the high rate of speed indicated for the mails. Admitting that for the sake of argument, it was not necessary that passengers should continue travelling all the time. There were places where hotels could be built, and people who wished to rest on the journey could do so. Mr. Andrew, than whom there was perhaps no greater authority on the subject, had said there would be great difficulty in raising the capital for this undertaking. No doubt that was so at the present moment, but he would say a word on behalf of the Turks. Having been in that country himself, he had heard a good deal about railway enterprise there. No doubt there were faults on both sides. The Turkish Government had granted facilities for railway communication, but he did not think we, in this country, had fulfilled our part of the obligation. We had not fulfilled the conditions we made with them. We had not put sufficient rolling stock on the line to carry the traffic which already existed. He believed one reason why the Turkish Government had not paid the guarantee with punctuality was, because traffic was waiting, but the company had not sufficient rolling stock to carry it. If, however, this proposed line were guaranteed by the European Governments, there would be a sufficient control over it to ensure that whatever traffic there was would be satisfactorily carried. Looking at the financial part of the question, he maintained it would be just as easy to raise twenty millions as ten millions, but that was no argument against the desirability of the through line. He thought, probably, the line from Alexandretta (Scanderoon) to the Persian Gulf would be more advantageous to England. If they could prevail upon the Government to assist them in that, they would accept it as a part of the whole; but he maintained that the through line should ultimately be carried out, and he had no doubt if they could obtain the guarantee for the line from Alexandretta, the capital for the missing link would be forthcoming; other nations would give a guarantee of some sort, which would enable the capital to be raised. They were told that this through line would be useless in time of war; that depended upon whom we were at war with. If it were with Turkey the line would be useless, but he could hardly suppose that England, the faithful ally of that empire, would ever go to war with it. Would the shorter line be of any more value than the other? Suppose we were at war with France, we could defend our two ports on the Red Sea, but the mails could not be carried without a sufficient escort. The through line was more important, because the line from Scutari maintained an inland communication the whole way, which could only be interrupted by an enemy establishing himself in the Turkish territory; therefore the Turks themselves would be our allies in this matter. There was another point he might mention; he had the best authority possible for stating his belief that the Turkish government would grant no concession of this importance to any undertaking which did not start from somewhere near Constantinople—somewhere north of the Dardanelles; and it might fairly be asked why should not they have the advantage of the interior of their country being placed in direct communication with the capital. They were told that the line was not likely to be remunerative at present. They scarcely ever heard of a line, except the Metropolitan, which became a dividend-paying line at the first opening. But if this line was to be a guaranteed one, he hoped it would be under some government supervision and control. All the expenditure would be watched, and all that could be done to save the public exchequer would be done. One item of revenue should be specially noted. At present Turkey was allowed to levy a duty of 1 per cent. upon all goods passing through that country. All the light and valuable goods, such as silk, would come up the Gulf and cross over to Alexandretta, and all the trade from Persia would come that way which now sought an outlet through Russia to Poti, on the Black Sea; but when they got the proposed railway the whole of the trade would come to the Mediterranean.

Mr. CAMPIN did not know whether the author of the paper, in stating that the through route proposed would take them to Calcutta in twelve days, intended that the travelling should be continuous during that period by night as well as by day. Even with the opportunities of resting on the journey, suggested by the last speaker, a twelve days' journey upon a railway would be a greater stress upon the system than most people could bear. The breaking of the journey in the way suggested would lengthen the duration of it beyond the time in which it was accomplished at present. It was therefore a question whether the system of steamers suggested by Sir Arthur Cotton would not be best for passengers, but with respect to the postal traffic he thought it might be different.

The CHAIRMAN, in closing the discussion, said, as far as he was personally concerned, he believed it was pretty well known that he had taken great interest in the introduction of railways into India long before any sanction was given for their construction, and his view then was that they should be constructed by the Government and not by private companies; but he was now obliged to confess that the enterprise of those private companies had been eminently successful in India, both for commercial and political objects. They had in a short time brought together extremities of the country, which it would otherwise have been impossible to connect within any reasonable period. With regard to the rival schemes of Mr. Andrew and Mr. Hyde Clarke, he did not hesitate to say he was incompetent to pronounce an opinion. Even if he had had the details of the two projects to consider, and the map before him, and had had an opportunity of examining each, he would still be equally at a loss to decide, because he was ignorant of the physical difficulties of both lines, as well as the topography of the country. He thought, however,

that neither of the gentlemen could say what the physical difficulties really were We had now a direct communication with India by the Red Sea, commercially and by telegraph, and also by a mail service. By the telegraph a communication was received from Bombay within the twenty-four hours; and if we could be certain that would be maintained, it would, probably, answer all reasonable purposes, both of trade and public concerns. With regard to letters, the last mail from Bombay came over in 22 days, which was tolerably quick work; and, moreover, the silks of China, which alone would bear the cost of railway transport, had been brought to us from India in those 22 days, *viâ* Marseilles. There were two services to do that: there was our own noble service—for so he must call it, because those vessels had been valuable auxiliaries to our navy in times of emergency—and then there was the Messagéries Imperiales service, which had run the Peninsular and Oriental Company so close that it was impossible they could undertake a new contract upon the former footing. They would have been ruined by doing so, in consequence of the enormous subsidies which the French government gave to their company. We could not do that in this country, and he hoped the House of Commons would always have an eye to due economy in these and other matters of public expenditure. For his own part he wished there could be further direct communication with India by Asia Minor, and also by the Euphrates Railway, if possible; but where was the money to come from? The English Government would not give them a subsidy, and he did not think they would get it from the Turkish Government. It would, therefore, depend upon private resources whether one or both of these projects were carried out. If they trusted to any permanency in Turkey, what chances were there of that amidst the conflicting interests at work in that unfortunate country, from which, sooner or later, the Christian population would be severed? The prospect of any guarantee of a permanent character on the part of Turkey was, he thought, very remote, although it might be given in perfect good faith. These projects, therefore, must depend for their success entirely upon public confidence in them; but was there any confidence even in English railways now? Could any railway now borrow one hundred pounds? If there was that want of confidence in this country, how could we expect there would be confidence on the part of the capitalists in foreign railways which were to run through deserts and mountainous countries, and with only a guarantee from a government which was not likely to last. Therefore he was afraid, whatever they might wish, neither of these projects would be carried out during the lifetime at least of the older portion of the audience he was addressing. He should be gratified, in the interests both of this country and of India, to see both projects carried out, but he repeated he saw little hope of their being realised in his own day: at the same time he would be far from discouraging the efforts which were made to keep this subject before the attention of the public, and he strongly urged these gentlemen to persevere. He would conclude by proposing a cordial vote of thanks to Mr. Hyde Clarke for his most interesting and valuable paper.

The motion having been agreed to,

Mr. Hyde Clarke, in acknowledging the compliment paid to him, said the project he had brought forward this evening was not his own, but that of the concessionnaires of the Scutari and Bussorah railway, who were represented by the Hon. Captain Stewart. There was no rivalry between that project and the Euphrates railway, though difference of opinion existed as to whether the Euphrates section only should be carried out, or whether the whole through line should be adopted. The question had been fairly discussed, and when the members read the paper with the help of these observations, he thought it would be found there was less in the remarks that had been made of a discouraging character than they supposed. With regard to what had fallen from the chairman, he (Mr. Hyde Clarke) thought he might ultimately come to the same views as those he had expressed with regard to railways generally in India, when he had had an opportunity of looking more fully into the subject, for he was one of those who always formed his opinion in conformity with facts and sound reasoning. He could not concur with the chairman in his views respecting the future of Turkey, for geographical reasons; because even if the Christian population in European Turkey separated from the Turks there still remained the main part of the empire, which was in Asia, and consisted of a Mussulman population, and he believed the general feeling was, that the existence of the Turkish Empire would thus be maintained, and it was through that part of the empire that the proposed line passed. With regard to the observations of Mr. Gerstenberg as to the telegraph, he thought they tended to confirm the views which he (Mr. Hyde Clarke) had advanced as to the extent and value of the telegraphic communication on the proposed railway, and if they were to have a telegraph through Russia, it was an additional reason why they should have another line by this route. He was happy to find that his estimates of the cost and profits of the undertaking had been more than confirmed by so competent an authority as Mr. Austin, who had put the latter at a very much higher figure than he (Mr. Hyde Clarke) had ventured to do; and looking to the gross receipts of the Persian Gulf telegraph, he did not think the estimate he had made of revenue from that source was at all excessive. With regard to the bridge over the Bosphorus, it was not included in the proposed undertaking.

The paper was illustrated by maps of the districts referred to, kindly lent by Mr. J. Wyld, M.P., and Mr. William Smith, C.E.

Proceedings of Institutions.

Marlborough Reading and Mutual Improvement Society.—Mr. Ellis Roberts fulfilled his engagement with the Mutual Improvement Society on Monday evening, 17th February. The attendance was large, and Mr. Roberts showed himself an accomplished musician, and a perfect master of the harp. He was accompanied by a lady vocalist, Miss Mabel Brent.

Yorkshire Union of Mechanics' Institutions.—*Stanningley Mechanics' Institute.*—The annual *soirée* of this Institute was held on Shrove Tuesday in the Town School, which was filled to overflowing. Mr. E. Slater occupied the chair, and was supported by Mr. Alderman Robertshaw, Mr. Henry H. Sales, Mr. Councillor Harrison, Rev. T. Jowett, and other gentlemen. The report gave a highly satisfactory account of the work done by the Institute in the past year, and spoke of all the branches being in thorough working order. The finances showed a balance in hand. One of the prominent features is the Penny Savings Bank, which now contains deposits amounting to thousands of pounds, and is in connection with the Yorkshire Penny Savings Bank. The evening classes are progressing satisfactorily.

BRIEF OUTLINE OF THE SYSTEM OF PUBLIC INSTRUCTION IN THE KINGDOM OF THE NETHERLANDS, 1868.

By John Yeats, LL.D., Middle School, Peckham.

At a time when public instruction has become a leading topic, it is not surprising to find that speakers and writers frequently refer to the state of things in Prussia and France. But in referring to those countries, let it not be forgotten that their political and social institutions are widely different from our own; and that the means

by which success has been ensured, and on which it is, perhaps, mainly dependent, could never be made available in this country, such means being incompatible with our national characteristics. Allow me, therefore, to draw attention to another people, whose educational institutions are of much older date, and, if possible, of higher aims than those of either country referred to; whose social, moral, and religious principles are, moreover, more nearly akin to our own—I allude to the people of the Netherlands. Educational reform began among them with primary instruction, the humblest classes being helped first. This reform aroused the emulation of the middle classes, who, in turn, demanded for their children special culture and schools in harmony with the requirements of the age; while the classes who frequent the universities are not yet reached. A law affecting these institutions is understood, however, to be in active preparation.* Without dwelling upon the great social movements (1761—1763) which led to the present improved state of education, and which continued without intermission until they resulted in the law of 1806, let me first draw attention to a society to which is rightfully assigned the honour of having laid the corner-stone of the structure of national instruction—the "Maatschappy: Tot Nut van 't Algemeen."† Wholly self-dependent, continually struggling against difficulties, and frequently disappointed through prejudice and party-spirit, this society took education, in its forlorn condition, to heart, and nobly adhered to it throughout.

By its instrumentality ideas, more methodical and systematic, respecting teaching as an art, were diffused; competent men were set to work to prepare suitable books for teachers and pupils; schools (*departement scholen*) were established in which instruction was not charged for at all, or else made accessible at a very small fee; training schools for teachers were founded and supplied with necessary funds; the scanty salaries of many teachers were raised, so that domestic trouble might not influence the general tone of the school; in short, where aid was needed it was given cheerfully and liberally. And, as time showed, not in vain; for the favourable results obtained within a very few years interested the nation at large. Even when at length Government took the burden on its own shoulders this society, not thinking its task complete, continued directly co-operating with the laws, and furthering the good cause wherever possible; and to our own day many infant schools, repeating schools, evening classes for lower instruction, night classes for technical instruction, industrial schools, Sunday schools, charity schools, &c., &c., are the living monuments of the Maatschappy.

As already mentioned, the first great law on instruction was passed in 1806, and this law, though replaced by another framed more in accordance with the wants of the day, is still the basis of the whole system. Revised, extended, and improved, but essentially the same, it is known as the new law on lower instruction of 1857. In 1863 a law for middle instruction was passed, and higher instruction is now awaiting its turn.

The whole system may thus be conveniently divided into—

* In the three universities of Leiden, Utrecht, and Groningen, there are studying for divinity 319 young men; jurisprudence, 593; medicine, 213; science, 96; letters, 76; total, 1,297.

† This society originated in the following manner:—"In the year 1784, John Nieuwenhuizen, a humble minister of a Mennonite or Baptist congregation at Edam, a small town situated in North Holland, a few miles from Amsterdam, perceived the defective condition of primary education, and the slenderness of the existing means for its improvement. He was a man who, though moving in a retired sphere, had both the sense to conceive the means of improving the social condition of the people, and the intrepidity to put his designs into execution. At first not much was attempted. A society, composed of himself and a few friends, began to agitate the question of improved education, and to encourage the growth of morals and general intelligence. Little by little the society increased in the number of its supporters, and extended its usefulness, till it finally spread over the whole of Holland, and every town and village was subject to its cheering influence."—*Chambers' Tour.*

(*a.*) Lower* or primary instruction.
(*b.*) Extended lower instruction.
(*c.*) Middle instruction.
(*d.*) Higher instruction.

The leading characteristics are—

1. That public instruction is an object of constant care to the Government.

2. That public instruction is based on the precepts of Christianity; but that no dogmatic instruction is suffered in any of the public schools.

3. That public instruction is not compulsory, while practically it is universal in its operation.

4. That private individuals or sects or corporations are free to establish schools for their own advantage,—subject to the requirements of the general law.

5. That no instruction is allowed to be given by any but persons of approved capacity, and of acquired proficiency in the art of teaching.

Lower or primary instruction comprises only that knowledge which the state may justly demand from every citizen as the minimum of intellectual culture. Being the chief and often the sole opportunity of training for the children of labourers and artisans, it aims directly at knowledge which is indispensable for practical purposes.

The subjects taught are:—Reading, writing, arithmetic, the Dutch language, geography, history, natural history, form, vocal music.

Every commune is obliged by law to have one school or more for lower instruction, according to locality or number of inhabitants. The expenses connected therewith, such as salaries, repairs, supplies of books, stationery, fuel, light, &c., are to be defrayed by each commune. In case a commune is unable to raise the necessary funds, it receives a gratuity from the province to which it belongs, or from the State.

If a commune feels the desirability of higher instruction for the young, schools for an extended range of knowledge may be established. They can be either separate from, or united to, those for lower instruction. The subjects, additional to those for lower instruction, are:—

(*a.*) The rudiments of the French, German, and English languages.
(*b.*) Mathematics.
(*c.*) Rural economy.
(*d.*) Gymnastics.
(*e.*) Geometrical drawing.
(*f.*) Girl's plain and fancy work.

The schools for lower and extended lower instruction are under the supervision of the Minister of the Interior who is directly aided by—

1. Local Boards of Instruction.
2. District Inspectors.
3. Provincial Inspectors.

In every commune there is a local board of instruction, whose duty it is to see that the requirements of the law are strictly complied with, the schools kept in good condition, and the teachers not in want of necessary materials, &c. For such purposes the board visit the schools twice a year, to inquire into the general character of the instruction given, the progress of the pupils, &c. An annual report has to be sent to the magistrates of the commune, and to the district inspector. The board further assist and advise the head master, co-operate with him in every way possible, and do all in their power to promote the cause of education.

The district inspectors indirectly superintend the local boards of education. By visiting the schools, and by attending the weekly meetings of the teachers, they keep

* It must be well observed that the terms lower, extended lower, middle, and higher instruction, refer solely to the subject taught, and the more or less extensive treatment of those subjects, and have no relation whatever to social rank and position.

themselves well acquainted with the general state of instruction in their districts, and give an annual report to the provincial inspector and to the State deputies.

The provincial inspectors endeavour, partly by visiting the schools, but mainly by correspondence and intercourse with the district inspectors and the local boards of education, to promote continual improvement. They also consult about scholastic affairs with the Home Minister, to whom an annual report is handed in. (Vide Titel v., Art. 52, 53, 64, 67, law of 1857).

As to the second point. The differences in religious opinion are various in Holland, but the heads of all parties unite cheerfully in upholding the State secular instruction. Ministers of all the sects are required by their respective synods, and by the law, to give in their churches weekly instruction of a formal character to the young of their own faith; and no jealousy or sullen indifference manifests itself. (On this head see the correspondence quoted by Mr. W. Chambers, page 17; see further pages, 26 and 32.)

The third point is undoubtedly of no less importance than the other two. Really good teachers, and especially educators, are nominally many, but in reality few. To understand the youthful mind, to train it, to lead it in the paths which tend to virtue, are no easy matters, and require a great deal of experience, as well as the possession of much general knowledge. Hence it is that the government will not trust the teaching of the young to men who have not been specially trained for this difficult task.

The inspectors of the several school districts constitute, under the presidency of the provincial inspectors, the provincial boards of examination.

Pupil-teachers, whether trained in one of the colleges or by the headmasters of the lower schools, are obliged to submit themselves, at the age of 18, unless exempted on the score of illness, to an examination, which, if passed, gives them their first degree, and enables them to officiate as assistant-teachers. At the age of 23 they undergo a second examination, to obtain the rank of headmaster. If preparing for the office of headmaster of a school of extended lower education, they have, besides, to pass special examinations in the subjects mentioned under *a* and *b*.

Where vacancies for public employment occur, competitive examinations are held, and the magistrates of the commune have to choose one out of the three or not more than six who have obtained the highest number of marks respectively. The examinations are conducted by the district inspector.

Having thus outlined the chief characteristics of the system of primary or lower instruction, I proceed to speak of middle instruction.

Middle instruction is a continuation either of the primary or of the extended primary course. The subjects are gone into more minutely, and are studied to greater perfection, while additional help is provided for scientific and technical knowledge.

Middle instruction, as a continuation of the lower, is given in—

(*a*.) Evening classes for the children of artisans.
(*b*.) Day schools of two years' course.

Middle instruction, as a continuation of the extended primary course, is given in—

(*c*.) Schools of three years' course.
(*d*.) Schools of five years' course.
(*e*.) Commercial and industrial schools.
(*f*.) Technical schools.
(*g*.) Agricultural schools.
(*h*.) The Polytechnic school.

The subjects taught in schools *a* and *b*, are:—Mathematics; theoretical and applied mechanics, machinery; physics and chemistry; natural history; either technology or rural economy; geography; history, ancient and modern; the vernacular tongue; political economy; geometrical and free-hand drawing; gymnastics.

The subjects taught in schools of three years' course are:—Mathematics; physics and chemistry; botany and zoology; political economy; book-keeping; geography; history, ancient and modern; Dutch, French, German, and English languages; caligraphy; geometrical and free-hand drawing; gymnastics.

The subjects taught in schools of five years' course, are:—mathematics; theoretical and applied mechanics, technology and machinery; experimental physics, experimental chemistry; mineralogy, geology, botany, and zoology; cosmography; principles of the communal, provincial, and civic organisation; political economy, with the statistics of the kingdom of the Netherlands, especially its colonies and possessions in other parts of the world; geography; Dutch, French, German, and English languages and literature; the theory of commerce, raw products and book-keeping; caligraphy; geometrical and free-hand drawing; gymnastics.

The subjects taught in the Agricultural schools are:—political economy; applied mathematics; mechanics and knowledge of agricultural implements; the arrangement and construction of farm buildings; geometrical drawing, viz., architecture and machine drawing; physics, chemistry, and meteorology; agricultural technology; mineralogy and geology; botany and zoology, general and special; structural botany and zoology; the knowledge of the external forms, races, diseases, and requirements of domestic animals; general and special agriculture—tillage, pasturage, forest and fruit-tree culture, horticulture, forcing, &c.; the rearing of cattle, comprising poultry, bees, and dairy-husbandry; agricultural book-keeping; practical agriculture, comprising forest-culture, and the management of domestic animals; colonial agriculture and forest culture.

The Polytechnic school is established to train young men for industrial pursuits, or for technologists who require a greater amount of theoretical and technical knowledge than can be obtained at a school of five years' course. For the profession or calling of civil engineer, architect, naval engineer, mechanical engineer, mining engineer, the subjects taught are—higher algebra; spherical trigonometry and analytical geometry; descriptive geometry and its applications; the differential and integral calculus; land surveying, levelling, and geodesy; theoretical and practical mechanics, with knowledge of implements; mechanical technology and the construction of implements; applied, experimental, and analytical chemistry; chemical technology; knowledge of the present state of manufactures; mineralogy and geology; applied geology and mining; metallurgy; hydraulics, roadmaking, making of railroads, building of bridges; civil architecture; naval architecture; geometrical and freehand drawing; practical exercises with tools and lathes; making of models of machinery; political economy; commercial legislation; legal enactments concerning embankments, public works, mining, and industry.

Schools for middle instruction are either public or private.

Public schools are those which are established and maintained by the communes, by the provinces, or by the Government, alone or together. All other schools are private.

Private teachers, as stated before, may compete with the Government in offering instruction of a superior or of a special character.* All private schools, however, must be classified and reported on by the public inspectors as primary or middle schools, according to the results manifested in them. Private teachers, if aggrieved by the decisions of inspectors, possess right of appeal. As a case in point, see "Verslag," p. 38.

To private establishments gratuities may be given by

* The Crown Prince of Holland was sent, in his 14th year, to a private school, Noorthij, near the Hague, in 1854.

the commune, by the province, or by the Government, under such conditions as are thought necessary by said communes, provinces, or Government. Private establishments enjoying such gratuities are virtually converted into public schools, accessible to all classes and all sects.

Every commune whose inhabitants exceed the number of 10,000 is by the law obliged to have one school of two years' course, day and evening school. In case communes establish schools of three or five years' course, evening classes for technical instruction are to be held therein, for the sake of apprentices and artisans.

The state meets the demand for scientific and technical instruction by establishing fifteen schools for middle instruction, of which at least five are of a five years' course. There is, moreover, one Government Agricultural School and one Government Polytechnic.

The expenditure of those middle schools which do not belong to the fifteen above mentioned is met by the communes, most of which are subsidized by the state.

A small fee is charged to every pupil.

In a school of two years' course the fee is not to exceed 12 florins (one guinea) per annum, and in schools of three or five years' course the annual fee is not to go beyond 60 florins (five guineas).

All pupils of the Government Agricultural School pay annually 100 florins (8 guineas), which entitle them to attend all the classes.

In case pupils wish to follow special lessons, the yearly fee is, for lessons given :—Once a week, 5 florins (9s.) ; twice a week, 10 florins (18s.) ; thrice a week, 15 florins (£1 7s.) ; four times or more, 20 florins (£1 16s.).

Pupils who attend all the classes at the Polytechnic are charged 200 florins (16 guineas) per annum.

In case pupils wish to follow single lessons, the annual fee is, for lessons given :—Once a week, 10 florins (18s.) : twice a week, 20 florins (£1 16s.) ; thrice a week, 30 florins (£2 14s.) ; four times, or more, 40 florins (£3 12s.).

The number of pupils at the Polytechnic School was, in 1865, 104.

Examinations are annual; the final examination, if successful, entitles the student to hold Government employment, as architect, civil engineer, &c.

Pupils wishing to enter a School for Middle Instruction, have to submit themselves to an initiatory examination in the subjects comprised within primary instruction.

The superintendence of the Schools for Middle Instruction is entrusted to the Minister of the Interior, aided by

(*a.*) Local boards of instruction, appointed by the magistrates.

(*b.*) Inspectors appointed by the State.

The duties of the local boards and inspectors for middle instruction are very nearly the same as those of the local boards and inspectors of lower education.

The directors and teachers (lectors) of middle instruction are appointed by the State. No person can be so appointed unless possessed of an academical degree, or of a diploma given by the commissioners of education.

In special cases the Government decides. With what care the examinations are conducted, see pages 77—93, *Verslag van den staat der Hooge Middelbare en Lagere-Scholen en het Koningryk der Nederlanden over* 1865-1866.

To conclude with a few remarks. Besides the clinical schools of medicine, veterinary schools, schools training for the navy and military service, the civil service, etc., there were in operation, in the year 1865, 21 schools of three and five years' course, attended by 1,466 pupils, taught by 219 teachers. If we keep in mind that of these 21 schools four only are government schools, and thus 11 government schools are still to be established; that besides the great number of evening schools for technical instruction, and schools of two years' course, there were at least 11 private establishments for middle instruction; that since 1865 the number of middle schools has been increased by 15 (among which is one government school of five years' course), there can be no doubt that for a population of 3,493,611 inhabitants ample provision has been made, and that within a few years middle and technical instruction will be as general as lower instruction is at present.

The expenditure of the government is 35,766,793 florins (£30,429), from which amount is to be subtracted the surplus of the school fees, amounting to 3,616,014 (£3,077). The expenses are thus 32,150,779 (£27,362).

During nearly four years I was resident in Holland; but for the foregoing notes I am indebted to several friends, and chiefly to Mr. C. P. van Tiel, of Westzaan, now in London, whose attainments as a teacher, and whose intimate knowledge of English, are guarantees for the accuracy of the statements.

Fine Arts.

Fine Art Exhibition at Amsterdam.—An exhibition of the works of living artists, Dutch and foreign, is announced to open on the 7th September, in the present year, at Amsterdam, and to close on the 5th of October, unless the directors see reason for extension of the time. The exhibition is under the joint management of the authorities of the town of Amsterdam and the Council of the Academy of the Beaux Arts. The programme includes painting, sculpture, architecture, engraving, and drawings, but no copies will be admitted, whether in oil or otherwise. The Commission retains the power of admission or rejection, but liberally offers to pay the cost of transport of works sent by the ordinary means, but not by express. The time of reception is between the 10th and 24th of August, and the works are to be accompanied by a letter to the Commission de l'Exposition Local de l'Académie des Beaux Arts, Oudemanhuispoort, B 106, containing the names in full, and the address of the artist, and (if for sale) the price of the work. The municipal authorities give six gold medals, of the value of one hundred florins each, but exhibitors may compete or not, as they please.

Manufactures.

Preparation of Coffee.—The *Colombo Observer* says: —"Few perhaps have any idea of the trouble and expense required to bring the coffee into the state in which it passes into the hands of the retail merchant. When ripe, the berry is of a deep red colour, and much the same size and shape as a cherry, and hence the planter designates it cherry coffee. Like that familiar fruit, too, it contains a juicy pulp wrapped in a delicate skin; but here all resemblance ceases, for the juice of the coffee is sticky, and by no means agreeable in taste or flavour, and instead of enclosing one seed it envelopes two, each of which has a tough membranaceous cape or covering, called the parchment. It will be observed, therefore, that the bean has to be relieved of two coats, viz., the pulp and the parchment. The process of pulping is generally performed by machinery on the estate, while the fruit is fresh, as, if allowed to lie, the pulp ferments and impairs the flavour of the seeds. When the pulp has been got rid of, the parchment is found covered with a tenacious coating of the juice, which is removed by maceration and washing in water. When quite clean, the coffee is taken out of the troughs, spread on a raised platform called the barbacue, and exposed to the sun until dry. At this stage the coffee leaves the hands of the planter, as few except native growers attempt to remove the parchment, which is usually done by the aid of steam machinery. The agent used for this purpose is a huge solid iron wheel, that trundles round on its edge in a circular trough, like the pug mill used by bricklayers for preparing their mortar. The coffee is laid in the trough, and the action of the wheel tears and removes the parchment; the coffee being transferred to a fan, the shreds are blown away, while the beans descend into a

recess, from which they are lifted by machinery into the hopper of the sizer. The sizer consists of a long wide tube of wire netting, placed in a slanting position, so that the coffee may slide down towards the lower end, and revolving slowly on an axle so as to cause the beans to pass through the netting. The meshes gradually increase in size towards the bottom of the tube, so that the small beans pass through first, while the larger ones travel downwards until they find an opening sufficiently large to permit of their escape. Troughs placed below receive the coffee as it drops through the netting, and by this simple contrivance a vast amount of manual labour is saved in sorting the batch according to the size of the bean. Hand-picking is afterwards resorted to for the removal of bad or bruised beans. It will thus be seen that coffee requires a great amount of labour in its preparation. Indeed, we may safely say that, besides the mechanical operations, every single bean has to be looked at and handled before it is fit for roasting and grinding."

Commerce.

Discovery of New Oyster Beds.—A letter from Ostend, in the *Organe de Namur*, gives an account of a discovery of some importance. The writer states that, during the late storms, some English fishermen were driven from the neighbourhood of Calais towards Ostend, and, having kept their nets in the water to lessen the speed of the vessel, were astonished on raising them to find them full of magnificent oysters. Having transferred the oysters to a Billingsgate boat, the fishermen returned to the same ground, and for several weeks obtained an abundant harvest. The beds are reported to be about four leagues from land, and at a spot whence Ostend and Blanckenberghe are perfectly distinguishable. It is said that new oyster beds are being discovered every day, and that the quantity of oysters is incalculable.

Cultivation of Tobacco in Germany.—In Germany the cultivation and sale of tobacco are subject to no restriction, but the land on which it is grown is subject to a very light tax, proportioned to the quality of the soil; Prussia may be taken as a type of the German system. and in that country the procedure is as follows:—The tobacco fields are divided into four classes, the first being estimated to produce 9 quintals per *morgen*, the second 7½ quintals, the third 6 quintals, and the forth 4½ quintals. The tax is reckoned at 3·50 frs. per quintal, but is calculated on the acreage (a morgen being equal to about five-eighths of an acre). Thus a morgen of the first class land pays 31·50 frs., of the second class 25·75 frs., and so on. A plot of ground of less than six square rods pays nothing. In 1866 there were in Prussia 1,690 morgens of land of the first class, 13,276 morgens of the second, 8,093 of the third, and 1,027 of the fourth class; in all 24,086 morgens subject to duty, and 1,449 morgens, in small lots, free of duty. These figures are less than those reported ten years ago; a fact which shows that more foreign tobacco is smoked, for it is not probable that the average consumption in 1866 was smaller than that in 1856, when it amounted to 3 lbs. per head. The import duty is about 1¾d. per lb.

State of Trade in the Potteries.—The *Staffordshire Sentinel* says:—"The total amount of our foreign trade in earthenware and china still continues to fall far short of the corresponding period last year. The aggregate number of crates exported in January, 1868, was 9,114, against 9,813 in January, 1867; and the total number of casks exported was 2,902, against 4,834. Thus the entire number of packages exported was 12,016, against 14,647, a decrease of 2,631. The full effects of the declension are not yet felt in the production of wares, for manufacturers have not diminished the work given out to their hands to an equal extent with the decline in actual sales, as is clear from the important fact that large numbers of packages have been sent off from the Potteries which have not been exported. Indeed, the wharves and warehouses of the Anderton Company, at Runcorn, are crammed with goods awaiting final orders for shipment. Not fewer than 10,000 crates, &c., are said to have accumulated there, which it is not yet deemed safe to export. The plethora is so great as to be scarcely capable of increase from the want of space, which indicates the probability of a decrease in production, were it for no other reason than this, that there is not room to stow away the unsold goods. The returns of the total number of packages exported in January, compared with those of December, are 12,016 against 12,918, a decrease of 902. But the decrease does not continue in the same ratio as in December compared with November, when the decrease was 2,541. The tide, however, still continues to ebb, though not to the same extent. As the chief declension continues to be in our exports to the United States, it affects the trade of the central and northern parts of the Potteries chiefly, they being the principal seats of our manufactures for the American market. The extremely quiet state of the demand in the home market operates most powerfully on the works in which the superior classes of goods are made. In Longton, where common china goods for the home market are extensively made, there is a much better supply of work than in other towns. The potting trade, it is sometimes said, is one of the last to decline and to revive in this country; and, as there is a decided improvement in some other staple trades in Great Britain, it may be hoped that as the spring advances the demand for earthenware and china will improve."

International Maritime Exhibition at Havre.—Mr. Frederic Bernal, Her Majesty's Consul at Havre, in a letter to the *Times*, calls attention to the above Exhibition, already noticed in the *Journal*. It is to open on the 1st of June, and the time of receiving applications for space has been prolonged to March 10. He says:—"I was sorry to learn from the secretary, that although some demands for admission had been received from Great Britain, including entries in three classes made by me on account of the Board of Trade, yet the number fell far short of what had been reasonably expected. I think this is a great mistake on the part of all who are connected in any manner with our mercantile marine, and can only attribute it to their being unaware of the wide scope and importance of the above exhibition. It has been taken under the immediate patronage of the Emperor and the Prince Imperial; it has excited the greatest interest in the seaport and other important towns of France, and I see that an influential committee has been formed in New York to organise a proper exhibition of American naval objects and appliances. The building will consist of a covered gallery in the form of a square, enclosing a large open space, and the whole area will comprise about 12½ acres. The rates to be paid by exhibitors, varying according to locality, are moderate. There will be in all 43 classes, embracing every description of article connected with ships and seamen. Practical trials of lifeboats, and other life-saving apparatuses, will be made. Apart from the more serious business of the Exhibition, but in connexion with it, there will be nautical fêtes and regattas, and there will also be a large salt-water aquarium, which will represent 'Fingal's Cave,' and will without doubt form one of the most interesting objects in the exhibition. Such an exhibition, held in the 'Liverpool of France,' at our very doors, ought to possess very great attractions for a maritime nation like Great Britain, and I yet venture to hope that we may be better represented thereat than at the present moment appears likely. Persons requiring further information can receive the same on application to me."

The Russian Tariff.—An inquiry is now proceeding relative to the revision of the Russian tariff. The cotton-spinners are vigorous supporters of the present protective system, and the following is the statement given in the *Voix* of St. Petersburg, of the working of the present

tariff in their case:—The existing rates of duty were established in 1822, and between 1844 and 1864 the importation of cotton yarns fell from 600,000 to 72,000 pouds per annum, while raw cotton, on the contrary, has followed the opposite course, and amounted, in 1866, to nearly 2,500,000 pouds. The present import duty on cotton yarns is higher than the cost of Russian manufactured yarns, consequently, the tax on the population generally is a very high one, and there seems no doubt that it will be altered. The free-trade organs of St. Petersburg speak confidently as to the future; they say that the great reforms recently made have had an extraordinary effect upon the economic condition of the country; the growth of the income from customs and other indirect taxes is remarkable; the increase in 1867, as compared with the previous year, having been nearly six millions of roubles, showing an increase in the consumption of articles not of prime necessity, and consequently in the condition of the population. At the same time the increased imports of raw materials and machinery show that the home trade has not suffered by the increased imports of manufactured articles; and the extent of land in cultivation is said to have increased since the emancipation of the serfs.

Notes.

Great Organ for Notre Dame.—The French Government has ordered a very powerful organ of Messrs. Caville-Coll for the cathedral of Nôtre Dame, the restorations of which are just completed, and a special commission has been appointed to watch over and receive the work. The commission includes the composers Auber, Thomas, and Rossini, M. Benoist, professor of the organ at the Conservatoire, Baron Séguier, of the Academy of Sciences, several dignitaries of the Church, the Director of the School of Religious Music, M. Viollet-le-Duc, the architect, and several officials.

Agricultural Exhibition at Brussels.—The Société Agricole of Brabant announces a great exhibition of cattle and implements, to take place in Brussels in the middle of the month of June next. The mechanical portion of the exhibition is to be universal. By a royal decree there is to be a lottery established for the purchase of implements, which are to be distributed by lot amongst the subscribers. This is, we believe, the first time that a lottery has been established in the interest of agriculture.

Sale of the Late Paris Exhibition Building.—The iron portion of the building in the Champs Elysées has been sold to a company of contractors, for the sum of £60,000; it is not yet known what is to be its future destination.

Population of Italy.—The total population of Italy, according to the last census, was 24,231,860 persons. The density of the population is 85 persons per square kilometre (about 247 acres); of these there are 12,128,824 males, against 12,103,036 females (an excess in favour of the males of 25,788 persons). As regards age, there were 3,788,513 children under six years of age; from 6 to 24 there were 8,376,884 persons; 10,452,613 from 24 to 60; and 1,623,304 persons above 60 years of age. The proportion of married against single is 8,556,175 to 14,052,381; and 1,623,304 widows and widowers. Of the single there is a difference of 690,901 in favour of the males; there are 498,354 widowers, against 1,124,950 widows. As regards occupations, more than one-third of the entire population (8,292,248 persons) are engaged in agricultural pursuits; 3,923,631 in manufactures and commerce; 58,551 in mining; 549,293 in professions; 174,001 priests and ministers of religion; 147,448 in government and public employment; 242,386 soldiers, pompiers, police, forest keepers, and rural police; 520,686 domestics, &c.; 759,771 landed proprietors; 305,343 poor (in the strict sense of the word); and 9,258,502 persons without definite occupation, and in great part aged persons and children. There are 5,167,480 families in Italy distributed in 3,766,204 houses. Of the language spoken, 23,958,103 persons use Italian; 134,435 French; 20,393 German; and 118,929 persons spoke other languages such as Greek, Albanese, and Slavonian. The number of persons of the various religious denominations was 24,167,855 Roman Catholics; 32,932 Christian Dissenters; 29,233 Jews; and 1,850 professing other religions. Italy contains 8,856 communes, of which 2,663 have a population of less than 1,000 inhabitants, and only 9 with a population exceeding 100,000. The average population of the communes is 2,830 persons.

Correspondence.

National Musical Education.—Sir,—I observe that neither in the 1st nor in the 2nd report is there any allusion to our training colleges for schoolmasters and mistresses, as channels through which the musical education of the masses may be effected. Now, I feel assured that if your scheme can be so applied as to carry efficient musical instruction into these institutions, you will at once find a ready and effectual means of distributing its advantages throughout the country. Every elementary school which is happy enough to secure the services of a well-trained and efficient teacher of music in the person of its master or mistress, quickly becomes a musical centre, from which the whole parish (rich and poor) is gradually trained to appreciate, to love, and frequently to seek the culture of music. There is already strong inducement for the students at the training colleges to acquire music if they can, for a good knowledge of the art is now almost invariably desired by managers of schools in search of teachers, and considerably higher stipends are obtained by those who can train a choir and conduct a singing class. But there is generally great difficulty in obtaining systematic instruction in the theory and practice of music in these colleges, and hence the knowledge acquired is, for the most part, of a very imperfect kind, and their subsequent attempts to teach music are often abortive, if not positively mischievous. I most heartily hope that you may be able to do something in this direction, even if my suggestion be thought impracticable.—I am, &c., Thos. Bacon, Secretary to the Winchester Diocesan Training School.

Kingsworthy-rectory, Winchester, Feb. 20, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon......Farmers' Club, 5. Mr. George Jackson, "Would not the make of English Cheese be generally improved by the introduction of Cheese Factories?"
R. United Service Inst., 8½. Major W. H. Ross, R.A., "Field Artillery on the Connected System."
Society of Engineers, 7½. Dr. Cullen, "On the Surveys of Proposed Lines for a Ship Canal between the Atlantic and Pacific, on the Panama Railroad, and on the Darien Ship Canal."
Royal Inst., 2. General Monthly Meeting.
Entomological, 7.
British Architects, 8.
Medical, 8.
Victoria Inst., 8.
Social Science Assoc., 8. Rev. Henry Richard, "On Standing Armies, and their Influence on the Industrial, Commercial, and Moral Interests of Nations."

Tues ...R. Inst. Mr. Geo. Scharf, "On Historical Portraiture."
Civil Engineers, 8. Mr. C. P. Sandberg, "On the Manufacture and Wear of Rails."
Pathological, 8.
Anthropological, 8.
Syro-Egyptian, 7½. Mr. D. Smith, "On the supposed Alphabet lately discovered on the Slabs from Nineveh."

Wed ...Society of Arts, 8. Mr. John Randall, "A Workman's Views on Technical Education."
Pharmaceutical, 8.
R. Society of Literature, 4½.
Obstetrical, 8.

Thur ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. Mr. Roland Trimen, "On Mimetic Analogies among African Butterflies."

Chemical, 8. 1. Messrs. Wanklyn and Chapman, "Action of Oxidising Agents on Organic Compounds, &c." 2. Dr. Stenhouse, "On Chloranil, and on the Action of Nitric Acid on Picramic Acid." 3. Mr. W. H. Perkin, "On Hydride of Aceto-salicyl."
Royal Inst., 3. Mr. George Scharf, "On Historical Portraiture."
Society of Fine Arts, 8. Mr. F. Y. Hurlstone, "On Satire."
R. Society Club, 6.
Artists and Amateurs, 8.
FRI.......Geologists' Assoc., 8.
Philological, 8.
Royal Inst., 8. Mr. Kingdon Clifford, "On some of the Conditions of Mental Development."
Archæological Inst., 4.
SAT ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 16th January*, 1867.

SESSION 1867.

516. Railways—Return.
580. County Treasurers (England and Wales)—Abstract of Accounts.

Delivered on 17th January, 1868.

Prison Discipline (Colonies)—Digest and Summary.

SESSION 1867.

471. (I.) Fire Protection—Index to the Report.

Delivered on 20th January, 1868.

SESSION 1867.

507. (I.) Health of the Navy—Statistical Abstract.

Delivered on 23rd January, 1868.

4. Provincial Workhouses—Letter and Report of Dr. Edward Smith.

SESSION 1867.

431. (A. VII.) Poor Rates and Pauperism—Return (A).

Delivered on 28th January, 1868.

Trades Unions and other Associations—Report by the Examiners.

Delivered on 30th January, 1868.

33. Education—Report by Professor Levi.
46. Lighthouses, &c.—Reports.

SESSION 1867.

497. (I.) Oxford and Cambridge Universities Education Bill—Index to the Report.
526. Local Taxation—Returns.
561. Coals—Return.

Delivered on 31st January, 1868.

22. Bill—Church Rates Regulation.

SESSION 1867.

Public Petitions—Index.

Delivered on 5th February, 1868.

43. Court of Session (Scotland)—Returns.

SESSION 1867.

431. (B.) Poor Rates and Pauperism—Return (B).
563. Lancashire and Cheshire Steam Coals—Report.

Delivered on 8th February, 1868.

16. East India (Weights and Measures)—Report.
37. Metropolis Rates—Abstract of Returns.

SESSION 1867.

205. (I.) Waterford County Election Petition—Index.

Delivered on 11th February, 1868.

17. Metropolitan Board of Works—Returns.
45. Metropolitan Board of Works—Report.

Delivered on 12th February, 1868.

SESSION 1867.

565. Iron-plated Ships and Batteries—Return.

Delivered on 13th February, 1868.

26. Bill—Public Departments (Extra Receipts).

SESSION 1867.

545. Taxes and Imposts—Returns.

Delivered on 15th February, 1868.

50. Election Petitions Trial—Letter from the Lord Chief Justice.
Inland Revenue—Eleventh Report of Commissioners.

SESSION 1867.

211. (I.) Tipperary Election Petition (1867)—Index to the Minutes of Evidence.

Delivered on 17th February, 1868.

51. Post Office (Anthony J. Duffy)—Correspondence.
53. Local Taxation, &c.—Returns.
73. Educational Statistics—Letter from the Rev. C. A. Stevens.

Delivered on 18th February, 1868.

28. Bill—Habeas Corpus Suspension (Ireland) Act Continuance.
70. Public Income and Expenditure—Account.
72. Railway Bills, &c.—Report of the Board of Trade.
Agricultural Returns for 1867.

Patents.

From Commissioners of Patents' Journal, February 21.

GRANTS OF PROVISIONAL PROTECTION.

Aërial locomotion, obtaining—412—P. E. Masey.
Barytes, &c., separating powders of sulphate of—437—J. E. Billups.
Baths, floating saloon—222—J. Dixon.
Baths, vapour—409—B. M. Oakeshott.
Bedsteads, metallic—433—J. Key and E. Hoskins.
Blinds, raising and lowering—415—J. O'Donnell and T. Arkill.
Boilers—385—W. E. Newton.
Bottles, &c., stoppers for—383—P. Graham.
Braces—429—J. Nixon.
Bricks, tiles, &c.—387—T. W. Walker.
Buttons, &c.—395—W. E. Newton.
Cotton, &c., doubling—177—J. Whiteley.
Drain pipes, &c., trapping and ventilating—404—J. Honeyman, jun.
Drill braces, &c.—406—J. C. Cole.
Engines, &c., locomotive—381—A. C. Sterry.
Envelopes—413—H. W. Hart.
Fabrics, finishing paper and textile—416—S. Read.
Fabrics, looped and textile—417—J. and J. Cash.
Fibrous materials, preparing—411—W. Tongue.
Fire-arms, breech-loading—2846—C. Avery.
Fire lighters—407—J. T. White.
Furnaces, burning combustible liquids in—393—H. Bunning, jun.
Gauges, steam—405—W. E. Newton.
Grain, drying—379—T. Scott.
Healds for weaving—435—W. Brooke and R. Edmondson.
Iron and steel—397—J. A. Jones.
Knitting machines—2877—J. H. Johnson.
Locks—422—W. R. Lake.
Looms, &c.—414—C. and C. H. Longbottom.
Lubricators—389—S. G. Taylor.
Matches—401—A. E. Borgen.
Paper, manufacturing—331—C. H. Roeckner.
Pipes, &c., rain-water—420—G. Tucker.
Ropes, &c., winding—391—F. Ardache.
Scaffolding, &c.—424—G. Harford.
Sewers, &c., constructing—426—T. Walker.
Sewing machines—408—G. F. Bradbury and T. Chadwick.
Shuttles—403—H. Brindle.
Smoke, &c., consuming—293—T. Hydes and J. Bennett.
Soap, cutting—399—C. W. Guttridge.
Steam, apparatus for condensing—402—W. J. M. Rankine and J. M. Gale.
Steel, &c., compressing, &c.—423—J. B. Wilson.
Steel, &c., powder for polishing—425—A. McKnight.
Thrashing machines, removing straw from—312—G. Thornton.
Valves, regulating—427—P. Rothwell.
Wood, &c., cutting—421—W. Drake.

PATENTS SEALED.

2413. J. McIntyre.
2414. J. L. Norton & G. Hawksley.
2421. E. A. Dana.
2422. J. Varley.
2425. A. and E. Wigzell.
2431. W. R. Lake.
2432. P. Kniaghininsky, P. Galahoff, and N. Ossipoff.
2434. W. Berry.
2436. E. Sonstadt.
2440. J. W. Webb.
2454. W. T. Watts and D. J. Fleetwood.
2468. A. McN. and M. A. Wier.
2476. J. A. Brown.
2477. W. J. Matthews.
2488. W. R. Pape.
2504. J. K. Smythies.
2553. J. Eichhorn.
2628. H. M. Mellor.
2685. A. Ziegele.
2686. H. Forbes.
2691. P. H. Colomb and F. J. Bolton.
2734. F. Meyer and W. Wainwright, jun.
3106. A. V. Newton.
3688. A. V. Newton.

From Commissioners of Patents' Journal, February 25.

PATENTS SEALED.

2435. W. C. Thurgar.
2450. W. Pedder.
2464. J. and R. D. Paulin.
2465. W. Muir.
2484. C. Gelstharp.
2486. H. Vallance.
2487. C. Tessier.
2494. E. Y. Robbins.
2496. E. T. Archer.
2522. F. Versmann.
2528. A. M. Clark.
2529. J. G. Tongue.
2547. W. R. Lake.
2548. C. E. Brooman.
2590. P. R. Couchoud.
2683. A. M. Clark.
2710. A. Taylor.
2739. J. H. Johnson.
2799. J. H. Johnson.
2973. W. Brookes.
3358. A. V. Newton.
3633. J. Davidson.
3662. W. E. Newton.
31. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

466. T. Ogden.
559. J. M. Hart.
481. R. Willison.
488. C. V. and A. O. Walker.
504. G. Sinclair.
548. M. B. Nairn.
522. J. Howard.
581. J. Park.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

500. W. Whalley.
518. C. Beslay.
516. J. Wilson.
484. J. Howard & E. T. Bousfield.
453. A. Barclay.
486. J. Young.

Journal of the Society of Arts.

FRIDAY, MARCH 6, 1868.

Announcements by the Council.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

March 11.—"On Courts of Arbitration, and the Principles of Co-operation, as means of bringing into Harmonious Action the Interests of Capital and Labour." By Thomas Beggs, Esq. On this evening Wm. Farr, Esq., M.D., F.R.S., will preside.

March 18.—"On Railways and their Management." By Robert F. Fairlie, Esq.

March 25.—"On Horse as an Article of Food." By A. S. Bicknell, Esq. On this evening Sir John Lubbock, Bart., F.R.S., will preside.

Cantor Lectures.

The following is the syllabus of a course of four lectures "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," to be delivered by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture I.—Friday, March 13.

Chloride of Sodium, or Common Salt,—Its extraction and composition. *Sodium*—Its manufacture and employment in the production of aluminium, magnesium, and gold. *Chlorine*—Its preparation and properties, and especially its action on certain metals. Illustrations.

Lecture II.—Friday, March 20.

The Bleaching Properties of Chlorine.—*Bleaching Powder*, its manufacture and application to the bleaching of calico, linen, and paper pulp; the manufacture of chloroform, &c. Illustrations.

Lecture III.—Friday, March 27.

Chlorine and its Compounds with Oxygen.—*Chlorate of Potash*—Its manufacture and remarkable properties. *Hydrochloric acid*, or spirit of salt—Its production and applications in Arts and Manufactures, viz., galvanizing of iron, sal ammoniac, chloride of tin, &c. Illustrations.

Lecture IV.—Friday, April 3.

The Conversion of Chloride of Sodium into Carbonate of Soda.—The decomposition of common salt into hydrochloric acid and *sulphate of soda*, Glauber's salt; the transformation of this compound into *soda ash*, *soda crystals*, and *bicarbonate of soda*, Ballard's process; and the important and recent discovery of the utilisation of soda waste, &c. Illustrations.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture. Tickets for this purpose are forwarded to each member with this number of the *Journal*.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Saturday, February 15th. Present—Mr. Harry Chester (in the chair), Mr. Samuel Gurney, M.P., Mr. E. C. Tufnell, and Mr. G. F. Wilson, F.R.S.

Mr. Frank Whitaker, architect, of Westminster-chambers, attended to give information with respect to a projected meat and general market at the West-end of London, and, in reply to the interrogations of the Committee, stated that he had given attention to the subject of the food markets of London. He had more especially considered it with reference to the affording of facilities for bringing meat, vegetables, poultry, &c., to London, to a site where such a concentration of the ordinary railway system of the kingdom existed as would give the most favourable means for the distribution of provisions around London, as well as meet the wants of a very large and populous district of the metropolis in the immediate vicinity of the proposed market, whereby the expenses of re-carriage would be diminished, and trouble saved to the dealers in the various kinds of provisions. At the present time the butchers of Richmond had to get up at two o'clock in the morning in order to be at the meat markets by four. If the meat markets were placed in contiguity with the railways a great deal of that inconvenience, he thought, might be obviated. The railways would then have the power of receiving the goods into the market and reshipping them round London, by which, he imagined, a considerable amount of expense, which the public had to pay for now in the price of the provisions, would be saved. In other words, if the articles could be brought into the market cheaply they could be sold cheaply. It was considered that great advantage would be derived from having a general provision market established in connection with the inner circle of railways round London, in regard to facilities of distribution to the suburbs, as well as affording great accommodation to the inhabitants of the west and south-west districts of London in the purchase of provisions.

The Chairman inquired whether Mr. Whitaker was acquainted with the existing markets of London?

Mr. Whitaker replied he was, and also with some of the larger provincial markets, and he had seen the market in Birmingham. The proposed market, being on the banks of the river, would afford great facilities for the fish trade; but the great bulk of fish now brought to London was carried by the railways. The business in fish carried by the various railways was very large indeed.

He had been favoured by Mr. Forbes with the returns of the Chatham and Dover Railway, which showed that they carried as much as 1,700 tons of fish per annum for the London market, delivered at the stations at Blackfriars and Victoria. His plan had not yet been launched, but would be so very shortly, as a limited liability company; and from the managers of the railways most interested in it, viz., the London and Brighton and the Chatham and Dover, he had received letters stating they would give every possible encouragement to the undertaking, although they would not assist in a financial point of view.

A conversation ensued with respect to the evidence already before the Committee as to the mode of conducting the fish trade in the purchase of the fish at the outports, by agents located there for the purpose, and its consignment to the Billingsgate salesmen. The recent evidence of Mr. Charles on this subject was referred to, also that with regard to the failure of Hungerford market, and Mr. Whitaker stated that he thought one element of success with regard to the fish trade in the projected market was to be found in the fact that the fish would be brought direct into the market by the railways, by which the serious delays in the delivery, which were spoken of by Mr. Charles, would be obviated.

Mr. Whitaker then proceeded to lay before the Committee the details of his plan. The proposed site of the market, he said, was in the Victoria-road, adjoining the York-road Station of the Chatham and Dover Railway, and about a quarter of a mile from the Victoria Station. This site at Battersea was within very easy reach of the whole of the West-end and south of London, and communicated with the Brighton and South-coast, the South-Western, Great Western, and West London, the Chatham and Dover, the South-Eastern, and Metropolitan Railways. The land, which comprised an area of 5½ acres, was already in the possession of the promoters, but in the financial difficulties of the country the scheme had been allowed to lie dormant; but, under the promised countenance of the railway companies, there was every prospect of its being speedily carried out. The market would be reached on the rail level of the Brighton line at Battersea, and the goods could be brought from all parts of England direct into this depôt whence they could be reshipped all round London; and the dealers and purchasers could come up at all times, buy their goods, and go back with them. There would be a wharf by the side of the Thames for the landing of goods brought by water carriage; and it was thought to be an advantage with respect to the foreign cattle trade that the animals should be brought up to this market in barges constructed for the purpose, and slaughtered, some of the arches of the railway viaduct being utilised for abattoirs, and others for vegetable stores, &c. He had no doubt the railway companies would establish market trains. Within a circuit of one mile round this site there was at present a population of 250,000, and building was now going on to such an extent that what were fields one day were, in the next three months, covered with houses. This vicinity was largely inhabited by the artisan classes, to whom such a market could not but be a very great accommodation and benefit, because in this district there were scarcely any shops, and those of an inferior kind. On Saturday nights the Wandsworth-road was a perfect fair, from people coming from all the district round to purchase their provisions, when, for about a penny fare by the railway, they could go to this market and purchase their goods to greater advantage.—[Mr. Whitaker laid before the Committee a plan of the proposed market site, and pointed out the principal features of the surrounding locality. He also produced a drawing of the elevation of the projected building.]—The capital, he said, would be £120,000, to be raised in £60,000 shares of £2; and, as the company would be incorporated under the Joint Stock Companies' Act of 1862 and 1867, no application to Parliament would be necessary to carry out the undertaking.

Mr. Tufnell remarked that the existing toll on Chelsea-bridge would be a great objection in reference to this scheme. The toll was only removed on Sundays and Good Fridays.

Mr. Whitaker said he was not aware of the value of the tolls of that bridge, but being in the hands of the government, he did not think that would be allowed to stand in the way of so great a public benefit to that district of London. They had the densely-populated neighbourhood of Vauxhall on one side of the river, and the wealthy neighbourhood of Belgravia on the other; and people might come from Clapham to this market for 2d. He considered such a market would be of advantage to the inhabitants of the West-end. If they had a good market in their own vicinity, they would not go to the City markets for their articles. His idea in this scheme was that of combining Covent-garden, Billingsgate, and Newgate, in regard to the provisions brought there, and thence distributed to that part of London and its suburbs—meat, poultry, fish, vegetables, milk, &c. He had had no communication with the great meat and fish dealers of London on this subject, and it was probable they might oppose any innovation of this kind; but he thought all these things would work themselves round in time. The railways, he thought, would exercise great control in the matter. They would say, "We bring you the things, and you must fetch them away." According to the evidence of Mr. Charles, fish was sometimes kept at the railways till 2 or 3 o'clock in the afternoon. In this case they had only to buy the goods and take them away.

The Chairman remarked that a great deal of fish was brought up to London at three or four o'clock in the afternoon. Of course, a market in connection with the railways would facilitate the distribution of that fish. He inquired at what cost Mr. Whitaker expected to purchase the site of 5½ acres he had spoken of?

Mr. Whitaker believed the land could be obtained at £3,000 per acre, which was about the price the Brighton Company paid for it. At the smallest calculation, he believed the return upon the capital would be from seven to eight per cent. A great portion of the income would be derived from the rents of the shops and stalls, which he averaged at about £20 a year each, and, as the Market Company would be the salesman of the produce, a large commission for agency would also be available. There was a large amount of market gardening carried on in the district, and the railway arches would afford large storage room for vegetable produce brought to the market. With regard to the supply of meat, that article could be brought from all parts of England direct to the spot. Live cattle could be brought to the market in barges, direct from the vessels in which they were brought from abroad. He was aware that there was a proposition before Parliament to have a separate market for foreign cattle. That was proposed to be near Millwall Docks, and was proposed with a view of slaughtering the animals on the spot where they were landed. He thought, if the animals were brought to this market in barges, there was nothing to fear from contagion, because they would be killed, and there was an end of them. He could not imagine a site more eligible for a market in all respects. There was a splendid supply of water, and first-rate drainage, as the main drainage ran through the site. They had gas to any amount, and they had a large population all round. The project would shortly be brought out as a limited liability company, and would not require an Act of Parliament. It would be to the interest of the railway companies to promote the scheme as far as possible. On the subject of the alleged injury to live cattle by re-shipment, he stated that flat-bottomed sea-going vessels might be constructed to bring cattle from distances like Dieppe, which, by being fitted with lowering masts, could pass through the bridges, and the cattle could be brought up to the company's own wharf without re-shipment or being driven through London.

Mr. Whitaker remarked that the establishment of such

a market would be a matter of great public importance and benefit with regard to the population of one side of the river only.

The Chairman observed that another project, which had been laid before the Committee for a market in the vicinity of Paddington, was considered to be open to the objection, that, as it was not proposed to be in immediate connection with the railway it would involve as much re-shipment of the goods as if it were miles away from any railway. There could be no question as to the advantages of this proposed site in regard to the great facilities of railway communication which it would afford.

Mr. Whitaker handed to the Chairman the report of meat, fish, &c., carried by the London, Brighton, and South Coast, and the London, Chatham, and Dover Railways, for which he said he was indebted to the managers of the two railways, Mr. Hawkins and Mr. Forbes.

Statement of Cattle, Fish, Meat, &c., brought into London during the Years 1866 and 1867 :—

London, Brighton, and South Coast Railway.

	1866.		1867.
Cattle	167	...	238
Calves	81	...	322
Sheep	9,141	...	8,745
Pigs	163	...	47
Milk	409,912 gals.	...	409,734 gals.
Fish	3,569 tons	...	3,287 tons
Eggs	5,635 „	...	4,187 „

London, Chatham, and Dover Railway.

Meat	288tons	Beasts	37
Fish	1,768 „	Sheep	6,964
Fruit & Vegetables	12,055 „	Pigs	16

The Committee thanked Mr. Whitaker for the information he had given them.

Mr. Robert Walker then gave evidence in reference to a market scheme as follows:—He stated that he was a member of the Society of Arts, and by profession an architect. He had given attention to the subject of markets in London from having read the proceedings of the Committee from time to time, and having been connected with various projects for markets. He was at present connected with a project under the title of the Suburban Market Company, the object of which was to erect about eight market places as an experiment in different most populous suburbs of London. That company was at present advertising for information with respect to sites adapted for the purposes in view. Two sites were already in contemplation in the South of London, viz., at Walworth and at Brixton. The object was to start these markets, and to build market-places on a small scale, at a cost of about £3,000 each, keeping in view the desirability of having them situated as near as possible to good local railway termini. The plan was, to let the stalls in the markets to the highest bidders. It was calculated they would bring from £30 to £35 a-year each—shops or stalls with counting-houses; and, the company paying the rates, and gas, and water, this would leave a net rent of about £20 a year each. The company would have no more to do with the market than as lessors of the shops or stalls; it would be purely a building speculation on the part of the company. It was proposed that these markets should, where practicable, be in connection with the railways, so that the supplies might come to them direct from the great centres of London, or from the country. The main support which the company looked for was in respect of the meat trade. There were large farmers in different parts of the country who sent up dead meat to London. It was anticipated that many of them would take a stall in each of these markets, or make an election of one or more markets to which they could send their meat direct, and save the expense of the salesmen. This project was suggested to those who had taken the initiative in it by a leading article which appeared in the *Times* last October, which stated as follows:—"We think we can see one defect which ought to be at once remedied. The trade is not quite open enough, for lack of sufficient centres of supply. We ought, in fact, to have many more markets. It ought not to be necessary to traverse the City in order to make use of such a remedy. In French towns markets are multiplied, and are within the reach of every one, and a similar advantage ought to be afforded us in London." On the strength of that article this company was projected; the shares were £5, and the proposed capital £20,000 or £25,000. If shares to the amount of half the cost of one of these market buildings were taken in any locality, then the company proposed to build a market. This kind of support had been promised by persons in Brixton. Of course he anticipated opposition to this project; and in some cases the support which was promised had been withdrawn.

The Chairman inquired whether the company in question had at all entertained the idea of taking any of the existing local markets and working them; for instance, Farringdon, which had failed, and Oxford-market, which was only a partial success. Had any attempt been made by the company to utilise the markets which exist?

Mr. Walker replied that he had looked at both the markets with that view. Farringdon was too large an affair for the company to touch. He thought both those markets were in the wrong place; his own opinion was, that every market should be in the main line of thoroughfare. Unless they were on the principle of the doors being open to the public, they were failures, and a market to be successful should be near to a railway terminus. One or two of the railway companies which had disposed of surplus land near stations, had been the means of making small markets; and exorbitant rents had been asked for small pieces of land which they let. It was proposed to have from 30 to 40 stalls in each of these market buildings. The principal thing the company looked to was for people in the provinces to take stalls and send their produce consigned direct to the market. He thought with regard to fish there might be some difficulty; but it was believed that farmers and graziers who killed their meat in the country would send it direct to this market. Fish, no doubt, would have to be brought from the large central market, as was done now, but the public would be able to buy fish cheaper at a market of this kind than they could at the fishmongers' shops.

The Chairman inquired whether the company had had any communication with the Royal Agricultural Society, as, he said, it was desirable to have their co-operation in any useful improvement of the market system.

Mr. Walker replied that he had not yet communicated with that society, but he should be glad of the opportunity of doing so. He believed this plan would come before the public in a definite form in the course of a few weeks. The principal difficulty hitherto had been to get appropriate sites.

Mr. Tufnell inquired whether any site was contemplated in the neighbourhood of Paddington.

Mr. Walker replied in the negative. The intention, he said, at first was to purchase the land, but as they ascertained that freehold land as a rule would not pay more than three or four per cent., and as that was a small profit for a speculation of this kind, the company determined, if they were unable to buy freehold land on advantageous terms, to purchase leaseholds; people expected to make five or six per cent. in a concern of this kind. These markets would not be placed in very poor neighbourhoods; they were intended to benefit and accommodate the lower portion of the middle class, not the upper portion. There was undoubtedly an advantage in having a mixed trade among butchers where the better portions of the meat would be bought by those who could afford to do so, and the inferior parts by the poorer classes. In very poor neighbourhoods, the costermongers made the best markets for the lower classes. The middle classes often took long credit from

their butchers, and paid a higher price for their meat in consequence, but the artisan class were always ready-money customers, and would therefore buy upon the best terms if they had the opportunity of going to a good market. There was another point to be considered. A tradesman, on going into a locality, was compelled to take a lease of the premises he wished to occupy. The responsibilities of a lease, &c., were sometimes more than a small tradesman could manage, and there were circumstances which prevented that open competition amongst tradesmen which there was in a public market. A man taking a stall in one of these markets at 12s. or 15s. a week, had no further responsibilities; and if he had £30 or £40 capital to buy his goods from the central market, he would be content with smaller profits than a man with a lease and all the other responsibilities and expenses attaching to a tradesman. The markets proposed would be of the most open kind. He repeated his belief that a great number of farmers who grazed cattle would send their dead meat to these markets, the great inducement to do so being in the fact that they would make a larger profit on their produce than by sending it to Newgate Market, which involved the commission to the salesman. This plan did not imply that the farmers must, to a certain extent, become butchers. It was anticipated that these markets would have the support of the inhabitants of the localities in which they were established, in the way of subscriptions to the capital, by which a pecuniary interest in the success of the undertaking would be created. The business of these markets would be conducted under the regulations of the company, and they would be open to the usual public inspection with regard to the articles sold, and the suppression of fraudulent practices on the part of the dealers.

Mr. Tufnell remarked upon the desirability, in the interests of the public, of articles being brought into the market and disposed of without the intervention of the professional salesmen, who, to a great extent, held the producers in their power with regard to the amount of profit they made upon their articles. He mentioned the fact that a large grower of early potatoes in the Scilly Islands had given up that cultivation on account of its not being remunerative, although the produce was sent over here at a time when potatoes fetched as much as 2s. 6d. per lb. in Covent-garden; but the great bulk of the profit was taken by the intermediate salesman, which ought to have gone to the producer.

Mr. Walker observed that there was a certain amount of prejudice against attending markets on the part of the middle classes, which markets of this description would be likely to overcome. In this respect we differed very much from the same classes on the Continent, inasmuch as persons of the highest respectability made it a practice to attend the market themselves to purchase the articles they required. The trade in London was, to a large extent, carried on under the system of sending orders to the tradesmen by people who went round every morning for that purpose; they seldom or never saw the articles till they were delivered at the houses. By obtaining local subscriptions to the capital, as was proposed, people would have a direct interest in supporting these markets.

The Chairman remarked that, in the question of the supply of food, there was a great want of local organisation. In the neighbourhood in which he resided as many as 30 or 40 different butchers' carts came into the street for orders. In the co-operative societies which had been established the members lived in all parts of London; but if that system was to answer—which he doubted, as a permanency—he thought the co-operation should be local. If they could get 50 or 100 families in a locality to combine, and say "We will put up our custom to the best bidder, and will deal with those who supply us best for ready money," there might be an advantage in that to all parties.

Mr. Walker said in one locality in which it was proposed to establish one of these markets, there were a dozen or fourteen large boarding and day-schools, the proprietors of which had promised to subscribe for shares. If these promises were realised, the company would build a market-place in that locality, and the parties alluded to would have a direct interest in supporting their own premises, and earning a profit on their own investment. If the plans were realised, the profits of the undertaking would exceed 10 per cent.

The Committee, having thanked Mr. Walker for his communication, then adjourned.

Thirteenth Ordinary Meeting.

Wednesday, March 4th, 1868; William Hawes, Esq., F.G.S., Chairman of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Briggs, Thomas, Richmond, S.W.
Winsor, William Henry Benyon, 29, Kensington-gardens-square, W., and 38, Rathbone-place, W.

The following candidates were balloted for, and duly elected members of the Society:—

Johnson, Matthew Hawkins, 379, Euston-road, N.W.
Roe, Thomas, jun., Mayor of Derby.
Sarll, John, Drapers'-hall, Throgmorton-street, E.C.
Wise, William Lloyd, Chandos-chambers, Buckingham-street, Adelphi, W.C.

The Chairman, before calling upon Mr. Randall to read his paper, announced that the main object of the evening was to hear the opinions of artisans on the question of technical education and scientific training, rather than of the members of the Society and others who might be present. He especially hoped that any of those workmen who had been to Paris would express their opinions on this subject.

The Paper read was—

ON TECHNICAL EDUCATION.

By Mr. John Randall, F.G.S., one of the Artisan-Reporters on the Paris Exhibition.

Technical education has suddenly assumed amongst us an importance it never had before. An almost universal interest appears to have sprung up through the country in its favour—an interest which we may reasonably hope will not very soon subside.

The Society of Arts has done more than any other body of men to give to the question its present prominence, and it now seeks to ascertain how it is looked upon from a "workman's point of view."

It is as a workman, actively engaged in one of the important industries of the country, that I wish to speak. I purpose speaking, however, chiefly for myself, seeing that, in taking different stand-points, and in looking at the question on all sides, a diversity of opinion may exist. It would indeed be strange if it were otherwise. But with respect to its main features there is little doubt but that we shall be agreed. We shall agree, I think, upon its urgency and paramount importance; also, that we are greatly to blame for having permitted the question to remain so long in abeyance. Not that we, the workmen of this country, have been altogether indifferent: we might have been had we been ignorant of the productions of any other nation but our own; but with a full knowledge of the merits of those of other countries, and of the advantages brothers of the craft elsewhere enjoyed, it was impossible that we could have been so. We might indeed be said to have been in the position of the blind, but with the tantalizing knowledge that we were competing with others who could see; and as the blessings

of vision are supposed to be most prized by those deprived of sight, so no one could have regretted our infirmities more than ourselves. If I might be permitted to interpret the experience of very many others by my own, I might say our whole lives have been little more than struggles to overcome the deficiencies of education; or, to use a figure, that we were weighted in a race which needed the utmost strength we could command, that we were sent defenceless to measure our prowess with others fully equipped—and that in a struggle in which the weakest must inevitably go down. And we could scarcely fail to feel that this was neither fair, nor wise, nor economical on the part of this great nation, which suffered in its most vital parts in consequence. We felt that this false economy was telling on every one of our great industries —particularly on those coming under the head of mining and manufacturing, and that great waste of energy, life, and property resulted therefrom.

If we were an exclusive people, dependent entirely upon our own productions, and dealing only amongst ourselves, it would even then become us to husband our resources, and to make the most of those natural treasures placed at our disposal: it would behove us to turn them to the best account, to shape and to adorn them in such a way as to make them ministers of thought, carrying pleasing impressions wherever they circulate. I say, gentlemen, if we manufactured for ourselves, and our countrymen had resolved to deal exclusively with their own people, it would be inexcusably wicked not to make the most and best of our ores, our coals, our clays, and all other elements of our wealth. But when we were among the first to court a free interchange of industries, the first to consent to meet our neighbours in the open market of the world, and to submit our productions to the tribunal of nations, our credit and character were at stake, and it became the solemn duty of the people of this country to adopt means for securing some sort of fitness between the producer and his productions.

In all ordinary undertakings it is usual, when certain work is required to be done by machinery, to take pains so to prepare the machine that it may acccomplish its task in the best way and in the shortest space of time; and whether it is to furrow the land, or plough the sea, care is taken that there shall be no undue friction or waste of power, whilst every improvement for saving fuel or force is eagerly sought out and adopted. If this is sound policy with regard to machines, how much more so is it with regard to men? and how much more important is it that the force which creates machines should not run to waste, but be husbanded, quickened, and turned to the best possible account?

The only way in which this fitness or adaptability can be secured is by technical training, a process the importance of which, under another form, our ancestors—wise in their day and generation—were not slow to recognise. In cases where great strain had to be put upon their mental powers, or where great skill was needed, they provided the best aids and qualifications they could, by instituting suitable preparatory training. They provided, even for adult education, institutions such as universities, and schools with scholarships, as intermediate stages between these and those primary establishments in which boys may be supposed to have mastered—even under unfavourable circumstances—the substantial elements of a useful education. And we also, following their example, still adopt the same course in preparing the youth of this country for the church, the bar, and the medical profession. Scarcely less imperative is the demand in this age and at this time of day for some such preparatory training to meet the strain put upon the mental powers of the higher class of artisans in this country by the discoveries and improvements which have taken place within the past 16 years. As the languages of the great nations of antiquity are supposed to afford to youths making choice of the three professions alluded to the key by which they may open the whole arcana of knowledge essential for the prosecution of their pursuits, so is special instruction in what has already been achieved in art, and in the means and routine by which it has been wrought, needed to put the artisan upon a level with his peers—to enable him to press into his service the aids art or science places at his disposal.

The Exhibition of 1851 opened up a new era in manufacturing industry which, looking at the distinguished influence exercised by its author—the late lamented Prince Consort—might well be termed the Albert Epoch. This and subsequent exhibitions exploded a host of old prejudices; it gave rise to fresh activities, created new styles, and exerted an influence which reached every artisan, and taught all thoughtful men that for the future greater knowledge, higher skill, and a more intellectual training would be necessary for the successful prosecution of every one of the industrial arts.

The Exhibition of 1862 showed the extent to which the world had profited by the first; and there is no question whatever but that the advance made by this country was more observable than in the case of any other; indeed, so signal was this progress that the French were alarmed by the rapid strides we had made. One of their jurors says:—"The upward movement is visible, above all, among the English. The whole world has been struck with the progress which they have made since the last exhibition, in design." Another added,— "It is our duty to remind our workmen that defeat is possible, and that it may be even foreseen at no distant date. English industry has, during the last ten years, made amazing progress, and we may soon be left behind." A third says, on the same subject,—"It is impossible to ignore the fact that a serious struggle awaits France from this quarter." Evidently they had taken the alarm; and the way in which they prepared for the struggle is shown by their report on the Exhibition of 1867. In classes 89 and 90, under the head of "Apparatus and Methods used in the Instruction of Children," they say:— "Before entering into details concerning the articles exhibited, we cannot help stating that the space allotted for the two classes 89 and 90 has been quite insufficient to present their whole development, or to give an adequate idea of the details and *ensemble* of our vast system of public instruction. However, we feel convinced that, incomplete as this Exhibition is, it will prove to our own countrymen and to foreigners that public instruction has made in the last few years immense progress in France, thanks to a liberal and prolific impulse; and that our public and private establishments are worthy of a nation so enlightened and advanced as France proves herself in all the branches of human activity. For the first time, at the International Exhibition of London in 1862, a particular class was created to receive the school requisites, works and materials, but this was limited to infant schools and special schools for drawing. The French Exhibition of 1867, however, embraces, on a much more comprehensive scale, all kinds of education,—that of adults as well as of children, their professional education as well as technical education; and, acting up to its universal character, presents for examination the various evidences of the intellectual activity of the country. Therefore, whereas the Exhibition of 1862 numbered only 180 exhibitors in this class, that of Paris possesses as many as 500 exhibitors, which, however, is less than half the number who applied to the Imperial Commission for admission. A rapid progress has been realised during the last five years, and a still more marked advance is in process of realisation, to bear fruit in no very distant future."

This progress was witnessed by a large number of our countrymen, including a goodly sprinkling of artizans, who expressed their surprise—a surprise, however, which subsided on looking into the facilities foreign workmen enjoy for obtaining a knowledge of the principles of their art, and of the theory of their several crafts. Many of those who have written on the subject tell us that they found light and easy styles of ornamentation, founded upon a close observance of nature, and adapted

to various materials in almost endless devices; and this not altogether as applied to rich and costly articles coming within reach of the luxurious classes, but in connection with multifarious objects of elegance, produced at little cost, and intended for common consumption and general use.

They saw French workmen working less hard than ourselves, but producing higher effects with greater ease,—working with less energy, but with a greater familiarity with the science and tendencies of their art; they found these workmen acting out their parts under the direction of intelligent foremen and chiefs—themselves the higher creations of the same excellent system of technical training; and they found these results the matured fruitage of indigenous institutions which had taken firm root on French soil. They found on instituting a comparison, in very many instances, British workmen imperfectly taught, and to a great extent ignorant of the economy of human effort,—often working under foremen chosen more for ability to keep accounts than from any superior knowledge or power to direct. In either case, they found few reaching above the level of mediocrity, or receiving any stimulus beyond mere wages to develop the faculties with which God has enriched them, and which, if fully cultivated, would increase the means of individual happiness, and add to the prosperity of the country.

If it were necessary I might add my own experience to the weight of evidence; I might refer to works, a large portion of the productions of which find purchasers among the more wealthy and refined of the very highest classes of this country, and show how slight are the provisions or guarantees that the productions, from the first stage to the last, shall become articles of taste; also how, among even the best workmen, eight out of ten find themselves at fault every day of their lives for want of a knowledge of first principles, having to grope their way and flounder on, ever copying others' copies, and rearranging old materials into stiff and lifeless forms.

This view of the case is to some extent borne out by the report of the judges appointed by the Society of Arts, as to the result of last year's competition for prizes for works somewhat allied to designs. The report states that "indications were given in last year's competition of a power and disposition on the part of the competitors to execute meritorious works other than those in accordance with prescribed designs; and the Society consequently extended its invitations in that direction. The result had, however, scarcely realised expectation, since, with few exceptions, the works wrought in accordance with prescribed designs were in all respects superior to those in which the workman had followed his own inspiration. That circumstance pointed forcibly to the weak side in the present condition of the training, or want of training, of the Art-workmen. His knowledge of the functions, capabilities, and right application of the processes he employed with so much dexterity was greatly in arrear of his taste and knowledge of the principles of design. His head did not keep pace with his hands. The addition of a small amount of knowledge of the elementary principles of the theory of design would have, in many cases, prevented the considerable waste of ingenuity and labour shown in many of the subjects which had not followed any prescribed design."

But it is not only on matters strictly relating to art manufactures, but in other departments of industry, such as those in which science was in request, that we found a large number of gentlemen who visited the late Exhibition, including eminent manufacturers, school inspectors, members of the Privy Council, and others who might be supposed to give an unbiased opinion, concurring in the unpalatable admission that other nations had been more successful than ourselves. And there can be no doubt but that this superiority arises from the facilities which the workmen of the Continent enjoy over our own for obtaining necessary technical instruction in their several departments.

On this subject I might quote favourably from reports of artisans published by your Society, but as these must be familiar to the members, I will take one which appeared in the *Birmingham Post*, written by Mr. Spencer, national schoolmaster, of Oldbury. Speaking of France, he says:—

"Where must we look to find out the secret of our neighbour's success? Must we simply study the marvels of science stored up in the Exhibition? It would be like examining a river at its mouth to become acquainted with its character and peculiarities, instead of going in the first instance to its source. The Exhibition is merely the effect of a cause; hence to form a correct judgment we must go to an examination of the course of education received by the children of the Parisian artisans, for herein is the key to unravel the mystery. Having this object in view I found a school in Paris corresponding to our national schools. France has, I am aware, institutions of greater pretensions, but as I wish to compare that with the school of which I am a teacher, and which is primarily intended for the instruction of the children of our artisan population, I preferred visiting such a class than that of a higher standard. Great prominence," he says, "is given to art in French schools, and very great efforts are made to give a good idea of drawing to all children under instruction. The school is visited twice a week by an Art master, and during my stay I had an opportunity of witnessing the work for myself. In a school of 190 boys, nearly 100 of them were making drawings of an advanced kind." He says, "I also visited another school attended by 830 children of the working classes, whose ages range from 12 years and upwards, and supported by subscriptions and town grants. It was, in truth, an industrial school on a large scale, and the admirers of 'technical education' would be highly gratified at what they could witness. I do not hesitate in saying that such a spectacle could not be witnessed in England. To watch these children at work in their Art School would really astonish one. The results were splendid, and the most sceptical, after visiting this institution, cannot but affirm that France must maintain her present proud position while her youths are educated so wisely and so well. The shaded, architectural, and machine drawings would do credit to any School of Art in England. Connected with this institution are workshops, rented by master men, who undertake to teach the boys the various trades: two hours daily are allowed for instruction. There was also a designing room, and I observed boys of 15 years making designs of most exquisite patterns, and combining the colours according to their own judgment. I was informed there were 130 learning trades; three years were spent in the workshop, and each child could select his own occupation. I cannot but think if schools of this nature, where education and work are combined, were introduced into England, they would have a very beneficial effect, and would tend to elevate her from her present position."

I heard an English workman observe in Paris, that there is much more credit due to an English workman if he is clever, for a Frenchman has so many advantages that, if he only have moderate talents, he can scarcely help but be a good workman. He has excellent schools to give him a technical education, and go where he will there is something to educate his eye, and elevate his taste.

It is my decided opinion, that whatever the means suggested for supplying the deficiencies of technical instruction, they should be in the hands and under the control of Government. The voluntary system with regard to education, notwithstanding the sectarian stimulants applied, has signally failed; and the part-voluntary scheme of Art education has proved inefficient. In few places, if any, are Art Schools supported as they ought to be, whilst in some, as in the Borough of Wenlock, several have been closed altogether, and those still open are chiefly attended by amateur ladies and others above the class of artisans. Even where successful, in the

large towns, the burden falls unequally. One manufacturer, fully appreciating the importance of Schools of Art, subscribes liberally from a sense of duty; another, more selfish, makes up his mind to wait till his neighbours' subscriptions have educated the most promising student, in order to outbid him in the wages he will offer to secure him.

Gentlemen,—It is important to know our deficiencies; and it is encouraging to know that side by side with these, agencies are at work for remedying them, and that there is a willingness on the part both of the governing powers and of the public of this country to multiply and perfect such agencies. Government, indeed, has hitherto been in advance of the people to a certain extent on these points; and it really is to the governing power that we must look, rather than to local effort, for the means of placing the Art-workmen of this country on an equal footing with their rivals on the Continent. To accomplish this, to call into action those unstirred forces that yet lie slumbering, as it were, among the primary elements of our nature, will require not only all present educational agencies strengthened and expanded, but supplemented by others. Give to the Englishman the same opportunities of enlightenment and instruction as to the foreigner, and there is no branch of Art and Science, no human industry requiring taste and skill, in which he will not shine pre-eminent.

Much, unquestionably, has already been done within the past few years; and fortunately, too, it has been done so as to form a sound basis for what more is required. The national system of education, in affording to a great extent the means of procuring instruction, has sent a more intelligent class of boys into our manufactories. The half-time system, properly apportioning the hours of education and labour, at an age when the physical energies of the child are unable to bear too great a strain, and the mind is as yet easily susceptible of impression, together with Schools of Art in connection with the Science and Art Department, are exercising an extensive healthy influence on our manufacturing industry. The influences of the latter are already telling in a very perceptible degree in manufactories wherever young men are found willing to avail themselves of the advantages neighbouring schools of design afford; the effects being observable in a freedom, yet correctness of outline, and boldness of execution not otherwise readily attainable. And although such schools have not hitherto succeeded in attracting the working classes to the extent their promoters had reason to expect, yet the numbers attending them through the country are on the increase; and it is worthy of remark that those who show the greatest desire to avail themselves of their advantages are they who first commenced drawing in the National Schools. These feel a pleasure in their work, whilst elder boys and young men experience a delicacy in sitting down with those by several years their juniors, but more advanced, perhaps, in the art of drawing than themselves.

The conclusion seems natural that the seed of a Scientific and Art-education, such as the country requires, must be sown in the national or primary school, either by the schoolmaster or by supplementary teachers. What we complain of, and what the country, raising the taxes to support the present system, complains of most is that it is too much in the hands of the clergy, and under inspection by men drafted from them, men who are neither qualified by their education, their callings, nor their sympathies for appreciating the importance of that secular knowledge which is so essential to the social well-being of the children committed to their care, and who are under a temptation to use it as a proselyting scheme, rather than an engine for fitting children for their duties. What we want is for the State to carry out its own admitted principles; to furnish that education which it professes to give, which it admits is essential to the commonwealth, instead of going a round-about way and giving something else. Government in effect now says: Education is all-important; it is essential to your welfare, and to that of the public; you want it, and we undertake to give it upon condition that you take something else with it. It is the old plan of cheating the law by selling the straw and giving the book. If you are to have education you must take my dogmas with it, say the educators. Here are boys, say in a mining village, seven out of ten of whom will in all probability be employed in trades connected with the works. Does the State teach them anything as to the nature of that work, or of the mineral they work, or of the dangerous elements with which they come in contact?

The new Minute of the Committee of Council for the advancement of technical education in connection with art and night schools, by payments and scholarships, is a step in the right direction and will give a stimulus to the good work of technical training; but it will even require something more than this to overcome the inertia of existing indifference and general apathy.

Many suggestions might be made, and no doubt will be made, for remedying the present state of things. One very desirable scheme is, that there should be central district colleges, in which the science of agriculture and mining, and a preliminary knowledge of those principles of art necessary to the success of manufactures, should be taught; such colleges to have "fellowships" in connection with them, for those attaining distinction in certain branches of study.

Such fellowships would not be mere empty honours; they would give a man a qualification and a position, and would be sought after.

The Museum of Practical Geology and School of Mines are precisely what is required, so far as the information they propose to convey, and do convey, to those who attend the lectures. But it is not sufficient to lecture in London. The means of those who should be benefited will alone enable them to profit by information furnished in their own districts. I have heard Professor Percy lecture in Jermyn-street on coal to less than twenty persons, out of three millions of inhabitants of London; and one-half of the twenty probably came not so much to learn as out of compliment to the learned lecturer.

The district colleges I suggest might be situated so as to be easily accessible by railways, for classes of children of national schools, at stated periods, and for students more advanced in such studies. Such means of technical education, with sufficient incentives thereto, would both raise the character of our manufactures and of our civilisation, by profitably occupying the spare time of the operatives, by refining their taste, and by strengthening and enlarging their minds.

DISCUSSION.

Professor Williamson, F.R.S., thought everybody must sympathise with the general tone of the paper, and with many of the particular conclusions at which the author had arrived, but, nevertheless, the subject was of such paramount importance, that they could not be too careful in any conclusions, until they had most carefully sifted the grounds upon which they were based. In order to prevent, what he feared there was a little danger of, any action being taken on the advice of that most pernicious of counsellors—panic—he wished to make one statement on the subject. He believed that to his distinguished friend, Dr. Lyon Playfair, attached considerable responsibility for initiating the great movement in favour of what was called technical education. The opinions he had expressed with regard to the superiority of foreigners in the industrial arts were founded chiefly, if not exclusively, upon the observations which he made during the late Paris Exhibition; but others, who had not only seen the Exhibition, but who had also exact and comprehensive knowledge of what was doing upon the Continent, had arrived at a different conclusion. It certainly was not admitted by those who were most cognizant, not only of what science had done in any particular art,

but what practice was doing—he did not speak of the fine arts—that foreigners were at present in advance of Englishmen. For instance, in the iron trade and affiliated branches, it was considered that the progress made on the Continent consisted mainly in adopting improvements which had been known for some time in England; and moreover, that foreigners were still behind us in adopting many of the most important improvements. He thought that the very fact of foreigners not being equal to us in originality was, at least, a ground for doubting whether the system of training to which they had been subjected had been successful.

Mr. Connolly (mason, one of the artisan reporters) certainly concurred in the majority of the observations made by Mr. Randall; indeed he could not, in fact, do otherwise, after spending some time in Paris during the preceding summer. It did not, however, require any comparison with foreign nations to enable them to understand that an educated Englishman must be far in advance of an illiterate one, or to discover that a man acquainted with the nature and properties of the materials upon which he was engaged, would be more capable of making a good job of them than one who was completely ignorant in that respect. Therefore, irrespective of any panic, the question was of the utmost importance, although at the same time it was the part of a wise nation to contemplate the possibility of its being outstripped by others. He believed that if they were to ever assume the place which God and nature intended they should, as the great industrial manufacturers of the western portion of the old world, it would only be when the people were fully and fairly educated. Any man who had had experience in the workshops of this country knew that there was a deplorable deficiency in the education of artisans; and sometimes he was tempted to think that the inhabitants of his native country across St. George's Channel were, in this respect, wiser twenty or thirty years ago than Englishmen were now. When he was a boy, no one in his neighbourhood would dream of apprenticing his child to any trade without giving him some sort of education which would fit him for it. If he was to be a carpenter or a mason, an effort would be made to have him taught mensuration, or as much of that science as the country schoolmaster could impart; and he had been surprised in the workshops of London to find how many men there were, engaged in occupations that required the greatest amount of skill, completely illiterate and destitute of any knowledge which could guide them in the prosecution of their art. In his own trade—that of a stonemason —he had often seen a shop-foreman spend hours over a stone, showing the man who was to work it what was required, and drawing lines upon it for that purpose; and it was often quite a puzzle between the man and the foreman what direction these lines should take. There was not more than one foreman in twenty that could take a pencil and make a plan and section of what was required to be done; and if there were more, not one man in a hundred would know what was meant. If the foreman had sufficient education to be able to communicate his ideas to the workman by drawings, and if the workman were able to understand the drawings, an immense deal of time would be saved, and work would be better done; but at present they both had, to a great extent, to grope their way in the dark. He contended that the nation ought to supply this education, and that it would be economy on its part to do so. He must differ in one respect from the reader of the paper, and that was as to the religious element in teaching. He could not ignore the benefits which art had received from religion. Everything grand and noble in it had been the result of the action of religion upon the human mind. The noble buildings which studded the face of the country like gems in a diadem, arose out of the religious enthusiasm of the middle ages; and were they to believe that that same spirit was dead in the people of England? No, it only slept; and when it was once more aroused, the same zeal and enthusiasm which enabled the English of bygone days to vie with foreign nations in art, would still, with the help of other influences, produce the same results. It was remarkable that the school which was referred to by the writer in the *Birmingham Post* as attended by 830 children, was under the management of the Christian Brothers; and surely, in the face of that fact, whatever might be the faults of country parsons, it would be hard to blame religion itself. Religion and education, he thought, should work hand in hand; and an artist would be none the worse for being a good Christian. He recommended that the movement now initiated should never be lost sight of until every workman had the fullest opportunity of being instructed. It was quite true that you could "take a horse to water, but you could not make him drink;" still, it would be a fine thing to have the water there, at any rate, and then if he died of thirst it would be his own fault. The most difficult part of the problem concerned the education of the present generation of working men. They could not begin with their primary education, and, therefore, in all great centres of industry there ought to be museums and libraries established, to which access could readily be obtained. He lived at Lambeth, in which district there was as intelligent and skilful a population of working men as could be found in the world, but if he wanted to consult a book on any particular subject he had the greatest difficulty in obtaining it. He thought they ought to have, in some central situation, a large establishment, consisting of a museum adapted to the requirements of the neighbourhood, a lecture room, and reading and class rooms for instruction. For education, like all other things, there must be an inducement. The publican, although his liquors in themselves were in great request, yet added as much as he could to the external attractions of his establishment; and on the same principle he did not see why educational establishments should be pushed back into holes and corners, where they were very hard to find, instead of being put in a commanding situation, and so conducted that a man might at any rate be more comfortable there than whilst at his daily labour.

Mr. R. M. Morrell, who said he had been apprentice, workman, and foreman for twenty-five years in the jewellery trade, and who had had this subject under his notice for a considerable period, inclined more to the views expressed in the paper than to those they had just heard. He thought it was too late to begin to educate when they got to adult workmen; they must begin at the beginning. With respect to exhibitions, he wished to say a word. For the Exhibition of 1851 the establishment with which he was connected did a deal of work, which was exhibited in the cases of various London goldsmiths as English workmanship, but one-half of that establishment consisted of foreigners, and the foreigners made the designs and did all the artistic portions of the work, whilst the Englishmen only did the straightforward part, that which might almost be compared to the carrying of the bricks and mortar by the labourer for the use of the bricklayer. The foreign workmen received from 15s. to £1 a week higher wages than the English, and many of them had since gone over to New York, and were now in business there, employing a considerable number of hands, so that the work which used to be manufactured in England and sent to America was now made there, and this was one reason of the depression of trade which had been complained of. Not one of the Englishmen in the shop of which he was then foreman could make a drawing, but all the foreigners could do so if called upon; and upon asking these men the reason for this difference, they told him that on the Continent schools of art, &c., were open free to the working classes, and everything which would tend to their mental improvement was accessible to them at times when they could avail themselves of it. In addition to that, if a pupil really showed a decided aptitude for art, he was taken in hand by the government and sent to Rome, where he received a much higher education. He could not help comparing that system with the one which prevailed here.

Boys were apprenticed without any trouble being taken to ascertain whether they had any taste for the trade, simply as a mode of getting a living, and were kept by their employers running about on errands for two or three years, without any attempt being made to teach them their business, and without any idea of sending them to a training school. It would be of no use establishing schools of design, unless both in parents and employers was implanted a desire that the boys should attend them. Employers at present seemed to care nothing about it, but found it more to their advantage to employ ready-trained artisans from abroad. Would it not be far better that the youth of England, instead of standing about the corners of the streets on Sundays, insulting the passers-by, should have opportunities of going to museums, and other places where they might improve their taste, and obtain useful knowledge? In an article by the Editor of *Lloyd's Newspaper*, the other day, it was stated, and with truth, that until the love of art was implanted in the population they would never make much progress, and his opinion was, that that could best be accomplished by means of secular schools. His (Mr. Morrell's) own youth was spent in a national school, and, being made monitor at the age of twelve, he was employed day after day in teaching a junior class the history of the wanderings of the Israelites in the desert. What would have been his present position had he not been so fortunate as to get hold of better instructors? At present there were no inducements to youth to take to art pursuits, but every difficulty was thrown in their way. Unless they could get government, parents, and employers, to unite in the good work, in his opinion all their efforts would come to nought.

Mr. Jacob (cabinet-maker, one of the artisan-reporters) remarked that one great advantage which it had struck him during his visit to Paris the French workman had over the English, was the opportunity of visiting museums and galleries of art at times convenient to himself. They could only visit the British Museum on certain days in the day time, which was practically equivalent to excluding working men. The influence of the clergy would probably be exerted to prevent the opening of such institutions on a Sunday, and even if they were open of an evening, he would ask anyone who worked for eight or ten hours a day as he ought to work, if he then felt fit to go to a museum and study. He had tried it, and found great difficulty in deriving much benefit from his visit. The museum of South Kensington had certainly done more than anything else to improve the artistic taste of the working classes, but much more might be done, and as one means he would suggest the supplying copies of plaster casts at cost price, for in many cases no drawings would convey the same idea to the mind as a cast. Again, the knowledge of geometry and orthographic projection was difficult of attainment, and the books from which it might be learned were costly; yet without some acquaintance with these subjects it was difficult to make a workman understand a working drawing. He suggested that sheets of such projections should be issued at a low price, so that they might be introduced into workshops, and that men might become familiarised with them. With reference to what had been said by Mr. Morrell, he might remark that he knew several young men in the jewellery trade by whom he had been told that they experienced the greatest difficulty in obtaining information connected with their business, and that it was not until they were turned 21 years of age that workmen would notice them at all.

Mr. Jung (watchmaker, one of the artisan-reporters) gave an outline of the system of education in Switzerland. Instruction was provided by the Government, was compulsory, and every one, rich or poor, was obliged to send his children to school. From the age of 7 to 12, the child must go to a day-school, and from 12 to 16 he must go to either a morning or evening school. He thought people in England often sent their children to school too early and took them away too soon; many were sent at four years old, but the result was, that instead of learning anything their education was really retarded. It had been found in Switzerland that a child sent to school at four and remaining till he was nine, knew very little more than one who did not go to school until he was seven or eight and remained a year or two. A child at 10, 11, or 12 was just beginning to understand what he was learning, and ought not then to be taken from school. In Switzerland, again, geometry was taught in a more practical way than was usual in England. Once a week they were taken out in the fields, where they measured the ground, and on coming back they had to draw the plan, and to calculate the area of surface. The same with timber measuring and other practical matters. This was the sort of school he attended, some years ago, in a little village with only 3,000 inhabitants. Those who distinguished themselves in the village school were sent to a district school, and thence again those who distinguished themselves were promoted to a canton school. He did not believe that in the whole of Switzerland, except possibly in the highest parts of the Alps, there was any one, under the age of 30, who could not read and write. At these schools also they would be taught one or two modern languages, and though he did not say this was necessary, it was very useful, particularly in removing prejudices. When a man knew the language of a people, then only did he begin to understand them, and to appreciate their character. Religious teaching was given to a very small extent in Swiss schools, which might practically be called secular. He differed from Mr. Connolly as to the beneficial results of the efforts of the Christian Brothers, for he believed statistics would show, in France, Germany, and Switzerland, that where they had the management of the schools not much science was taught. Technical education was to a large extent positive science, which religion was not, and he did not see how the two could be mixed up together. He believed the many different forms of faith in England had prevented the national system of education taking deeper root, and he should therefore be in favour of secular schools, which would still leave abundance of opportunities for religious instruction. Some ten or twelve years ago primary instruction in France was very much in the hands of the priests, and for that reason it was much neglected, but the more advanced stages of education were better provided for. There were various courses of lectures, such as that of the Sorbonne, to which working men had free admission, only paying a nominal sum if they wished to compete for prizes. He believed that if similar facilities were given in England, they would be taken advantage of, and in conclusion he would remark that if, in some respects, the English workmen were behind their Continental brethren, in others they were far before them. For instance, they saw and acknowledged the progress which had been made by other nations, which Continentals, especially Frenchmen, were very slow to do. If the English workman had fair scope given him there was no doubt but that he had a bright future before him.

Mr. Mackie (wood-carver, one of the artisan-reporters) agreed with Mr. Randall as to the necessity of well instructing youth; the lessons received when young were the most valuable, and would last the longest; but he thought there was an omission in the paper, viz., as to the necessity for establishing museums, &c., all over the country. He was perhaps rather sanguine on this point, but he believed that if they were established a real change for the better would soon be perceptible. Too much stress could not be laid upon the importance of early special training in accordance with what was to be the future work of the individual through life, but yet those who were already grown up should not be left to grope their way in the dark. A good deal was said sometimes about the force of genius, but the genius which forced its way generally had obtained its knowledge by mere chance, and what was wanted was a system which should give the same or better opportunities to all, so that those who had

genius might at least have an opportunity of showing it. They certainly wanted something more than local effort. Government might be slow to move, but local effort would be slower, and he would strongly urge the necessity of something being done immediately, or else they might realize the truth of the old proverb, "While the grass grows the steed starves."

Mr. B. LUCRAFT (chairmaker, one of the artisan-reporters) would like something done for the men of the present day. Of course he agreed with all that was proposed to be done for the technical education of the rising generation, but even these, when they grew up, would require museums and libraries, and what would be good for them then would be good for working men now. If trade and commerce were likely to suffer, as some said, from the deficient education of English workmen, there would be but a poor chance of preserving it for fifteen or twenty years, while a new generation were receiving their instruction. Again, if they had been neglected up to the present time, that was no reason why they should be so for the future. He considered it was a disgrace to the country that the working classes had been so neglected in the matter of education, but the present state of things could not last much longer. Working men would soon have the power to assist themselves, but, in the meantime, their friends—and they were many—were willing to help them now, and he was very glad to see it. He wanted to see the governing class take the matter in hand at once, and say—"If we have neglected you in the past, it is because we have not understood what you wanted, but, now that we do, we will do all that lies in our power." If the working classes only asked for education in the proper spirit, and were determined to have it, he did not think there would long be danger of their being outstripped by foreigners. He was as much in favour of technical education as anyone, but taste could not be implanted by this means, it needed the constant sight of beautiful objects, and for that purpose they must have local museums. He was very glad to find they were going to have one at the East-end, but they wanted one over the water, suited to the engineers in that locality, and one in the north, where he lived, where the cabinet making, jewellery, and watch-making trades were principally carried on. Some talked about educating workmen, as if it were likely to lift them out of their sphere, but this was quite a mistake; he loved his own business, and he wanted to see it as much respected as any other calling, and other men did the same, and that was why he wanted museums not only in London, but in Lancashire, Yorkshire, and all the great centres of industry. He was an Englishman to the backbone, and he wanted to see Englishmen equal to any nation in the world. Moreover, he contended that working men had a right to these things if only for their pleasure—for there was a pleasure in going to such museums as South Kensington; and if there were a similar institution his own neighbourhood he should be there nearly every night, and his children with him. He did not agree with Mr. Randall in advocating workshops in connection with schools; a trade could not be taught in school; it must come through a regular course of training; but the boy should be prepared for his trade before he commenced it, and then no time would be lost. He was astonished, when in Paris, at the skill with which he saw a boy of 14 carving; and on asking an explanation, he was informed that the friends of a boy who was to learn such a business had him properly prepared by his education before he was apprenticed, and then, instead of being kept for two or three years running errands, he commenced carving at once, and in three or four years was a capital workman, if he had any taste for it at all. In England, on the other hand, it was quite that time before they began to find out whether a lad would ever do anything at all at the trade to which he was put. He did not say that Englishmen were superior to everyone else, but he believed they would be their equals, if they only had a fair chance.

Mr. BLACKIE said only one side of the question had been looked at, and although there were good institutions in France, they were not without them in England as well; and the educational systems in Germany and Prussia excelled those of France in many ways. He considered the great want in England was the power of compelling parents to educate their children, for he had very often found it the case that artisans earning from two to three guineas a week would not pay anything for the education of their children if they could get it done anyhow for nothing. They should be made to educate their own children to a certain extent, and then government might step in and supply the deficiency.

Mr. W. ELLIOTT (die-sinker, one of the artisan-reporters) was very glad to say that his own experience enabled him to correct the somewhat desponding views as to English art-workmen which Mr. Morrell's remarks must have caused. He was intimately connected with a trade associated with jewellery—that of die-sinking and chasing—and he could say with the greatest confidence that there was no specimen of foreign work in the Paris Exhibition which would bear comparison with what had been produced for the last twenty years in Birmingham, Sheffield, and London. Again, it was not the case in his business that boys entered it in such a promiscuous manner, without any previous knowledge to fit them for it. He had worked in all the places he had just named, and in each of them it was necessary, before a boy was apprenticed, for him to show that he possessed some aptitude for the trade, and in many cases the employer fostered the art-longings of the boy by sending him to school. At a time before Schools of Design were established, his master, Mr. Wilkinson, of Sheffield, paid for two years Art-education for him by a private instructor. Some years ago he had worked for a firm who manufactured largely for the trade, and in other names they were considerable exhibitors, both in 1851 and 1862, but they were not indebted to foreigners either for designing, modelling, or chasing, and in fact there were but two foreigners in the establishment, numbering about 80 in all. He though such opportunities as he had enjoyed through the kindness and generosity of his employers ought to be within the reach of all.

Mr. J. HERMANN said that some time ago he offered his services to the committee of the Horological Society, to conduct a mechanical drawing class, and the result was, that after publicity had been given to the matter for six months, they could only muster a class of seven, three being apprentices, and only one of the number being engaged in the manufacturing department of their business, the others being what were technically called "jobbers." He found that the adults paid far more attention than the apprentices, which probably arose from their feeling the necessity of theoretical instruction. But it was rather late in the day for a young man to seek for theoretical knowledge at the time when he ought to be in possession of it, and therefore he thought technical education ought to commence at the beginning of apprenticeship, as was the case in Germany, where seven or eight hours a-week were devoted to that purpose. An apprentice was bound by his indentures to obey the lawful commands of his master, and he did not see that there would be any despotism in inserting a clause that he should attend an evening school for a few hours every week. He (Mr. Hermann) had been subjected to compulsory education, and he only regretted now that he had not been compelled to learn more than he had.

Mr. G. LOCK observed that the attention of the speakers and of working men generally, did not seem to have been directed to one very important point, viz., the means of obtaining the education which they were seeking for themselves and their children; and as they had shown such aptitude in devising schemes for political reform, he thought they might usefully devote their attention to the best means of providing the necessary finances for a national system of education. Nothing had yet been said

as to how either the schools or the teachers were to be provided, and it was a well-known fact that there was a difficulty in obtaining efficient teachers for the present schools, so that any national scheme must include provision for more normal training schools. It was very important to consider whether the means should be provided by the Government or by local rates, and unless it were done by the good-will of the people, there would be as much opposition as there had been to other measures for the benefit of the poorer classes. Not long ago there had been quite a commotion in Hackney in consequence of a number of persons being summoned for poor-rates who had not been accustomed to pay them; and when an attempt was made in Marylebone some years ago to establish a free library, it met with the greatest opposition, and ultimately failed, because the inhabitants would not submit to a rate of ½d. in the £ for its support. These free libraries had been established in Liverpool, and in many other large towns; and educational institutions, such as had been described by Mr. Connolly, were much better supported by working-men in Liverpool, Edinburgh, and Glasgow, than they were in London. From what had been said it would almost appear that there were no evening schools in London, and that if there were, there seemed to be something in the climate which rendered a man, when he had done his day's work, totally unfit to learn anything at all. He had resided in Paris a year or two, and he found workmen there quite as willing to attend evening school as they were in Edinburgh; but this certainly was not the case in London; for every one who had had any experience in the matter knew that the majority of attendants there were not workmen. There always seemed a difficulty in meeting the class prejudices and opinions of the men, and unless these were all consulted, there was no getting them into the schools at all; they did not like meeting with boys or with men of other trades, and that would be one very important practical point to consider, how the men and boys could be induced to enter the schools when they were established.

Mr. Peter Graham, referring to the attempts to establish a free library in Marylebone, remarked that the act applicable to these matters was only permissive, and could only be carried into effect by vestries on a majority of a meeting of householders desiring them to do so. He had taken an active part in the effort alluded to, and the fact was that the largest room at their disposal—the workhouse school-room—was densely filled before the meeting began with keepers of small coffee shops, newsvendors, and so on; and the most eloquent speaker could not obtain a hearing. That was the result of permissive legislation on this subject.

The Chairman said that whether they were in favour of beginning in primary schools, of educating the adults in evening schools, or of giving working men opportunities of seeing and studying works of art, all were unanimous that some technical education for the great body of the artisans of England was necessary. The new East-end museum about to be established would be the result mainly of one gentleman's exertions (Mr. Antonio Brady), but such things ought not to be left individual effort; public opinion generally ought to assist the working men in every locality in inducing the Government to grant them a bill for the purpose of acquiring the necessary land to establish such museums in various quarters. There was no doubt that half-a-dozen museums could be supplied with casts of the finest works from South Kensington; and in the British Museum there were thousands of works of art and interesting objects in the cellars which ought to be distributed all over the country; and in the National Gallery there were an immense number of paintings hidden, which would immensely benefit the working classes if they could be seen. It was not too much to ask the government to take some steps by which these valuable collections should be utilised for the benefit of the nation at large, especially of large centres of population and industry, such as Sheffield, Birmingham, and Manchester. While he fully concurred in the opinion that this kind of education was necessary he totally dissented from the conclusions arrived at by Dr. Lyon Playfair, and had stated so in that room soon after the first appearance of that gentleman's letter. Foreign workmen had much improved since 1851, and had approached nearer to the English; and if we now stopped short, there was no doubt that in a short time they would surpass us, but so long as there was English industry, English skill, and the determination on the part of English workmen to educate themselves—even if the Government would not educate them—he had no fear of any foreign country surpassing us in the great manufactures of the world. It did not look much like being beaten by foreigners when the commerce and manufactures of England had increased more in the last ten years than all the rest of the world put together, and more rapidly than at any previous period. He could not despond, unless he believed that the English workman had forgotten his duty to himself, his own class, and his country; and while they found amongst them such men as the reader of the paper this evening, he could not join in the conclusion of Dr. Playfair, or believe that England would lose her present position. He was sure they would be unanimous in according a hearty vote of thanks to Mr. Randall for the paper with which he had favoured them.

The vote of thanks having been passed,

Mr. Randall, in acknowledging the compliment paid to him, wished to correct a wrong impression which seemed to have been produced—that he was not a friend to religion. It would be sufficient to show that this was not the case, if he mentioned that he and his wife were members of the Church of England, that he had three daughters school mistresses in national schools, and one son a pupil teacher. He, therefore, knew something of the system of which he had spoken, and he knew that religious prejudices did interfere with the proper education of the country. The children were divided amongst several schools of different religious denominations, whereas if religious teaching was altogether left out, they might meet in one common school, and a higher class of teachers might be employed with profit to the children taught. It was quite usual, especially in country parishes, for a clergyman to speak of "my school," and "my schoolmaster," just as if the whole establishment was under his sole control. He quite agreed with the idea that district museums and colleges should be established; and those who were even now disposed to think well of us as a nation, should consider, if we had done so much under present circumstances, what might we not have done with the advantages which foreigners possessed. He thought it would be well if these district colleges had the power of conferring honorary distinctions upon such men as showed themselves worthy of them in their particular calling. He had been made a fellow of the Geological Society in consequence of his studies in that science, which he looked upon merely as a recreation; and if some similar distinction were awarded to men who devoted their energies to the attainment of excellence in their own particular business, it would be likely to have a very beneficial effect, especially on the rising generation of artisans.

AGRICULTURE IN FINLAND.

From a report by Mr. Campbell, Her Majesty's Consul in Finland, it appears that great suffering and distress has of late years occurred in the northern districts of Finland, and more particularly in the government of Uleaborg, in consequence of the failure of the crops. Since the year 1856, when a total failure of the harvest took place, the country has more or less suffered, partly from the total exhaustion of any surplus grain which the peasantry might, under other circumstances, have been in possession of, and partly from deficient harvests result-

ing from inferior seed. In 1862, however, a total failure again occurred, which was succeeded in 1863 by a partial failure. The year 1864 brought a miserable harvest, and 1865 brought once more a total failure, the consequence of which has been that from one end of the government of Uleaborg to the other, a degree of suffering, sickness, and misery altogether unprecedented has resulted. Under these deprivations the bread of the peasantry consisted of bark and straw, either separate or mixed; the former is the inner bark of the pine tree (*Pinus sylvestris*) which is collected during the months of June and July; this bread produces much disease and sickness, but still it is considered more wholesome than another description produced from boiled hay.

The severe and unpropitious climate of Finland proves the greatest impediment to the progress of all agricultural pursuits, and for a series of years there has not only been a partial, but frequently a total failure of the crops in the northern provinces; and notwithstanding the large sums which are annually spent by government in endeavouring to dry the extensive morasses in those districts, it is sadly to be feared that Finland will not be able to produce a sufficiency of grain for its own requirements.

The Administration, however, appears determined, through science, to do its utmost to cope with this natural impediment to cultivation, and in order to carry out its projects has erected and endowed the following agricultural schools throughout the country:—

1	In the government	of	Wiborg.
1	"	"	" St. Michael.
2	"	"	" Kurpio.
3	"	"	" Uleaborg.
2	"	"	" Wasa.
1	"	"	" Nyland.

Besides these schools, and by far the largest agricultural institution in the country, is that of Mustiala, in the government of Wasa.

The course of instruction in that institution is conducted in two departments or classes. In the first of these the student is taught practical farming, veterinary surgery, cattle breeding, &c., &c., and moreover, he must practically assist in the building of houses, and in the construction of all implements necessary for agricultural purposes. To this department 40 students are admitted: that is to say, 30 from the governments of Nyland, Abo, and Tavastehus, and 10 selected from the above-mentioned schools. In this department students receive instruction, as well as board and lodging, free of any charge.

In the second, or theoretical department, the students are taught geometry, stereometry, planimetry, mineralogy, and zoology. To this department 24 students are admitted, who have to pay an annual fee of £25 each.

As a proof of the energy with which the government has lately turned its attention to the agricultural interests of the country, I may mention that, in the budget for 1853, the sum required for the agricultural institutions of the country was 5,428 roubles, and in 1860 it had increased to 36,610.

Manufactures.

New Machinery for Rolling the Tea Leaf.—The *Indian Daily News* describes a tea leaf rolling machine, which consists of one or more discs rotated horizontally over a surface on which the leaves are placed. This surface, which represents regular lineal indentations, is covered over with fine matting, and its relative distance from the revolving disc is under control. The latter is bound with a loose rim, which adjusts itself to the space between the disc and the lower surface, and thus imprisons the leaves whilst being rolled.

Economising Carbonic Acid Gas.—A French chemist, named Noël, has arranged a system of economising the carbonic acid produced during the operation of fermentation, for the production of bicarbonate of soda. The fermenting vats are closed, being furnished with a trap, through which the operation may be watched from time to time, and also with a force-pump which conveys the gas into a special reservoir provided for the purpose and connected with a barrel containing the alkali. The gas is made to enter the latter at the lower end, and the air is allowed to escape at an orifice at the top; when, instead of atmospheric air, carbonic acid issues from this orifice, the operation is terminated. The water of crystallization is withdrawn by means of a tap at the bottom of the cask, and this is afterwards treated separately with carbonic acid. M. Noël proposes to convert the alkali in the barrels in which it is afterwards to be sent out, there being nothing to be done but withdrawing the tap and closing the two holes.

French Manufactures.—The last annual report of the Industrial Society of Mulhouse furnishes some interesting information relative to French industry. There were in the department of Haut Rhin, on the 1st January, 1867, 436 establishments, with 652 steam-engines of 15,067 horse-power. Of these, 197 were devoted to spinning and weaving; 51 to printing, dyeing, dressing and bleaching; 31 foundries, hardware, and other iron-works; 65 factories for felt, cloth, wadding, ribbons, paper, and rope-making; 21 chemical works, distilleries, starch manufactories, chemical matches, gas works, &c.; 56 breweries, saw-mills, tanneries, &c., and 15 brick, tile, plaster, and cement works. There were 105 cotton mills with 1,529,378 spindles, and 125 with 30,421 mechanical weaving looms. On the 1st January, 1868, there were in the department 929 boilers with 1,737 receivers, and 674 steam-engines of an aggregate horse-power of 15,293. Among the corresponding members elected last year were Mr. P. L. Simmonds, and Dr. Forbes Watson, of London. In the annual report of the society mention is made of a new red-and-violet aniline, found in the natural state in the vesicle of a mollusc *Aplysies depilans*, which is met with in great abundance in the Mediterranean and on the coasts of Portugal. Mr. E. Kopp has brought into successful applicaation extracts of madder for printing fabrics. He obtains commercial purpurine, which is used in dyeing silks and wools, and in the preparation of very handsome red lakes and pink madders. Green alizarine, which serves as the first matter for preparing pure alizarine extract, for printing violets and lilacs, and, finally, a pectic extract, with which is prepared a composite alizarine extract for printing reds, pinks, puces, &c. Mr. O. Scheurer is the person who has just brought into successful application, for commercial purposes, surface-printing with madder colours. The society has voted a first-class medal to M. Pernod for the successful application of an extract of madder to painted linens.

Commerce.

Swiss Commerce in 1867.—The exports and imports in Switzerland during the year 1867 were as follows:—*Imports.*—Cattle (small), such as sheep, &c., 123,078; cattle (large), 49,863; coal and turf, 338,878 tons; raw cotton, 338,087 quintals; cotton yarn, 12,776 quintals; cotton fabrics, 39,306 quintals; grain, 3,683,378 quintals; flour, 302,048 quintals; rice, 91,150 quintals; coffee, 161,247 quintals; sugar, 236,905 quintals; wine in barrel, 798,632 quintals; metals (excepting iron), 41,913 quintals; iron (manufactured), 270,469 quintals; iron (raw), 269,192 quintals; machinery, 58,367 quintals; silk (raw), 21,371 quintals; silk goods, 1,512 quintals; soap, 30,306 quintals; wool (raw), 19,970 quintals; woollen fabrics, 39,593 quintals; tobacco (in leaf), 82,976 quintals; tobacco (manufactured), 17,644

quintals. *Exports.*—Cattle (small), 54,309; cattle (large), 66,109; grain, 36,078 quintals; flour, 46,609 quintals; butter, 10,309 quintals; cheese, 396,774 quintals; dried fruits, 5,025 quintals; wine, 4,774 quintals; vermouth, 3,754 quintals; hides and leather, 53,283 quintals; articles in wood, 15,602 quintals; raw iron, 24,741 quintals; manufactured iron, 25,725 quintals; machinery, 68,879 quintals; cotton yarn, 67,911 quintals; cotton fabrics, 209,919 quintals; silk fabrics, 32,751 quintals; articles in straw, 7,917 quintals; clocks and watches, 3,837 quintals; tobacco (manufactured), 5,705 quintals; woollen goods, 2,965 quintals. The following was the weight of cattle of all kinds passing through Switzerland during the year—108,744 quintals, and 1,427,705 quintals of goods of all kinds.

TELEGRAPHY IN SWITZERLAND.—The reduction to half a franc for a telegraphic message in Switzerland has not proved a failure as was anticipated by many persons. In January, 1867, the number of telegraphic despatches throughout the country was 50,513, against 86,461 for the same period in the present year. In January, 1867, 19,250 intimation despatches were sent, against 20,077 in January of the present year. Comparing the amounts received, it will be seen that the revenue has not been diminished in consequence of the reduction of tariff. In January, 1867, the receipts were 59,628 fr. 69 c., against 65,329 fr. 35 c. during the same period this year.

SILK TRADE IN ITALY.—The following statement shows the comparative exports and imports of silk in Italy from 1863 to 1866:—

Raw and Spun Silk.

	Imports. kils.		Exports. kils.
1863	1,820,700	....	2,553,970
1864	1,517,470	....	2,273,240
1865	1,136,790	....	1,529,360
1866	643,780	....	1,777,070

Floss Silk.

	Imports. kils.		Exports. kils.
1863	..	....	1,464,980
1864	..	....	2,382,950
1865	1,068,740	....	1,173,430
1866	84,460	....	1,663,840

BRAZIL INDIA RUBBER.—This is the most important article of export from Para, on the Amazon. Its production, however, has contributed much to give to the originally quiet inhabitants a taste for a restless and wandering life, and has deprived other branches of agriculture of labourers. The rubber-tree grows mostly in very unhealthy situations, and in marshy soil. Intemperance, bad nourishment, and the malaria on the banks of the rivers, shorten the lives of the men engaged in the extraction of this elastic gum; yet so great are the profits to be obtained, that hundreds of canoes cross every year from the left bank of the Amazon to the islands and to the forests around Macassa, in search of rubber. No precautions are taken to preserve the trees, and from this cause already some districts produce a much smaller quantity than formerly. The tree, however, grows in great abundance throughout the whole valley of the Amazon, and on the banks of the tributary rivers. The exports from Para were, in 1864, 183,206 arrobas; in 1865, 256,967; and in 1866, 291,091 arrobas. The arroba is about 32½lbs.

Colonies.

SUGAR IN NATAL.—The *Natal Mercury*, of Jan. 11th, says:—"Turning from the treasures under the soil to the wealth growing upon it, we find no less than in past years evidences of progress. In spite of all drawbacks, and amidst all circumstances, the agricultural interests of Natal have worked ahead. Sugar planters have not for years been in such good spirits, and so confident regarding the future, as they in most cases appear to be at this time. The crop, for one thing, has turned out better than was expected about the middle of the year. Although an unusually late season, the yield has been, on several estates, above the average. Were it not for the heavy burden of debt resting upon them—the result of advances obtained at high rates of interest, for the purpose of erecting mills and forming plantations—our planters would be the wealthiest class in the community. When the day comes that capital can be got at low rates, no enterprise will have a fairer prospect than this. Markets, moreover, have been better than they had been. Buyers from or for the Cape Colony are constantly in quest of shipments. The home prices are a little better, and the quality of the sugars made here is being so much improved, that we hope in time to acquire a good name for Natal brands. It is possible that, ere the year be out, new markets will have been found in India and Australia for the sale of our sugars. The newspaper war sometime waged between different planters, regarding modes of manufacture, if occasionally acrimonious in its tone, has at any rate a wholesome effect in stimulating emulation, and promoting an improvement in quality."

Obituary.

M. LEON FOUCAULT, member of the Academy of Sciences and Bureau des Longitudes, of Paris. M. Foucault is best known by his demonstration of the rotation of the earth by means of the pendulum, first exhibited in the Pantheon of Paris, in 1848, and afterwards at the Great Exhibition, in London, in 1851; but he made many important applications of science, and his premature death, at the age of 49, is a loss to the world.

Sir CHARLES LEMON, Baronet, died on Tuesday, 11th February, in the 84th year of his age. The deceased baronet, during his long life, had been of eminent service as a county gentleman, and conspicuously so in political affairs, and in connection with the scientific institutions of Cornwall. Sir Charles Lemon was born on the 3rd of September, 1784, and was the second baronet, having succeeded his father in the title on the 11th of December, 1824. He married, in 1810, Lady Charlotte Ann Fox Strangways, youngest daughter of the Earl of Ilchester, and who died in 1826. Sir Charles has left no surviving issue; his second son, and last remaining child, was unfortunately drowned whilst bathing, when at Harrow School, on the 18th April, 1826, in the thirteenth year of his age. The deceased baronet was a Deputy-Lieutenant of Cornwall, and a special Deputy-Warden of the Stannaries. He represented the borough of Penryn from 1809 to 1812, and again in 1830. He was member for the whole county in 1831, and after the passing of the Reform Bill, when the county representation was changed to two divisions, he represented West Cornwall, in conjunction with Mr. Pendarves, until the year 1841, and again from 1842 to 1857. Sir Charles was a reformer, but rather one of the moderate Whig school, than of the more advanced politicians who are to be found in the Liberal ranks at the present time. He was President of the Royal Cornwall Polytechnic Society, and in former years of the Royal Cornwall Geological Society, and, as F.R.S. and member of other learned societies, he was ever deeply interested in the researches and advancement of science and the arts. He was also a zealous Freemason, and Provincial Grand Master of Cornwall for many years. Sir Charles was also Chairman of the Falmouth Board of Guardians; he was elected at the formation of the Poor-law Unions in 1837, and, although unable for some years to attend the meetings of the Board, he has been re-elected year after year, as a mark of personal respect. His sound sense gave great weight to his opinions, and rendered his services valuable in the promotion of local interests, of which he was ever mindful, as well as of the general

welfare and progress of the nation. In private life, his genial temperament won for him the affection and esteem of a large circle of friends. Sir Charles Lemon was elected a member of the Society of Arts in 1852.

Notes.

Havre Exhibition.—The letter of Mr. Bernal, her Majesty's Consul at Havre, published in the *Journal*, February 28th, and drawing the attention of English manufacturers, merchants, and others to the importance of the exhibition to take place in that town in June, should not be disregarded. Many men of business complain that their interests are often overlooked in great universal exhibitions, such as those of London and Paris, and have expressed a desire to see something of a more thoroughly practical character attempted. The coming exhibition at Havre affords an admirable opportunity for testing the value of a purely commercial exhibition; the management is in excellent hands; the project is warmly supported by the Emperor and the Imperial government; and Havre is not only one of the very first import and export towns of France, but very convenient for English visitors. At a time when the rivalry between the manufacturers of the two countries in the export trade of the world is so animated, it would be a serious error if British products were ill represented. The programme of the exhibition includes all articles of export, and, consequently, it presents an immense field for English manufacturers and shippers. The agricultural exhibition of Rouen is appointed to take place at the end of May, and it is hoped that the Emperor will be present at the distribution of the prizes on the last day of that month, and afterwards visit the Havre exhibition, which is to open on the following day.

Technical Education in France.—The Minister of Marine and of the Colonies has just issued an order relating to what are called the Schools of Maistrance, in which a certain number of workmen in the arsenals and dockyards, chosen by competition, receive such special theoretical instruction as fits them for foremen or heads of shops. These schools were reconstructed by decree in 1851, but the progress made since that time in industrial science and training having left these schools in arrear, the minister has caused an examination and report to be made upon them. The result is that a decree has been issued establishing preparatory Schools of Maistrance in each of the government yards and arsenals of Cherbourg, Brest, Lorient, Rochefort, and Toulon, and also a school at the imperial establishment of Indret, for the theoretical instruction of a certain number of workmen. In addition to these, two normal Schools of Maistrance are established, one at Brest, and the other at Toulon. All of these schools are placed under the charge of the department of the Director of Naval Construction. The old pépinière of the Luxembourg-gardens, which contained the finest collection of vines in France and a large number of other plants, has been swept away, to the great regret of professors and students in botany and arboriculture; but the chief gardener of the Luxembourg, M. Auguste Rivière, still continues his public instruction on the pruning of fruit trees; the lectures, which commenced on the 21st of last month, are given under a tent in the transformed garden on three mornings in the week.

Education in Holland.—Of secondary schools organized under the law of 2nd May, 1863, there were in 1865, 22, with 1,467 students, of whom five were educated at the expense of the state and 14 subsidized by their communes. These schools are established specially for the improvement of artisans and workmen. They serve at the same time as preparatory schools for the Ecole Polytechnique, founded at Delft on the 1st July, 1864. This college, which is intended to educate civil engineers and others, architects, manufacturers, &c., numbered in 1865, 154 students.

Correspondence.

Technical Education.—Sir,—I am glad to see that a committee has been appointed to give practical effect to the recent Conference on Technical Education, and I hope that amongst the subjects to which the earliest attention of the committee will be directed will be the relations of the present system of apprenticeship to the development of technical education. I believe that the system of apprenticeship which now prevails in this country will be found to be the greatest, in fact, I may say the only, serious obstacle with which the promoters of technical education have to contend; at least, that is the result of my own experience in all the efforts with which I have been connected, both here and elsewhere, for promoting the study of the scientific principles of art, not only amongst the artisan, but also amongst the professional class of skilled craftsmen, such as engineers, architects, and the like. So long as the only recognised, and, indeed, possible, road to the acquisition of a practical art is through a five years' apprenticeship, during which, on the one hand, the master is neither compelled to teach his apprentice more than it is for his (the master's) interest that the apprentice should learn, nor to give him any opportunity of acquiring a knowledge of the scientific principles of his art in institutions in which alone such knowledge can be systematically taught; nor, on the other, is the apprentice compelled to show that he has made good use of his apprenticeship by the test of a practical examination in what he is supposed to have learned, so long will all attempts to put technical education on the same footing as that on which it is in on the Continent be abortive and futile. If we really want to place our skilled craftsmen of all classes in a position in which they can compete fairly with those of France and Germany, what we must do is to give them the same start in the race, and that start is in their apprenticeship. It is of very little use expecting to educate the adult artisan class of the present day as a whole; we must devote our attention mainly to the oncoming generations, and in 15 or 20 years we may, with good management, find ourselves on the same level as that on which France and Germany now stand. Now, sir, if we intend to educate the workman of the future in the principles of his art, we must do it whilst he is an apprentice; and if we want to do this we must, as a preliminary, revolutionise the system of apprenticeship now prevailing in this country, and assimilate it to that which obtains in France and Germany. We must abolish the condition of having merely passed so many years in a workshop, or a factory, or an office, as the test of proficiency in a craft, and we must substitute for it the test of examination. Moreover, we must make the passing of such an examination the *sine quâ non* to the legal recognition of the apprentice as a master workman. In other words, we must put the practitioners of technical art on the same footing as that on which the practitioners of law and medicine now stand, and make the examination the primary, and the period of apprenticeship the secondary, condition of proficiency. If, in addition to doing this, we compel the master to allow his apprentice a reasonable amount of time to attend lectures, or to obtain information by other means in the theory of his art, and if we also give the apprentice, what I think it is only fair that we should give him, the right to shorten the duration of his apprenticeship by allowing him to go in for his examination as soon as he likes, I believe we shall have no difficulty in obtaining as comprehensive a system of technical education as we can desire. It is in this as in all other matters, provide the demand and the supply will soon appear. Establish demand for instruction in technical knowledge, and

you will soon find that you will have teachers and institutions start up in all directions to meet it. In spite of a good deal of outcry that has been made against it, I believe that the present system of the Department of Science and Art is quite elastic enough to meet all the demands that are likely to be made upon it for some time, and I do not see what more could have been done by it than it has done. To attempt to establish technical schools in different parts of the country so long as the present apprenticeship system exists, would be like establishing a hospital amongst a population which was notoriously healthy. The masters don't want them, and the apprentices don't care about them. The masters do not want them, because they are not sufficiently long-sighted to see their best interests, and because they do not care to travel out of their usual routine and give their apprentices time to attend the schools; the apprentices don't care about them, because they don't see how the knowledge which is to be acquired in them will materially assist their getting on in life, even if they had the time to attend them, which they have not. But once make the change in the relations of master and apprentice, and in the character of the apprenticeship, which I have suggested, and the whole aspect of the subject would be altered. Both masters and apprentices would quickly find out the advantages of technical schools, and the operation of the Government then, instead of being to weakly encourage their formation, would rather be to check their establishment by incompetent persons, or in conditions in which they could hardly expect to be successful. Depend upon it, this question of apprenticeship is the key to the problem against which we are all now so vigorously knocking our heads; and if the Committee want to do real service in the matter, they cannot do better than deal with it at once. Ten minutes and a sheet of foolscap would, I believe, be nearly enough to draw the outline of a bill which, if Parliament could be got to pass it, would make the future of technical education a very easy matter indeed.—I am, &c., Francis T. Bond, M.D., Principal of the Hartley Institution, Southampton.

March 5, 1868.

Mr. Hyde Clarke's Paper.—Sir,—In your report of my remarks on Mr. Hyde Clarke's paper on "A Daily Mail to India," occurs a misprint, which you will oblige by correcting, since the extravagance of the statement invalidates everything else I say. The possible speed at which vessels might be propelled, if specially built for speed only, I named as 20 miles per hour; I am reported to have said 30 miles an hour, which never entered my mind. The necessary condensation in reporting excludes the context, which might make manifest a misprint.—I am, &c., Jno. Jones.

338, Strand, Feb. 28, 1868.

Mr. Hyde Clarke's Paper.—Sir,—I feel it my duty to protest against Capt. Donald Stewart's indiscriminating remarks with regard to the state and quantity of the rolling stock on Turkish railways, made at the meeting on the 26th ult. They may apply to one particular line; but, if so, he should have taken into consideration, for the sake of his own undertaking, if not for others, the critical position of all railways under Turkish guarantee, and should have signalised the exceptions. I beg to state that the Smyrna and Cassaba Railway, of which I have the honour to be chief engineer, is furnished with ample rolling stock for its traffic or for that likely to accrue during the next three years; and I send herewith a quotation from the *Impartial* of Smyrna, under the head of "Constantinople News," to show that the opinion of the public, as well as of the government, is in favour of that company. His Highness Fuad Pasha, and the members of the High Council of the Treasury, have stated to me their perfect satisfaction with the progress of the construction and the arrangements for traffic on this railway; and the Sultan himself informed a deputation from the board to Buckingham Palace, that he was so thoroughly contented with the manner in which the construction and furnishing of the line was carried out by Mr. Edward Price, as well as with the management since the opening, that it would give him pleasure to favour any reasonable views of the company, and that an exceptional effort should always be made to satisfy promptly any claims it might make on the government. The real fact is, that no financial arrangement has been made by the government for the express purpose of satisfying the claims under the head "guarantee," which may be from time to time made by the several railway companies so privileged, and, consequently, when a payment is to be made on the score of guarantee, a special grant has to be made for the purpose, and extraordinary funds must be raised to meet it. In the meantime the company claiming payment is subject to the delay contingent on these proceedings.—I am, &c., Charles E. Austen.

7, Broad Sanctuary, S.W., 28th February, 1868.

Quotation from the "Impartial" of Smyrna, just received, dated 8th February, 1868.

"Constantinople.—On nous écrit de Constantinople, le 5 Février :—'Tout accident est assurément regrettable; mais un malheur, quelques conséquences facheuses qu'il ait, s'il ne peut être réparé quand il coûte la vie de l'homme, trouve son atténuation dans les mesures qu'il provoque pour en prévenir le retour. C'est là le jugement porté par l'opinion publique au sujet du déraillement survenu sur le Chemin de Fer de Cassaba, et qui a occasionné la mort du mécanicien. En général, on a loué l'administration de cette voie de son empressement à s'enquérir de la cause de ce déraillement et de promettre une recompense pour découvrir *l'auteur du méfait.* Ces mesures démontrent, de la part de la compagnie, une sollicitude pour la vie des personnes et les intérêts du pays dont on ne saurait assez tenir compte. Elles sont aussi un moyen efficace pour attirer la confiance et assurer le succès de l'entreprise.'"

MEETINGS FOR THE ENSUING WEEK.

Mon......Social Science Assoc., 8. Meeting of the Health Department. Dr. B. W. Richardson, "On the Effects of Excessive Physical and Mental Training."
R. Geographical, 8½. Mr. A. Waddington, "Geography and Mountain Passes of British Columbia, in connection with an Overland Route."
Medical, 5. Annual Meeting.

Tues ...Royal Inst., 3. Mr. G. Scharf, "On Historical Portraiture."
Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon Mr. Sandberg's paper, "On the Manufacture and Wear of Rails."
Photographic, 8.
Ethnological, 8. 1. Mr. Crawfurd, "On the Migration of Plants yielding fermented Alcoholic and Oleaginous Materials." 2. Miss Haigh, "On the Island of Teneriffe, and its Aboriginal Inhabitants, the Guanches." Communicated by Sir John Lubbock, Bart.

Wed ...Society of Arts, 8. Mr. Thomas Beggs, "On Courts of Arbitration, &c."
Geological, 8. Mr. Joseph Prestwich, "On the Structure of the Crag-beds of Norfolk and Suffolk, with some Observations on their Organic Remains."
Graphic, 8.
Microscopical, 8. 1. Dr. Collingwood, "On the Algæ which causes the Coloration of the Sea." 2. Dr. Murie, "On a Method of arranging Microscopical Cabinets."
Literary Fund, 2. Annual Meeting.
Archæological Assoc., 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.
Royal Inst., 3. Mr. G. Scharf, "On Historical Portraiture."
Society of Fine Arts, 8. Conversazione, at the Gallery of the Society of Female Artists, 9, Conduit-street.

Fri.......Society of Arts, 8. Cantor Lectures. Dr. Crace Calvert, "On Chloride of Sodium, &c."
Astronomical, 8.
Royal Inst., 8. Mr. W. Stanley Jevons, "On the Probable Exhaustion of our Coal Mines."
R. United Service Inst., 3. Lieut.-Col. C. H. Owen, R.A., "Modern Artillery, as exhibited in Paris in 1867."

Sat ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."
R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 20th February*, 1868.

29. Bill—Representation of the People (Scotland).
59. Court of Session (Scotland)—Return.
65. Charitable Funds—Return.

Delivered on 21st February, 1868.

27. Bill—Election Petitions and Corrupt Practices at Elections.
42. (I.) Postal Contracts.
57. Parliamentary Electors (Edinburgh)—Returns.
55. Electoral Statistics (Scotland)—Amended Return.
69. Sugar—Return.
71. The "Kit Carson" and "Bazaar"—Reports.
89. Metropolitan and City Police—Returns.
89. (I.) Metropolitan and City Police, &c.—Return.

Delivered on 25th February, 1868.

33. Bill—County Courts Admiralty Jurisdiction.
40. ,, Sunday Trading.
35. Poor Law (Workhouse Inspection)—Return.
61. Suez and India Telegraph—Memorial.
68. Postage (Gibraltar, &c.)—Returns.
100. Nuneaton Railway Station—Reports.
102. Army and Marines (Flogging)—Return.

Session 1867.

558. Greenwich Hospital—Returns.

Delivered on 26th February, 1868.

32. Bill—Landed Property Improvement (Ireland).
37. ,, Ecclesiastical Titles.
20. Record Publications—Return.
49. Mail Service (Bahamas)—Return.
92. Bank of England—Accounts.
93. Bank of England—Return.
103. East India (Irrigation)—Return.
107. Constabulary Fines and Fees Fund (Ireland)—Statement.

Public Petitions—Fourth Report.

Session 1867.

431. (A VIII.) Poor Rates and Pauperism—Return (A).

Delivered on 27th February, 1868.

43. Bill—London Coal and Wine Duties Continuance.
47. Army—Estimates (1868-9).
62. Army (Colonies)—Statement.
63. Army (Variation of Numbers, &c.)—Statement, &c.
78. Sardinian Loan—Account.
79. Greek Loan—Account.
80. Russian Dutch Loan—Account.
94. Mint—Account.
109. Railways—Report by the Board of Trade.
116. Revenue Department and Packet Service—Statement of Excesses.

General Post-office—Convention.

Session 1867.

46. (XII.) Trade and Navigation Accounts (31st December, 1867).

Delivered on 28th February, 1868.

60. Juries—Return.
76. Post-office Mail Service (Havana and St. Thomas)—Contract.
97. National Gallery—Annual Report.

Patents.

From Commissioners of Patents' Journal, February 28.

Grants of Provisional Protection.

Acetic acid, &c., manufacturing—480—H. B. Condy.
Albums, &c.—500—J. P. Lack.
Aniline colours, compound of—496—H. A. Bonneville.
Bale ties—326—E. T. Mainwaring.
Barometrical and thermometrical apparatus—529—L. Wollhelm.
Billiard marking boards, &c.—3029—G. Smith.
Blinds, &c., working the rollers of—453—J. Tansley.
Boilers—430—J. Howard and E. T. Bousfield.
Brush-making—490—F. Tolhausen.
Buckles, &c., substitute for—487—W. E. Deverna.
Candles—492—G. Roberts.
Carriage springs—454—H. A. Dobson.
Carriages—514—J. Barlow.
Cartridge boxes—478—S. B. Tucker.
Charcoal and sugar, treating—499—J. Steele and J. Hastie.
Cigar, ash, and light holder, combined—428—A. Philipp.
Coal, &c., excavating—458—J. W. Melling.
Corn, &c., drying machinery—466—J. S. Williamson.
Culinary purposes, revolving stands for—477—W. G. C. Hudson.
Cylindrical surfaces, connecting and disconnecting revolving—505—J. S. Raworth.
Dials for showing the distance travelled by public conveyances, and the fares due for the same—498—A. Lemasson.
Eggs, testing—464—F. Schäfer.
Envelopes—479—W. Wootton.
Fabrics, treating—520—J. P. Worrall.
Fibrous substances, spinning and twisting—518—W. H. Tasker.
Fire-arms, breech-loading—511—E. Cottam.
Fire-arms, &c., breech-loading—519—A. H. Brandon.
Fire-places—459—C. and L. Vezhulst.
Gas—465—A. Brin.
Gas meter cases—432—W. Cowan.
Gas stoves—485—R. George.
Glass, ornamenting—469—J. Wenden and S. P. B. Fussell.
Grain, cleaning—446—W. R. Lake.
Iron and steel—481—J. G. Willans.
Key rings, &c.—503—G. V. Wisedill.
Kneading apparatus—486—F. Grenier.
Knife cleaners—434—H. Woodward.
Lamp burners—522—W. Lincoln.
Lamps, moderator—497—H. A. Bonneville.
Lamps, safety—419—W. Hann.
Lamps, &c.—439—W. B. Marston.
Letter and invoice holders, &c.—445—W. Burgoyne.
Looms—470—S. C. Lister.
Looms—508—D. Whittaker.
Matches and fusees—455—T. J. Clanchy.
Millstones—475—R. Young.
Needles, papering—491—W. Woodfield.
Oils, treating and deodorising—506—R. Martin.
Ores, extracting and condensing the volatile portions of—493—W. R. Lake.
Paper, &c., cutting—476—R. C. Ross.
Pen and ink holders, combined—449—C. E. Brooman.
Pumps—484—W. G. H. Taunton.
Purses, &c., fastenings for—468—W. T. Woolley.
Puzzles and puzzle chains, &c.—523—J. G. Taylor.
Railway points and signals—509—W. Easterbrook.
Railway points, indicating position of—488—J. Wood.
Railway signals—447—F. Barnes and D. Hancock.
Railway wheel tyres, heating and forming metals for—3482—P. R. Hodge.
Railways and tramways—457—C. M. Holland.
Sewage, separating the solid and watery particles of—510—W. J. Bennett and J. Jobson.
Sheep, &c., shearing and clipping—451—H. C. Tucker.
Shipwreck, saving life in cases of—467—W. E. Newton.
Shirts—524—F. Chevassu.
Silk fancy weavings—463—G. Seamer.
Smoke, consuming—460—J. R. Stoney.
Stone, &c., crushing, &c.—512—B. Farmer.
Tiles, bricks, &c., ornamental—525—J. Walker.
Tobacco box and tobacco cutting machine combined—517—J. Clark and T. Vicars.
Trousers, &c.—338—E. Andrews.
Type composition, &c.—521—W. H. Wilkinson.
Valves—438—W. T. Sugg.
Water, raising—452—H. Schlotter.
Waters, manufacturing and storing aërated—353—A. Clark and A. van Winkle.
Whip holders—494—W. R. Lake.
Wood, preserving—441—N. C. Szerelmey.
Wood, treating compressed or embossed—371—J. H. Johnson.
Wool, &c., preparing for spinning—448—G. Jessop and B. Senior.
Woollen condensing machinery—461—W. Pickard.
Yarns, &c., sizing and balling—483—S. Seville.

Inventions with Complete Specifications Filed.

Breasts, artificial—616—W. R. Lake.
Washing and rinsing machines—602—W. Krutzsch.
Wood, seasoning and preserving—553—W. R. Lake.

Patents Sealed.

2461. J. Douglas.
2463. J. and G. W. Dyson and S. Martin.
2473. I. Dixon.
2474. M. Hammerstein.
2480. D. Nicoll.
2489. A. Field and W. B. Nation.
2492. A. E. Gelhaye.
2493. P. F. Lunde.
2506. G. T. Bousfield.
2513. H. Carter & G. H. Edwards.
2541. J. Whitham.
2844. T. Nelson.
2977. F. J. Bugg.
2993. H. Ritchie.
3190. W. and W. Campion.

From Commissioners of Patents' Journal, March 3.

Patents Sealed.

2503. F. B. Dœring.
2509. R. A. Jones & J. C. Hedges.
2514. G. Cope.
2515. J. Ford.
2521. H. Gardner.
2526. W. G. Creamer.
2527. T. W. Helliwell.
2534. J. B. Rogers.
2539. B. F. Stevens.
2549. F. Tolhausen.
2554. J. Turnock.
2555. J. Medhurst.
2593. W. F. Batho.
2604. J. Jeyes.
3002. L. Stockman.
197. W. R. Lake.

Patents on which the Stamp Duty of £50 has been Paid.

441. W. Kirrage.
556. S. S. Gray.
610. L. C. Cottam.
441. W. Kirrage.
558. G. Lauder.
483. L. A. Bigelow.
542. C. Whiting.
550. T. W. Roys and G. A. Lilliendahl.
592. R. Johnson.
577. J. Dodd.
579. A. T. Godfrey.
708. F. A. Braendlin.

Patents on which the Stamp Duty of £100 has been Paid.

506. J. Taylor, jun.
513. W. J. Hay.
483. L. A. Bigelow.
526. G. Smith and J. Carrick.
909. J. Silvester.

Journal of the Society of Arts.

FRIDAY, MARCH 13, 1868.

Announcements by the Council.

ARTISANS' REPORTS ON THE PARIS EXHIBITION.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's pubblishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'Clock :—

MARCH 18.—"On Railways and their Management." By ROBERT F. FAIRLIE, Esq. On this evening the Marquis of CLANRICARDE will preside.

MARCH 25.—"On Horse as an Article of Food." By A. S. BICKNELL, Esq. On this evening Sir JOHN LUBBOCK, Bart., F.R.S., will preside.

CANTOR LECTURES.

The following is the syllabus of a course of four lectures "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," to be delivered by Dr. F. CRACE CALVERT, F.R.S., as follows :—

LECTURE I.—FRIDAY, MARCH 13.

CHLORIDE OF SODIUM, OR COMMON SALT,— Its extraction and composition. *Sodium*—Its manufacture and employment in the production of aluminium, magnesium, and gold. *Chlorine*—Its preparation and properties, and especially its action on certain metals. Illustrations.

LECTURE II.—FRIDAY, MARCH 20.

THE BLEACHING PROPERTIES OF CHLORINE.—*Bleaching Powder*, its manufacture and application to the bleaching of calico, linen, and paper pulp; the manufacture of chloroform, &c. Illustrations.

LECTURE III.—FRIDAY, MARCH 27.

CHLORINE AND ITS COMPOUNDS WITH OXYGEN.—*Chlorate of Potash*—Its manufacture and remarkable properties. *Hydrochloric acid*, or spirit of salt—Its production and applications in Arts and Manufactures, viz., galvanizing of iron, sal ammoniac, chloride of tin, &c. Illustrations.

LECTURE IV.—FRIDAY, APRIL 3.

THE CONVERSION OF CHLORIDE OF SODIUM INTO CARBONATE OF SODA.—The decomposition of common salt into hydrochloric acid and *sulphate of soda*, Glauber's salt; the transformation of this compound into *soda ash*, *soda crystals*, and *bicarbonate of soda*, Ballard's process; and the important and recent discovery of the utilisation of soda waste, &c. Illustrations.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

EXAMINATIONS, 1868.

Secretaries of Local Boards are informed that a "Form 2" applying for 73 "Forms 4" has been received without signature or name of Local Board inserted. It is thus impossible to ascertain from whence it came. The sender of the above is requested to communicate with the Secretary of the Society of Arts.

SUBSCRIPTIONS.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOURTEENTH ORDINARY MEETING.

Wednesday, March 11th, 1868; WILLIAM FARR, Esq., M.D., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society :—

Phillips, John, Epsom.
Stewart, Captain the Hon. Randolph, 85, Eaton-sq., S.W.

The following candidates were balloted for, and duly elected members of the Society :—

Lewis, Thomas Hayter, 9, John-street, Adelphi, W.C.
Hollest, W., Leigh-house, Farnham.
Thomas, Wesley Henry, 6, Water-lane, E.C.

The Paper read was—

ON COURTS OF ARBITRATION AND THE PRINCIPLES OF CO-OPERATION, AS MEANS OF BRINGING INTO HARMONIOUS ACTION THE INTERESTS OF CAPITAL AND LABOUR.

By THOMAS BEGGS, Esq.

In this paper I propose to look at the antagonism which at present exists between capital and labour, and at some of its causes and results, and then to inquire whether means cannot be employed to bring the two interests into greater harmony. I must entreat the indulgence of my audience if I have to travel over much familiar ground in order to elucidate the propositions with which I shall conclude.

A contemplation of the present condition of society would seem to favour the belief that there is a tendency in civilisation to increase the extremes of wealth and poverty—to elevate the few into opulence, to depress the many into indigence, and to widen the gulf that separates the two classes. The more than usually prolonged commercial panic, from which I hope we are now emerging, has brought out in strong relief the dark features of our social system. We have immense capital lying idle, and therefore unproductive, and thousands of the industrious classes, who depend upon the employment of that capital for subsistence, driven to the verge of destitution, and living upon public and private charity. Pauperism and crime are increasing, and in some dis-

tricts the pauper class is increasing while the population is decreasing, both being effects of the same cause—the paralysis of the industry of the district. I will not trouble you with the statistical returns, but will simply call attention to one item of the account, one that is not shown by figures, and which escapes that attention which it deserves, that is, the rapidly increasing number of a class who live by precarious employments, and who follow unsettled and questionable pursuits. Many of these live in luxurious idleness, and some of them are persons of education and address. They prey upon the community, contrive to keep out of the meshes of the law, but are really the most dangerous of the dangerous classes. In all this there is much more than the money cost, there is the tendency to drag down; while other causes from without are operating to precipitate into the same gulph those who are tottering on the brink. Contemporaneous with this vice and misery, we are beset on all sides with plans for their relief, plans for treating the sick poor in workhouses, plans for making convict labour productive, plans for employing the able-bodied but destitute poor upon the waste lands, and many others. We are flooded also by applications for aid to various schemes of well-intentioned benevolence, from which it is difficult to withhold assistance, but which, like almsgiving, create as much poverty as they relieve. Is it not wise, then, to turn from these palliatives, and see whether we cannot stop the supplies to this large army of vagrants, paupers, and criminals, who must be fed although they do nothing to produce—who live, indeed, upon the vitals of the state. If this suffering be the natural and legitimate consequence of a progressive civilisation, then in obedience to an inevitable necessity, let us soften its severity in the best way we can; but before we adopt that conclusion, let us diligently inquire whether these mighty evils are not in a great measure the fruits of our ignorance of the economic law which governs the production and distribution of wealth, and which is as unerring in its operation as the law of gravitation. If we pursue the inquiry without passion or prejudice, and by the same processes of induction that we follow in any other field of scientific investigation, then we shall discover that these evils grow up from causes which it is in our power to remove. The laws of Providence are ever harmonious and beneficent, and it is something worse than folly to hold them responsible for the suffering that surrounds us.

This will indicate the course I am about to pursue this evening. The evils arise from both moral and economical causes, but I cannot enter upon all the various ramifications of a question so large, but will confine myself to one, perhaps the most difficult, and certainly the least inviting of the many—the most difficult because it is the one on which the greatest difference of opinion exists, even among educated men; and not inviting from the fact that I shall have to disagree with some for whose opinions, in other matters, I entertain the greatest respect. I refer to the discontent which, it is not too much to say, has become chronic among the workmen of England—the jealousy which prevails between the employer and employed—in a word, to the antagonism which exists between the capitalist and the labourer. The Report of the Royal Commission upon Trades Unions and Outrages has given a painful interest to the subject, and has probably done much to hasten the solution of a great social problem, but I prefer to dismiss from consideration the causes which led to the appointment of that Commission, and discuss the question as if no acts of violence had ever been committed. I found nothing upon the evidence taken by the Commission. The indictment I prefer against trades unions is based upon the observation and experience of many years. Should the indictment be substantiated, then trades unions will only stand convicted of the same errors which have misled statesmen in all ages up to the present time—errors which have sometimes led to desolating wars, and, what has been equally productive of human misery, to nation contesting with nation in the markets of the world, not by fair, open, and honourable competition, but by hostile tariffs and protective duties. I condemn the system, but I wish to speak with the greatest possible respect of those who believe that it is founded upon expediency and justice.

I object, then, that trades unions bring constraint in the place of that liberty which is just as essential to the development of the industrial resources of a people as political freedom is to their moral and intellectual progress; they limit the field of production, and fetter the hands of the producers; they obstruct the free flow of capital, upon which labour is dependent, by rendering the profits of that capital uncertain and insecure; they tend to reduce to the dull level of mediocrity the more skilful and energetic of their own members, and to oppress those who from physical or mental deficiencies are not able to keep pace with the majority of their fellows. Under the plea of protection—protecting the interests of a certain trade or calling—they perpetrate a wrong upon other trades or callings less powerful in numerical strength or funds than themselves, and by the means resorted to to promote their interests, very often destroy the trade of a neighbourhood and drive it away to other districts or other countries where it can enjoy greater freedom; they waste the labour fund and press down to poverty and ultimately to pauperism thousands who are dependent upon it. We must no more expect that trade will flourish under restrictive systems of any kind than healthy vegetable or animal life can be maintained with a partial exclusion from light and air.

This is a grave indictment, and ought not to be made but on the clearest evidence, but the history of the last half-century will justify every part of it. It applies to the peoples of all countries. In 1848, almost the first act of the workmen of Paris, while proclaiming the doctrine of "Fraternity"—"Liberty"—"Equality"—while attempting to carry out an "organisation of labour," and to establish "national workshops," was to call for the expulsion of the English workmen. Wherein does this differ in spirit or principle from the demands of several trades who are combined together for what is called mutual protection? What is all this but the triumph of the strong over the weak? It is less a war of labour against capital than that of one class of labourers against another; and nothing is written more plainly upon the annals of human progress than this:—that one class of men in a community cannot be permanently benefited by exclusive privileges or monopolies, by that which injures the community. What affects one class must ultimately affect all, and it may be taken for granted that the interests of the working classes in this or any other country are bound up together. If one large section of them suffer, the welfare of all is endangered. They can no more escape from the consequences of the poverty and suffering which afflict their fellows than they can escape from the atmosphere which surrounds them.

It is the character of evil to work out good, and the act of the workmen in Paris roused the indignation of the French economists, and wrung from them fervid protests against so tyrannical and suicidal a measure. For the first time in the history of political economy its expositions came forth clothed in a vivid and touching eloquence. The dry abstractions of a science became instinct with life. Thus the extravagancies of the communists and socialists of that time brought about a reaction, and inaugurated a new era in civilisation. I shall not be accused of exaggerating the importance of the movement then begun, when the results flowing from it are fully considered. Out of the discussion arose the proposition of courts of arbitration for the settlement of disputes between employers and the employed, and that still more important one, the formation of partnerships of industry to effect a reconcilement between labour and capital.

It will help us to understand the value of these two

propositions, both of which have made most satisfactory progress when carried out in action—if we look for a few minutes at the defence set up for trade combinations. The common plea is that workmen have a right to mutually agree upon the price at which they will sell their labour, if they do not coerce others. This is a very ambiguous way of stating a case. A limitation is intimated, but is not defined; and it would be better if those who use the argument would show us, by some example, to what limit the right may extend, and where it may stop. To my mind the statement amounts to this, that the men have a right to combine together—if they fulfil none of the purposes for which they enter into combination. It will be conceded at once that two men have a right to decide upon what terms they will sell their labour, but the moment they use the power that unity of purpose gives them to coerce a third, or in any way to prevent or disturb his free action, they are placing constraint in the place of liberty. The purpose of a trades union, as I take it, is to induce all its members to come to some common agreement on certain matters which are considered for the good of the trade. It may be as to the amount of wages, the hours of labour, or the number of apprentices, but whatever may be the object sought, coercion, in some form or other, is essential to their purpose, and inseparable from any line of action, whether defensive or aggressive, they may pursue to gain it. Let us keep in view the principle of liberty. From the time of Adam Smith to the present, all economists have accepted the axiom that a man ought to be left at liberty to produce that which he can produce best, and take it to the market where he can get the most for it. Whatever contravenes this right, whether it be in the shape of law, or custom, or combination among those who go to the same market, is vicious in principle, and must be injurious in practice. The most sacred right of a man, next to that of personal freedom, is that of being left at liberty to get the best price he can for the products of his skill and industry. The interests of the body politic demand that we should bring out all the energies of the individual man, but the union tends to annihilate that individuality and make him a mere unit in a large confederation of his fellows. It is little to the purpose to say that he becomes a member of that body by a voluntary act. What penalty has he to pay if he does not join a trade society? What freedom of action is left him either within or without the union? Without, he is a marked man, encountering that opprobrium which is most offensive to an independent man's pride; and if within, he must submit to the rules of the society, and often to the will of the dominant minds who are at the head. It is idle to say that the power exercised is moral power. Moral power, when employed by numbers, is merely the perspective of physical force. It is not much more to the purpose to say that the learned professions have similar combinations for similar purposes. This, if it be true, only shows that educated men fall into the same errors as the less instructed of their countrymen, and that it would be better if the scope of their preparatory studies were enlarged. They would be none the less fitted for a career of useful, honourable, and profitable employment, if they gave some time to the examination of those principles which, under the name of political philosophy, affect mankind in all their civil relations, and bind them together in communities.

It is said that such organisations are necessary to defend the workmen from the selfishness and rapacity of employers, and that employers themselves combine. There can, perhaps, be little said in behalf of employers as a class. No doubt many of them are selfish, look only at their own interests, and are wanting in a due consideration for those who receive wages at their hands. It is probable that many of the differences which have arisen might have been adjusted by a conciliatory spirit on the part of employers. An indifference or arrogance of behaviour is often most strongly marked in those who have themselves risen from the ranks of labour. It must be remarked, however, that there is not the same tendency to combine for a common purpose. They are engaged in a fierce competition. There is much keen and unscrupulous dealing in all trades, no mutuality of interests is recognised, and there prevails a jealousy of each other; but, wherever combinations exist to interfere with the legitimate operation of the laws of supply and demand, they are equally objectionable whether on the part of employers or of employed. One may be made an excuse, but is certainly not a justification of the other.

I am compelled to notice one or two other matters, because, in the discussion of this question, every exploded fallacy of the last fifty years has been imported into it. We hear of the tyranny of capital, of ruinous competition, of over production, and of over population, and that, therefore, combined action on the part of the working classes is absolutely essential to keep them from being wholly trodden down. It would require a separate paper upon each head to expose the fallacies lurking beneath, and then they would survive, for nothing is so long lived as a sophism that announces itself under a high-sounding phrase. I will only say a few words upon those which belong to my subject, and which will help to introduce the propositions I have to submit. It is assumed that capital is the enemy of labour—that there is an irreconcilable antagonism between them. Is that so? There is no man so much interested in the accumulation of capital, and its perfect security, as the workman. His own little possessions form a part of the general capital of the community, and any social, or political, or commercial disturbance affects him in as great a degree as the member of any other class. Capital creates and keeps up the demand for employment. It is his interest that the rights of property should be held sacred; if he suffers it to be assailed he endangers his own. What is the condition of the people in those countries where capital is scarce, or its employment unsafe? The sister kingdom is an example. The state of the people is one of wretchedness, and discontent stalks abroad. There is abundant scope for the employment of capital, and with a steady demand for labour, that discontent would die out. The labourer is idle because there is not capital, or, what amounts to the same thing, there are impediments to its safe and profitable investment. All history teaches the same lesson. Capital is the mainspring which keeps industry in motion; surely, then, it cannot be in antagonism to the skill and labour which keeps it fructifying from time to time.

What is meant by ruinous competition? Here, again, the man who lives by wages is more than any one else interested in having competition free and unfettered. By it the sober and industrious workman of the present day is able to obtain comforts, both in food, raiment, and lodging, that were the luxuries of the palace in the age of Elizabeth. The largest rise in wages to which he aspires would scarcely compensate him for a rise of ten per cent. in the price of all he consumes. It is his interest to have all articles of ordinary consumption at the lowest cost, but the wages paid form always an important item in the cost of production. Is there any consistency in the workman expecting that his wages should remain at the same standard, while he desires that all articles he consumes should be regulated in their price by open competition?

What does the friend of the working classes desire to see, but that every one of them should be able to secure an abundance of all the necessaries and comforts of life, and enough to provide a fund to meet the exigencies of sickness, and the infirmities of age, and that he should have more leisure than the present hours of labour afford for rational recreation, or the pursuits of study. All men desire that the workman should have more leisure, and he would have more if he knew better how to employ it; but we desire to see this,

not for a few favoured and powerful trades, but for all. How is this to be brought about, but by encouraging improvements in every way; by making the powers of nature, subordinate to man's skill and intelligence, perform the most irksome and toilsome parts of labour. Machinery and competition, under proper arrangements, are the friends of the workman; the one aids his power of production, and the other brings the produce within his reach.

One word as to the cry against political economy and its teachings, for every one who has a monopoly to defend, or a restrictive system to uphold, begins or ends his argument by a protest against political economy. They will persist in assuming it to be an ingenious theory, fabricated to favour particular interests, and it is in vain to assure them that it only aspires to expound the laws which govern the production, accumulation, and distribution of wealth. It is true that its teachers predicate what will be the result of certain laws and arrangements, but they are no more responsible for the sufferings which they foretel than is the meteorologist, who, after years of observation, is able to predict the storm, accountable for the devastation it creates. Men who have never given an hour to a consideration of the elements of the science hasten to condemn it, because its teachings do not quadrate with notions of their own, or fulfil the expectations of their experience. They forget that experience gathered without a sound theory to direct it is a false guide, and that theory without observation is equally liable to arrive at erroneous conclusions. Political economists do not agree on some minor matters, but this no more detracts from the value of the science than the fact that astronomers are not agreed as to the distance of the earth from the sun invalidates the science of astronomy. The points of difference are mainly those of definition. It must be confessed that almost exclusive attention has been paid to the laws which govern the production and accumulation of wealth, and much too little to the laws which regulate its distribution. But political economy, in its sternest teachings, is free from the charge brought against it. Its doctrines favour no class. It shows that there is no antagonism between capital and labour, and that all legitimate interests are in harmony. If its principles be studied with patience and docility they will dissipate the uneasiness which is felt as to over-production and over-population. Political economy vindicates the ways of providence, shows that the table of nature is spread for all, and that if any are excluded it is in consequence of the arrangements of those who arrogantly presume to be wiser than what is written. There is enough for every living being, and no producers to spare; and what we want is the abolition of all monopolies, restrictions, and imposts of every kind. We want perfect freedom of trade.

I will now endeavour to illustrate this harmony of interests, and show what, in my judgment, is the cause of the present antagonism between capital and labour.

Suppose, for the purpose of illustration, we plant some dozen families upon a tract of rich and uncultivated land. They have skill in all the arts of husbandry, strength and willingness to labour, but they have neither implements, seeds, nor supplies of food; in fact, they have no capital. It is obvious that unless they can find wild roots, or wild fruits to subsist upon, they must die of hunger, and that with such sustenance in plenty they will be no richer or better at the end of the year than they were at the beginning. This shows how labour without capital is helpless. Bring to them a man who, as the result of his own saving, or that of others, possesses spades, barrows, and other utensils, a supply of seeds, and also of food, and the case is altogether altered. He has neither knowledge nor skill, nor ability to labour, but he has what is better than all these under the circumstances, he has capital. He offers to the others the use of his capital, and, as a matter of course, obtains as much as he can for that use. This is a perfectly legitimate transaction; both parties are gaining by the bargain. They both receive and render service, for which they receive and render satisfaction; and looking at it under the light of ordinary commercial transactions, it is the interest of one party to give as little and the other to obtain as much in exchange as possible. Both are benefited, and in a few generations the wilderness is covered with fertile fields, ripening grain, and smiling villages. But as time goes on, and as wealth accumulates, and the community flourishes, we shall hear of the rights of labour, and the selfishness of capital, and of protection to certain interests. Why should this be when, as we have seen, they started from a point where union of interests was indispensable—when either would have perished without the assistance of the other. Does it not arise from a defect in the mode of exchange—a fundamental error in the method by which they render service and receive satisfaction? Can a principle be introduced which would establish an identity of interest? Now supposing the capitalist in this case, instead of going to the labourers with the view of making the best bargain he can, in its present sense, says this: Now, I have implements, seeds, and supplies of food, which in my hands are useless; you have skill, knowledge, and willingness to employ your ability; I will lend you what I possess, but you shall give me a certain per centage of the profits you may gather at the time of harvest, and on this principle of co-operation we shall all be benefited, and all have the same interest in exercising strict care over our machinery, in economising our supplies, and in making the most of our opportunities. In this arrangement the individuality of each is maintained. There is nothing of communism in it, as it is quite compatible with the arrangement that each man should receive in proportion to what he contributes to the common stock. There is no arbitrary rule of equality which has the tendency to extinguish honourable ambition, laid down. This rough sketch indicates the principle of co-operation proposed as a solution of that great difficulty which at present exists between labour and capital. There is a reciprocity of service and satisfaction, and there is liberty. Labour is elevated above its present position by being removed from the same category as the insensate things which skill and labour have produced. The distinction is an important one to keep in view. Is it right that the skill of the man whose steady eye and experienced hand guide the engine over its iron road should be held in the market as subject to the same rules as the machine which is obedient to his will? Be it as it may, the working classes will not be content to work for wages, nor will they be reconciled to it by the arguments usually employed. We may tell them, that in exchange for what they contribute to society in the shape of service, each man receives every day 200 or even 500 per cent. more than, if left to himself, he could produce in a lifetime; we may tell them that the profits of large concerns, when divided among all employed in them, would be too small a reward for the increased responsibilities: but all this will fail to make them satisfied with things as they are. Under present arrangements there is no chance of thoroughly reconciling the conflicting interests; and it is certain that if we intend to keep the position we hold as a manufacturing people, we must secure a greater unity of purpose between the employers and employed.

I submit that the principle of co-operation laid down, which is widely different from the schemes of Mr. Owen or Mr. Minton Morgan, is worthy of grave consideration by all classes. Of course there are many objections, as there are to all experiments, but they are not of the same kind as those with which the ardent reformer has had to conflict in every stage of our social progress. It will be recollected that in our own lifetime we were wont to hear a good deal of the manufacturing and agricultural, as separate, distinct, and rival interests. This was the result of laws which were made for the ostensible purpose of protecting native industry. The abolition of the corn

laws destroyed the rivalry of the two classes, and we have heard nothing since of these two interests being opposed to each other. Are there no means by which a like harmony can be produced between the employer and the workman. If there be anything impossible or impracticable in co-operation as a principle let us see what it is. Is there anything more than that fear of change which affects the mass of mankind? They do not see that we live in a world of change—nothing is to day what it was yesterday. And may not the principle I name be another step in civilisation, and lead to greater achievements than any hitherto made? It may tend to prevent the accumulation of immense riches in the hands of a few; but this would be no evil, while, at the same time, it would lead to a more equal distribution of wealth among those who produce it; and this would be a decided good.

Practice generally precedes theory, and in this case it is certainly not behind it. If we take the trouble to inquire, we shall find the principle of co-operation obtains in many cases. Inventors, who are not themselves manufacturers, as a rule make arrangements which give to them a royalty upon all the articles sold. This secures a permanent interest in the sale and improvement of the invention. A large number of establishments are managed in departments, the head of each department receiving a certain per-centage upon the profits in addition to salary, and a number of agencies are conducted upon the same plan. There are some firms that adopt the principle of rewarding long and faithful services by giving an interest in the business. These partial efforts show that men are led to the principle of co-operation by interest if not by inclination; but besides these, we have now the examples of many successful partnerships of industry. It is not my intention to give the history of these, a long list of which lies before me, but I assert there is a marked success in what has been attempted; and I agree with Mr. Mill that "they are the first step on the ladder leading to the prosperity of the masses, the upper rounds of which will be reached by an energetic application of the principle by the working classes to production as well as consumption." I hope, however, that the movement will be rendered more steady, more safe, and more rapid, by employers giving to it the benefit of their experience and business knowledge. It is less necessary that I should burthen this paper with particulars, as there are many valuable works on the subject. I would recommend the pamphlets published by Dr. John Watts, of Manchester. Mr. Mill, in the last edition of his "Political Economy," has added to his chapter on the "Future of the Working Classes," many valuable facts and statistics which I most earnestly recommend my hearers to consult. Those who have little time for inquiry and research, may derive advantage from reading a lively article in *All the Year Round* for February 29th, "The Rochdale Twenty Eight;" the perusal of this article will, if I mistake not, create a desire for further information.

The idea has caught hold of the public mind, and a full discussion will ensue. We must be cautious alike of the sanguine promoter of co-operative schemes, and of those who point to impending disaster and ruin. There will, of course, be mistakes made—this occurs in every enterprise of whatever kind—but mistakes tend to sober enthusiasm, and induce circumspection. The path of difficulty is often the path of safety, and we must not be deterred from following it because there is a lion in the way. It is scarcely possible that the working classes, if left to themselves, without the aid or guidance of those who are more skilled in commercial pursuits, would commit graver errors than those made by the classes above them. We have had a recent and melancholy instance of this in the limited liability companies. The legislature passed a very just and necessary measure. It was most inconvenient that, in a great trading community, a few men should not be able to unite together to carry out any undertaking, under the law of partnership as it once stood, without becoming responsible for the undertaking to the extent of every shilling they possessed. The legislature passed an act which enabled a company to be formed, making every shareholder responsible to the extent only of the full amount of his shares. It required a proper registration of the articles of association, and of the names of the shareholders. The law did this, but it could not give men prudence; nor could it give protection against dishonest or imprudent men. When it came into operation, an intense, it may be said an insane passion of speculation had set in. Advantage was taken of the new law to launch all kinds of reckless schemes, to float insolvent firms, and miserable failures ensued. It is incredible with what alacrity men, who had saved a reasonable competency by patient industry, rushed into these hollow undertakings. The bubble burst, and shattered thousands of bright homes, and has left an indelible disgrace upon our mercantile and trading classes. We shall profit by that bitter experience, and the Limited Liability Act—susceptible, however, of some improvements—will become most valuable in carrying out partnerships of industry. There are no doubt impediments, and very serious ones, in the way, and it may not be applicable to all trades and employments. Much will depend upon the spirit with which the educated classes of the country look upon the work. In this, as in all other great reforms, there is no royal road to success. The principle is capable of many forms and adaptations, the idea being that of giving to the workman an interest beyond the mere receipt of wages in the establishment to which he belongs.

It must not be expected that a change so important and so vital can be effected at once, nor will it be, under the most favourable circumstances, the growth of a single generation. Acts of legislation can do nothing to assist beyond removing obstructions out of the way. We may inquire whether during its development something may not be done to adjust the differences which ever and anon arise between the employers and the employed. Strikes and lock-outs are more worthy of the feudal ages than an age boasting its progress and enlightenment. They are a species of civil war disgraceful to reasonable men. They waste individual means and the national resources, and create feelings of bitterness inimical to the best interests of mankind.

This leads us to a consideration of the second branch of the subject—that of courts of arbitration. Such courts have existed in France for many years, and are under the sanction of the state. As a nation we are slow to learn from others, but at length the principle has taken root here, and our statesmen, as well as employers and workmen, are listening with eagerness to what can be said in relation to them. My aim is to stimulate inquiry and not satisfy it, and therefore I shall only take a few facts from the many which present themselves. Mr. Mundella, of Nottingham, to whom the nation owes a deep debt of gratitude for his exertions in conducting a great experiment, stated, in his lecture at St. James's Hall, that since the first formation of Courts of Conciliation in France, that is, in ten years from 1830 to 1840, they had adjudicated upon 135,730 cases; of these, 128,319 were amicably settled, 3,513 were withdrawn by consent, and 3,881 judgments had been pronounced against which only 155 appeals were made. The functions of the French Courts extend, as he informs us, to every question arising out of manufactures and trade, with the exception that they have nothing to do with fixing or determining the rate of wages; and Mr. Mundella points out that this want of power is a defect in the system. Every sentence of that plain and practical address deserves careful study. He describes what has been done at Nottingham, a place where feuds had existed, in certain trades, for more than a century, and the satisfactory results which had followed the adoption, in one trade, of a resolution to submit all disputes to arbitration. This experiment dated back only so far as 1860,

and I must refer you to his own account of it; but there is one case so pregnant with instruction, showing so forcibly what may be done, that I must quote it. This instance was given by Mr. Mundella in a speech made by him at Halifax. "Some men," he stated, "connected with one of the hand-frame branches came to their masters and said that trade had been bad for some years past, and their wages had been low, and it was time that some increase of wages should be given. The masters said, 'It is very true that your wages have been low, and we should be very glad indeed if something could be done to improve your position; but you must remember that you are in competition with foreign nations, that the French and Saxons are engaged in the same work as yourselves, and that three parts of what you produce is for the foreign market, therefore it matters little to the foreigner who purchases them whether they are made in Saxony or Nottingham. He looks at the texture, quality, and price; we cannot, therefore, make the allowance which you require.' Now, in the old days this perhaps would have been followed by a contest or strike. But what happened in this case? The matter was reasoned out. Two of the men were sent to France to look into the exact state of the case—to see what the workmen there could earn, what work they turned out, and with what result. Another man was sent to Saxony, to make a similar investigation. What was the result? When they came back they said, 'We have looked into all these matters; we have seen what the French and Saxons are doing, and we are perfectly satisfied that wages should stay as they are.'" Surely this was a rational method of reaching sound and satisfactory conclusions. Supposing a board of arbitration had existed, to which the recent case of the shipbuilders on the Thames could have been referred, should we not have had a different and more satisfactory result? There was evidently a disposition on the part of the men to make the most of circumstances, but the time for proper action was frittered away, as they were afraid of the rules and regulations of the trade, and they let the opportunity pass. Other instances will occur at once to those who have made any acquaintance with trade differences. Is there not, in the principle of arbitration, a promise of a better state of things? Mr. Mundella says, in simple but emphatic language, "he did not anticipate that all the masters, and all the workmen, would at once free themselves from all the follies and all the prejudices of the past, but was that a reason why they should not narrow as much as possible the area of strife? Was it not evident that, as the area was diminished, the power of resisting the evil would increase? He would ask, why should not masters and workmen mutually agree to let their contests cease, and let capital and labour shake hands?"

This is the language of sober wisdom, acquired by experience, and it will be well for all classes to pursue the inquiry. Besides the reasons given at the commencement of this paper, there are others supplying a strong motive to exertion in this direction. There is an immense power in combination. Dr. Watts gives a list of ten strikes which cost a million of money; and we have known certain branches of trade driven away by them from a district, as ship-building from the Liffey to the Clyde. A strike of the puddlers in Staffordshire closed many works that depended upon a supply of iron. We have had lately a strike for a short time of the engine drivers on one line of railway, but it was stopped by reasonable concessions on both sides. At one time it threatened to be a severe struggle, and it was intimated to be possible, if that one was successful, that it would eventuate in a strike of all the engine drivers throughout the kingdom. There was, perhaps, no danger of this, but it will be seen that it is in the power of this class of men, under any real or supposed grievance, to put a stop to all the traffic of the country. The mind can scarcely realize the extent of the inconvenience and loss which would ensue, but the passenger who had to pass into or out of London, or from one part of it to another, on the evening of the late cab strike, will be able to form some conception of what a single day's suspension of traffic would effect, and how all classes and interests would suffer. Again, we are told by competent judges that we are met, and most successfully, in foreign markets, by articles manufactured in other countries, in some instances equalling and in others surpassing our own, and this in classes of goods once made exclusively by ourselves. This is a fact that England cannot afford to trifle with or pass-by. How are we to keep our own in the world's markets? Not, certainly, by crippling our energies, but by making the most of our inventive skill, by economising material, and especially labour, by checking waste, by giving free-play to all our industrial resources. We must endeavour, by enlarging the field of production and creating a demand for labour, to lessen the burdens which fall upon the struggling classes; and it would greatly conduce to the same end, if the large sums which are thrown into the channels of waste—as for example, those which are spent upon drink and tobacco—could be diverted into the channels of profitable industry. We must have free trade in its largest and most comprehensive sense; we must get rid of the fetters which restrict alike the proper action of capital and labour. We must have harmony between those who pay and those who receive wages.

The Associated Chambers of Commerce, at their last meeting, have adopted the following resolution:—"That the result of establishing at Nottingham a standing local committee, consisting partly of employers and partly of employed, for the discussion and settlement of trade questions, having been found very beneficial, this association recommends its wider adoption, and requests the standing committee to use its influence to carry out the objects of this resolution."

I return to the subject again because of its overwhelming importance, and because some of our publicists are calling upon the legislature to legalise trades' unions, with a view to lessen or remove what is called their evils. I object to a legal sanction being given to combinations of any kind organised for the avowed purpose of protecting certain interests, but which really mean an interference with the freedom of the workmen. If they wish to unite for the purposes of mutual aid in times of sickness, the Friendly Societies Act is sufficient, or can be made so, to meet the purpose, and as a check or punishment for illegal acts, the laws against conspiracy are strong enough if put into practice. We must be cautious about this continual appeal to law. The statute book is already burthened by legions of laws, which, if they operate at all, only tend to restrain or impede our true progress. An evil is seen to grow up, and a rush is made upon the legislature for a new act of Parliament, when it would be more philosophical to inquire whether the evil may not be the result of some laws already in existence, or of some causes, the removal of which lies within the scope of voluntary exertion. Mr. Göschen said the other night, when speaking on commercial freedom, at the Liverpool Chamber of Commerce, "He felt assured that political economy was going to have a hard time of it, and the commercial classes were especially bound to defend the great principles of economic science, in which they were so deeply interested. They would assuredly have to repel attacks on one question—that of Government interference." This warning is worthy of all acceptance. The labouring classes as well as the commercial classes must look to it, for there is an increasing desire in almost all quarters to seek Government protection and Government aid. Every new scheme has its adherents. No person could possibly go wrong, if we believe our social reformers, and they could have their own way. A Board, with a number of public functionaries, supported by a Parliamentary grant of public money, is the usual machinery by which they seek to banish evil from the world, each in their own way. We want to evoke a spirit of intelligence that

will keep in check this restless love of law-making; and, moreover, we want to reserve some of that exuberant sympathy which is ever ready to expend itself on all objects within its reach for those who are suffering under the heavy burthens of local and imperial taxation.

According to one class of reformers everything ought to be done by the Government, and the idea of national workshops was scarcely more absurd than many of the schemes which are now propounded. Is it not an established fact that whatever the Government does is very expensive, and is scarcely if ever done well? This appeal to Government might all be very well if they possessed a purse with the magical powers of the cap of Fortunatus — that filled itself by some invisible and unfelt agency—but it so happens that the public purse is supplied out of the pockets of the taxpayers. This is overlooked when a clamour is made for Government aid and interference. Let us hope that the employers of labour and the employed in this country will adopt some voluntary action, some defined and peaceable method of adjusting all differences that may arise, without recourse to legal interference or enactment. They will secure all that is desirable far more effectually, and infinitely more economically, than it can be done by any Government, however wise and powerful it may be. Let us remember that, when a celebrated French minister told the merchants that he was desirous of doing something to promote commerce, they met him by the reply, "Let us alone." If some ardent reformers in the House of Commons should seek to settle the differences between capital and labour by new enactments, let the answer be, "If there are constraints imposed by law upon our perfect freedom of action, pray remove them. Give us a fair field, and then be good enough to let us alone."

The time has arrived when the topics which are here hastily delineated must be calmly and earnestly discussed.

No one can look at the disclosures of the last few years, as to the working of our commercial system, without feelings of shame and humiliation. They may be taken as portents of evil or as omens of good, just as we have the wisdom and virtue to apply them. There can be no more powerful cause, no more certain forerunner of decay in an empire than corruption among its merchants and traders. Let us hope that we may profit by a bitter experience, and in the future avoid the errors of the past. This is the favourable moment for such a retrospect as will place both sides of the account before us, and will show us what are our necessities. We want education for our people, and we may now expect that, after a half-century of debate and discussion on the subject, some unanimity of purpose and of plan will be attained. We want a technical education for our artisans and mechanics, so that they may be placed on an equal footing with those of other countries; and, besides, if I may venture to state it, we want a middle-class education of a higher order, one that will embrace in its curriculum a study of the sciences most important to man in his social relations—political economy and moral and political philosophy. There is a lamentable ignorance among the well-to-do classes on all the subjects appertaining to our national well-being; such knowledge would save them from some of the speculations to which so many fall victims, and might soften the force of those panics which so often, beginning in misapprehension, end by laying additional burthens upon the people in order to improve our national defences. They would learn where real danger lurks, and be better prepared to avert, or, when it appears, to meet it. The true defences of England are in cultivating the arts of peace, in maintaining friendly relations with all other peoples, and, above all, in spreading comfort and contentment among the abodes of those who labour. It may be, as some continental writers delight to tell us, that our meridian is past, and that decrepitude has already set in upon us. I believe no such thing. There is strength and stamina left in all classes of our people, new fields of enterprise are opening to us, and more glorious achievements than any yet recorded will be enrolled in the annals of England, if England be true to herself.

There is much of social reform and amelioration required; but I believe that nothing would be so conducive to the great end we have in view—that of elevating the character of our people, as that of capital extending the hand to labour, and labour, with the same cordiality, returning the friendly grasp. This harmony of interests is necessary to our prosperity; nay, more, it is essential to our safety. I conclude with the question: Are the means I have suggested worthy of consideration as likely ones to secure the desired end? I submit them as such; it is for others to decide as to their feasibility and value.

DISCUSSION.

The SECRETARY read the following communication from Mr. A. J. MUNDELLA, of Nottingham: — "I regret that I am engaged on the 11th to read a paper in this neighbourhood, otherwise I should certainly have availed myself of the polite invitation of your Council to be present at the reading of Mr. Beggs's paper. I am of opinion that if Courts of Arbitration were introduced in all our leading industries, the relations betwixt capital and labour would speedily undergo an entire change. Instead of strife, contention, waste, and loss, we should see peace, thrift, and mutual respect. It is now nearly seven years since the establishment of our Nottingham Board, and its working has been in the highest degree satisfactory to both employers and employed. I enclose the report for 1866; last year's is not yet ready. The lace trade has also adopted our plan with remarkable results so far. Masters and workmen sit down together to devise the means for bringing back to this country some of the trade which has been driven away by years of contention. Mr. Wilson, of Hawick, N.B. (brother of the late Financial Secretary for India), told me last week that they had adopted our system, together with our rules, a year ago, and the success had been most complete. It was educating the workmen in sound political economy; their opposition to improved machinery had ceased, and all bad feeling had disappeared. Mr. Hollins, of Minton and Hollins, also informed me that the workmen in the Potteries, who have long been in communication with me on the subject, had adapted our rules to the industry of Staffordshire, and that the masters assented to them, and in a month or two he believed the Board would commence operations. Last night, before leaving town, I had an interview with the Council of the Amalgamated Trades, comprising the most intelligent trades' unions in the Kingdom, viz., the Amalgamated Engineers, 33,500 men; Ironfounders, 10,500; Bricklayers, 5,500; Gilders, 600; Carpenters, 8,000; Shoemakers, 6,000; and a number of smaller trades in addition; and they passed a resolution unanimously desiring the general establishment of Boards of Arbitration in all the branches of their Union, and have resolved upon inviting the leading employers of the United Kingdom to meet them in Conference to arrange for prompt mutual action. From a correspondence with nearly all the leading trades' movements in England, I am convinced that if employers will only meet in a spirit of kindness and intelligence, the advances which working men are now ready to make, strikes will soon become a relic of the past. That which is dangerous and mischievous in trades' unionism will be eliminated, and capital and labour will enter on a new phase in their relations, and work harmoniously together. Two things are, I think, essential to enable Boards of Arbitration to succeed:—First, they must be voluntary, and free from all legislative interference, and all compulsion of witnesses, and fines and distraints, as set forth in Lord St. Leonards' Act. Second, the Board must be composed of equal numbers of employers and employed, with a president or umpire chosen by both parties—all the parties being engaged in or connected with the trades they legislate

for. This is merely a system of open friendly bargaining; we have endeavoured for a long time past to avoid voting on any question. We try to agree, and for three years and a-half we have agreed without once coming to a vote."

Mr. Hole had had one or two opportunities of seeing the principles which had been referred to in the paper successfully carried out. The first case was in a dispute in which the masons of Leeds were engaged, and in which he had been appointed arbitrator, in conjunction with one of the workmen, on behalf of the men, two masters being nominated on the other side, and the clerk to the magistrates being chosen as umpire. The question was fairly argued out, and the strike, which had been some time in continuance, was terminated amicably. The next case he had known was still more remarkable, and referred to a colliery near Leeds, conducted by Mr. Briggs. The strikes had there become so frequent, and things had got to such a pass, that the partners almost despaired of carrying on the business. They at last decided, however, in 1865, to form the colliery into a limited liability company, giving the men the preference in taking up the shares, and promising even those who could not take shares an interest in the results. The arrangements were that 10 per cent. interest should be first attached to the capital, and half of all that was gained beyond that was to be divided amongst the labourers in the proportion of their wages, in addition to what those who were shareholders received as such. By the last balance-sheet it appeared that 978 were entitled to bonuses, and they received them in amounts varying from $5\frac{1}{2}$ to 12 per cent. on their earnings. A shareholder who was in receipt of 20s. a week received as bonus £1 11s. 2d.; if he earned 30s. a week he had a bonus of £2 6s. 9d.; and if he earned 35s. a week he would have a bonus of £2 14s. 7d. The anticipation was that, if they could raise, as they hoped to do, the profits of the concern to $17\frac{1}{2}$ per cent., a bonus of $7\frac{1}{2}$ per cent. on the wages could be given. In other respects the results had been very satisfactory, for, instead of being a most turbulent and drunken lot of men, they had now become most orderly and sober, and, by the testimony of the clergyman of Normanton, who wrote to Mr. Briggs unasked, much superior to the generality of men in the neighbouring collieries. If such good results were obtained in the case of a low and uneducated set of men like colliers, they would naturally expect even better results in the case of workmen higher in the social scale. Some years ago there was a paper in *Chambers's Journal* giving the experience of a master painter and decorator in Paris, who, from finding the great loss to which he was subjected from the idleness and carelessness of his workmen, when scattered about in different parts of the city, away from any efficient control, was led to try the experiment of giving them all an interest in the business, taking for himself what he called a remuneration as manager, instead of the whole profits as proprietor. The result was, that the men became industrious and careful, and he received more as manager than he had as principal. Moreover, after some years' trial, the experiment was still found to be successful. He hoped this principle of co-operation would become more general, as he believed it was the only solution for the difficulties of the labour question.

Mr. Dunning had heard the statements of the last speaker with much pleasure, and only wished that the spirit of conciliation and thoughtfulness on both sides, displayed in the instances which had been mentioned, were more general between the employers and employed, but, unfortunately, it was not so, and therefore he could not altogether agree with the strictures on trades' unions contained in the paper. If such a spirit as Mr. Hole had referred to were universal, trades' unions would be superfluous, but instead of that there was a constant proneness on each side to take advantage of the other, and it was only by both standing somewhat on equal terms that this tendency was neutralised. A single workman in any trade could not make anything like fair terms for the sale of his labour, for his circumstances were such that he was unable to wait while a bargain was made. If a large estate were for sale, and must be sold in a week, there was no doubt that the seller would have to lose several thousand pounds, perhaps without any blame to the buyer; and it was just the same with labour, a single man could not stand out against his employer, and must practically take what wages he was offered, unless he combined with his fellows. He thought, therefore, that Mr. Beggs had been rather too hard upon trades' unions. Again, with regard to courts of arbitration, it did not often happen that both parties were willing to submit to arbitration. If the master thought he had the advantage he said he did not want any interference; the fact being that he did not want justice, he wanted victory. It was just the same with the men; if they thought they had an advantage they did not want justice either, but victory, and they rejected any interference. The party with a weak case was always willing to arbitrate, but not the other, and that was the reason that courts of arbitration had not been more generally established. Lord St. Leonards' Bill lacked one important feature which must be supplied in order to make it efficient, viz., a provision that on the application of one side, the other should be compelled to arbitrate. A year or two ago, when there was a dispute in the building trade, the men would have gone to arbitration, but the masters would not; and, some years ago, the Amalgamated Engineers would have arbitrated, but the employers would not consent. No doubt trades' unions might be abused to evil, and it was evident from what occurred at Sheffield they sometimes became conspiracies to murder, but so might a prayer meeting be turned into a conspiracy to murder. He believed that in the middle ages some religious institutions had ends very similar. With regard to industrial partnerships, he thought them most excellent; they seemed calculated to bring out all the good and repress all the evil in combinations, and he wished every success to the endeavours of Mr. Beggs to encourage their formation.

Mr. P. H. Holland thought it almost a pity that two subjects of so much importance as co-operation and councils of arbitration should have been brought forward together, lest full justice should be done to neither. He also thought Mr. Beggs had too much disparaged the influence of law in these matters. There were many cases in which legislation had been beneficial on social subjects, as, for instance, the Registration, Public Health, Vaccination, and Burial Acts. He also thought the paper was rather too hard upon trades' unions, for though their action was generally foolish, and not seldom unjust, it was not always so. It was very natural for a man who saw his employer daily amassing great wealth, while he himself was in poverty, and had no prospect but the workhouse in the distance, to look with great jealousy upon the persons who acquired this wealth, and fancy they had done so by an unjust division of the products of his industry and their capital. And such men would naturally grasp at anything which promised to rectify what looked like gross injustice. He granted at once that the means by which it was thus sought to adjust the great inequalities of wealth and poverty were bad, but still the inequalities did want adjusting, and this was what the trades' unions were aiming at. The effect, however, was generally the reverse of what was intended. Anything which prevented the employment of capital in any particular trade must lower the wages in that trade, and anything which rendered the masters' position and profits precarious tended to drive away capital. This had been the constant result of the action of trades' unions, but yet it was very natural for their originators to fancy they would be beneficial to their class. With regard to the remarks of Mr. Beggs on the limited liability companies, he might say that although the failures had been many, they had been

anything but universal. It would, however, probably be the case, that where the business was of so small a character that the limited liability principle came into direct competition with the individual trader, the former would be beaten by the latter, who was able to give more exclusive attention to the business. Another plan, which was more promising, was that of enabling individual traders to borrow money on a share of the profits, the lender not incurring more risk than that of the capital which he supplied, but neither did this promise to accomplish all that could be done by co-operation for the common welfare. The principle of co-operation was to give to every one engaged in the concern, not only the capitalist but also the labourer, a share in the profits, and this was a much more promising method of dividing the products of labour equitably than any other. Of course nothing human could be certain of success, but you had much more probability of it when you had everybody with you than when some were against you, and under this system everyone in the concern had an interest in the success of everyone else's exertions. On the ordinary plan there was a kind of tacit combination against masters on the part of workmen, who would never tell tales of each other, but under the co-operative system all this would be changed, and the idle man would be looked upon as a cheat by his fellows. He believed, therefore, that the experiment was a most excellent one, which would do a great deal if carried on to rectify one great and growing evil of the present day—the wide separation of two great classes, the capitalist and the labourer. Very few had an idea of how much social mischief resulted from such a state of things. He knew a large district, containing some 40,000 inhabitants, in which there were hardly any rich persons, or even those who could be called in the rank of gentlemen, the vast majority being labourers, foremen, and the small shopkeepers who supplied their wants; and, really, this was a most dangerous state of society. Discontent was often found festering amongst the population, sometimes almost breaking out into rioting, the employers of these men being, in most cases, gentlemen of vast wealth, which was looked upon with jealousy. If there was not this complete separation between employers and employed, and masters and men worked together more, the community would be much happier and safer, and the influence upon the character of working men would be much healthier. All had derived in some shape great benefits from others, either their contemporaries or predecessors, or both; and it was, therefore, the duty of all to do what they could for others in return. There was no way in which they could better use their inflence, and it might be a little money also, than in helping forward this co-operative movement. An investment in such an experiment was quite as safe as many others, and likely to be far more useful. He had lately invested £100 in one of these undertakings, which he hoped would turn out a good speculation, though that was not his object. If it failed he would simply lose £5 a year, which was not a very large sum to give in charity, and in this way he was more likely to do good than by giving away the money.

Mr. FORD said Mr. Beggs, in speaking of the education of the working classes, had referred to their backwardness in producing engineering works; and in connection with that he would observe that 15 years ago the Amalgamated Society of Engineers were very desirous of abolishing the system of overtime and piecework, and during several years' discussion they several times asked for an arbitration, but the masters would not agree to it, and did their utmost to crush the society, even going so far as to start another in opposition to it. The result was that many of the men who supported that strike—which he had also supported, and made collections for amongst his own workmen, feeling that systematic overtime was a great evil which they ought to stand against—men who were the best specimens of their class, industrious and careful, were driven away from the country, and were now at the head of foreign establishments which were competing with England in the markets of the world, while their place was supplied by men who had never been apprenticed to the trade or learnt either from a master or a workman the many niceties and delicate points in which as workmen they ought to excel.

Mr. HAWES thought that, in considering this subject, Mr. Beggs had had one dominant view in his mind, and had looked at it from the position of a capitalist rather than that of a labourer; for it was common in connection with this question to omit altogether the labourer's point of view. He objected as strongly as anyone to strikes, and to unions if improperly conducted; but he held that men had a perfect right to strike and to combine; it was merely a question of whether the strike was advisable, or whether it was likely to be injurious to the nation or to the trade, and whether the union was conducted on proper principles, and not used as a means of coercion in a manner which every honest mind must condemn. They had to consider the question of the interests of capital and labour quite apart from individual cases like those which occurred at Sheffield, or with the Amalgamated Engineers. There was no doubt that the latter believed they were right in endeavouring to abolish the overtime-system, and though he believed they did themselves great injury by that strike, he was quite sure that the men at the time believed that they were doing right in opposing what they considered was a great abuse which was creeping upon them, not seeing that the result would be to drive a considerable number of men abroad, to compete with themselves and ultimately injure their trade. It was true that those who went abroad took the lead in foreign establishments, and got much higher wages than they would have received at home; and if a few engineers had thus taught foreigners something, on the other hand a considerable number of art workmen from abroad were constantly employed in teaching our own workmen at home what was equally valuable, so that the result appeared to be a pretty fair interchange, and, on the whole, he did not think much mischief was done. Again, in looking at this, they had been talking much more of the results of past legislation than of what was being done in the present day. It was only within a few years that the principle of limited liability had been introduced, which was really only a mode of providing for co-operation in the case of capital. He had advised working men in the colliery districts to watch carefully the balance-sheets published by several large limited liability companies recently formed in Derbyshire, and told them that if it appeared, as had then been the case for two or three years past, that the profits were from 25 to 30 per cent., they certainly would have a right to demand from the managers a higher amount of remuneration than they received at present. On the other hand he had told them that if in good times they claimed and got these advantages, in bad times they must expect to have their wages reduced. The period was now come, unfortunately, when these very men had to submit to a reduction of ten per cent., whom a few years ago he was almost prepared to justify in a strike on account of the immense profits which were being made by the masters while they were barely able to support their wives and families. Therefore, he held that working men had a perfect right to take what steps seemed best to them—provided they did not infringe the law of the land—to obtain a fair share of the profits which they helped to produce, and of which, perhaps, they were deprived. He considered that these co-operative establishments would be of the greatest possible benefit to working men, in teaching them lessons of industry which they would never have learned in any other way; and by the publication of the accounts showing when they would have a fair right to demand an increase of wages, whereas when this was done at haphazard, it not unfrequently happened to be the very worst time, when the increase

could not possibly be granted. Here he differed to a certain extent from Mr. Beggs as to the province of the law, for he considered that if these accounts were not compelled to be published, many of the beneficial results of the principle of limited liability would be lost. With reference to courts of arbitration, the results at Nottingham had certainly been very wonderful, and he had been recently informed by Mr. Samuel Morley that it was quite true that, since the establishment of the court of conciliation there, there had not been a division in the council or a strike for several years. In this matter they were following the French *Conseils de Prud'hommes*, and in one sense improving upon their plan, inasmuch as they had a fixed president, who must be a master, while here the parties chose a president themselves, and in Nottingham he believed the principle was to choose some one quite independent, in whom both sides had perfect confidence; and the success of the plan was shown by the fact that there had been no divisions in the council. He agreed that there ought to be the most perfect freedom in regard to labour, but he thought there were cases in which the interference of the law was necessary. While they asked for a good technical education for working men, he believed it would be true policy to so far interfere with freedom of labour that no working man should receive wages for a child until he was of a certain age, and had a certain amount of education. With that and some similar exceptions he agreed with the general dictum, that the less interference of the law between capital and labour the better. He believed it would be found not only that the interests of capital and labour were really identical, but that they were identical with those of the whole community.

Mr. W. H. Smith said nothing could be more interesting than the discussion of the relations between capital and labour, especially as he believed those employed in labour were not aware of these relations, for, in the main, it would be found that the interests of both were identical; not, perhaps, that the interests of a particular employer were always identical with those of his workpeople, but, taking the great industries of the nation, anything which seriously interfered with the prosperity of any particular trade injured alike the employer and the employed. He believed, also, that any increase in the cost of an article, either from a rise in the price of the raw material, or from an advance in wages, did not, in the long run, affect the profits of capital, but was borne by the consumer; and it was the interest of all alike that no increase should be made in the price of an article unless there was an increasing demand for it, and one which would be maintained. If a portion of those engaged in any trade could command a higher rate of wages, and a portion fell out of work, the community received no benefit, but the reverse, and it was against the interest of the employer to have only three-fourths of the quantity produced at a higher cost for wages, and probably also for the use of capital and skilled superintendence. All experience showed that the interests of masters and men were, as classes, the same; and he believed that great benefit would arise in the present day from the demonstration of that fact more clearly to the working men themselves. A short time ago a paper was published by an eminent friend of the working classes, in which he represented the labouring classes and their employers as standing glaring at each other from the opposite sides of a great gulf, and he could conceive nothing more likely to be injurious than such views, which were, he believed, untrue. Nothing would tend more to correct such notions than the success of the co-operative societies referred to by Mr. Beggs. They were inimical neither to the interests of the employer nor of the employed, and at the same time they tended to benefit the consumer; and he believed their operation would help to demonstrate that on the average the profits of capital embarked in trade were not larger than might reasonably be expected. One great advantage of co-operation would be, that it would tend to raise the character of the working men of this country, who greatly needed such a stimulus to their providence and skill, and to a feeling of responsibility with reference to the materials and machinery entrusted to their charge.

Mr. Campin regretted that the two distinct subjects of co-operation and courts of arbitration had been introduced into one paper, each being fully worthy of an evening's discussion. As to the courts of arbitration, he would say that the idea of a court always carried with it that of some sort of compulsion, and, as had already been said, if they were to be generally useful there must be some sort of coercion, as was contemplated in Lord St. Leonards' Act. It appeared to him that the Act would have some vitality in it if there were only some machinery at hand by which it might be worked, but at present there was no such thing. He thought if there were a revivification of the machinery of the old City companies, which embraced associations for trade purposes of masters, men, and apprentices, something like what was needed would be supplied. He understood that in France it was compulsory to refer all trade questions to the *Conseils de Prud'hommes*, and he believed some such provision would be necessary to render their working effectual in this country. One of the great difficulties in referring any matter to arbitration was, to find an arbitrator in whom both sides had confidence, and therefore if some such association as he had referred to were established, it would be known that certain men were qualified and willing to undertake the office, and thus a fair chance would be afforded for a trial of the system.

Mr. Frederic Hill thought the title of the paper was sufficient to justify all that had been brought in under it, and that the combination of the two subjects, co-operation and arbitration, was perfectly legitimate. What was advocated in the paper, however, was courts of conciliation, with which courts of arbitration were often confounded. One or two of the speakers had advocated trades' unions, on the ground that without them the labourer was at the mercy of his employer, being frequently a man living from hand to mouth who could not afford to wait, and must accept anything he was offered. If that were so he (Mr. Hill) should not object to trades' unions, but he believed it was an entire mistake. If that were true it would be found that high wages were only attained where there was combination, and that in all other cases the workpeople would be driven down to the lowest wages. But this was not so. At a discussion which took place in Sheffield three years ago, by the National Society for the Promotion of Social Science, on the subject of trades' unions, a manufacturer of that town stated, in the presence of persons who were prepared to defend them, that in a certain branch of the trade there never had been a trades union, and yet the wages in that branch had risen at least as fast as, if not faster than, in any other, and that statement was not gainsaid. On the occasion of the last amendment of the law of partnership, he was requested to obtain some information as to the state of things in other countries, and amongst others he called upon Mr. Adams, the American minister. They all knew that in no country in the world was labour so highly remunerated as in America, and yet Mr. Adams told him that, in his native state of Connecticut, a manufacturing state, there had been very few strikes, and that almost all which had taken place had been concocted or led by either Englishmen or Irishmen. So, again, with domestic service. They all knew that wages in this department of labour had risen as fast as in any other. Therefore, he said, it was mere imagination to suppose that wages were kept up by such means. Moreover, it was as much opposed to science as to facts. He maintained that there was a perfect identity of interest between capital and labour, and not only as classes, but between every individual employer and his workpeople.

It must be the interest of both to fix upon such a rate of wages as would not drive away either capital or workmen. That was a matter for careful investigation and friendly counsel, and if that point could once be fixed, it would be against the interest of the workmen to take one penny more, or of the master to give one penny less. He hoped advantage would be taken of the new law of partnership for paying workpeople, at least in part, by a share of the profits (which formerly a man dared not do), for it was to the interest of all that this principle should be extended. He thought much good would be done by following the example of the Anti Corn Law League, some twenty years ago, in diffusing a knowledge of the laws of political economy on the particular points which they were interested in, among the middle classes, who were then almost the sole depositories of political power. That was now changed, and it behoved all who could to assist in diffusing true information on these subjects amongst the working classes; at present they were in great ignorance upon such matters, and until that ignorance was dispelled, all these difficulties and animosities which at present existed could not be removed, or harmony restored between labour and capital.

The CHAIRMAN said the subject of the paper was as interesting a one as could be brought before them. The main object appeared to be to discuss the question of combinations amongst workpeople, and the best way of reconciling any differences which arose between them and employers. It was pretty certain that whatever might be said, trades' unions would continue, but it was equally certain that in the long run they had no influence in regulating the rate of wages, which must follow the law of supply and demand. Mr. Beggs had denounced trades unions, but no reference had been made to the combinations in the middle ages of masters and men against the public, for the establishment of monopolies, though something similar still existed in the case of gas and water companies, and perhaps of railways, wherein all persons concerned combined to keep up a monopoly price for that which they supplied to the public. The establishment of courts of arbitration, to decide disputed questions between workmen and employers, could not be too highly commended. The first notion when men differed always was to fight, but in the end probably all would come to the conclusion that when a dispute arose it was better to refer it to some one who would judge fairly between the parties, and decide according to the justice of the case; and that part of the paper all must cordially support. Another subject treated in the paper was the principle of co-operation or the combination of masters and and men, that appeared to have answered well so far as it had gone, so that there was every encouragement to pursue the experiment. He asked them to unite in a cordial vote of thanks to Mr. Beggs for his valuable paper.

The vote of thanks having been passed,

Mr. BEGGS expressed his obligations to the gentlemen who had spoken, and said there was only one or two points he need reply to. Mr. Hawes had intimated that his (Mr. Beggs') view of the case was that of a capitalist, but that was not the case; he had endeavoured to subdue any such inclination, and indeed had every possible motive for doing so, having been himself a working man who had worked for years for wages. He went into a shop as an errand boy, went through it as an apprentice, subsequently became foreman, and ultimately an employer; and it was during the time he was a workman that he formed his very strong opinions upon the subject of trades' unions. He spoke strongly upon the subject, because he believed they would never be largely successful in establishing courts of arbitration and partnerships of industry until they could shake the faith of the working men of England in trades' unions. He had not spoken rashly, for he had been in the position of a workman, and knew how much wrong they had had to complain of, and how arrogantly and superciliously certain classes of employers had behaved to them, but that did not prevent his giving his opinion on the evils of trades' unions. It was no doubt true that the men had a perfect right to combine; he did not question the right, but the expediency of such combinations, and he believed the large trades' unions of England had not done so much harm to capitalists as they had to workmen. The oppression he complained of on the part of working men was the oppression of each other. No despotism on earth dare attempt to inflict upon the working classes what the trades' unions of this country had inflicted. He had a great respect for Mr. Dunning, who had been trained, he knew, in the right school, and he (Mr. Beggs) had been apprenticed to the same trade with which Mr. Dunning was connected as secretary of the Union, but he asked him to apply what had been said to the circumstances of his own trade. He (Mr. Beggs) had worked both in the provinces and in London, and he never knew a case in which a sober, industrious man could not obtain work at the highest rate of wages. He must be pardoned for speaking somewhat warmly on the subject, as he felt it deeply. He had addressed thousands of working men, and had written again and again on subjects pertaining to their interest, and he could say most conscientiously that he had never uttered or written a sentence except under the strong conviction that it was his duty to do the best he could for the class from which he sprang. He had been understood with regard to the interference of the law in a broader sense than he intended; he did not mean that all law making should be put a stop to, but he did feel that there was too much tendency to force new laws and central boards upon the country, which cost a great deal of money, and he had a great deal of sympathy with that large and struggling class who were already heavily pressed by the burden of imperial and local taxation. He thought more good would be done by sweeping away a lot of these useless and obsolete enactments than by loading the statute-book with more. He believed it would be well to limit the hours of labour and the age at which children might be employed, but that was too large a subject to enter on now. He particularly wished it to be understood that he did not mean to oppose all new laws, but to check the growing propensity to over-legislation.

Proceedings of Institutions.

CREWE MECHANICS' INSTITUTION.—The twenty-second annual report states that during the past year the Institution has gradually recovered from the state of apathy into which it had lapsed, and has considerably advanced both in its educational and general usefulness. The Council believe that a larger desire for instruction has been excited, and it must be a great object in future to seize every opportunity to satisfy this feeling. They have sanctioned various changes in the educational scheme, which they hope will be improvements, and provided extra classes which they deemed necessary. The Council again express their wish for the enlargement of the building, as there is not sufficient classroom at their disposal. During the past year the Council have sustained the loss of the very valuable services of Mr. George Lord, through his removal from the town; and likewise of Mr. T. Stubbs, Honorary Secretary. They are also sorry to announce that Mr. Hawkins has been compelled to resign the office of Honorary Treasurer. They have selected Mr. Jackson as Honorary Secretary, and Mr. Charles Worrall as Honorary Treasurer. The number of pupils in all the classes has far exceeded that of former years. The attendance of pupils in the classes has been as follows:—

CLASS.	Quarter ending December 31st, 1866.	Quarter ending March 31st, 1867.	Quarter ending December 31st, 1867.
Elementary	10	11	28
Arithmetic and Mensuration	39	44	72
Algebra and Euclid	5	3	15
Mechanics	..	5	5
Grammar and Geography	41	40	81
History and Literature	6	5	11
Mechanical Drawing	13	10	22
Elementary ,,	24	25	37

The Rev. Alfred Rose, M.A., Fellow of Emanuel College, Cambridge, kindly acceded to the request that he would act as examiner of the candidates for the directors' prizes. In his report he says:—"In the science classes the papers sent up on Euclid by the first division were, with one exception, very fairly done. The same, however, cannot be said of those on algebra and mechanics. In the algebra paper but a small quantity of work was shown up, and what was done seemed to indicate an insufficient grasp of elementary principles. The mechanical drawings have all more or less the same fault, which is a very grave one, viz., inaccuracy, and the free-hand drawings are very much out of proportion. With regard to the performances in the literature classes, I can speak with more satisfaction. Some of the papers shown up, both by the younger as well as the older candidates, exhibit evidence of considerable intelligence and industry. This was especially the case in the subject of English history. In geography the work was, with one or two exceptions, only moderate. Some of the younger boys have acquired no intelligent conception of the map of England. In the Scripture subjects one candidate in each division did excellently well, while the work of the rest was in general quite below the mark. Their acquaintance with the Bible itself seemed too often very defective." A scheme for a course of lectures has been under the consideration of the Educational Committee, which they trust may, during the present year, be carried into effect. They have received the promise of a lecture from the Rev. Professor Kingsley. They desire to return their hearty thanks to Mr. J. Stuart, Fellow of Trinity College, Cambridge, for his lecture on "Meteors," and to express their sincere hope that he may be able to perform his promise of delivering a short course of lectures during the spring of this year. As bearing directly on the subject of technical instruction, it may be mentioned that an examination in the "Details of the Screw-cutting Lathe" was held under the auspices of the Lancashire and Cheshire Union of Institutes. Also examinations in "Calculations connected with Machinery." The total issue of library books during the year was:—To men, 3,975; to youths, 1,067; to females, 501; total, 5,543. The total number of volumes is 3,123. The income of the year has amounted to £572 2s. 5½d., and the expenditure to £517 4s. 1d., showing a balance of £44 18s. 4½d. in favour of the Institution. The directors of the London and North-Western Railway Company have again placed at their disposal the sum of twenty pounds, to be awarded in books, &c., as prizes to the youths in the company's employ at Crewe, for literary and scientific attainments. The Council will also give books, &c., to the value of four pounds, as prizes to the best competitors on the subjects of "Political and Social Economy," and the "Steam Engine."

NOTTINGHAM BOARD OF ARBITRATION.

The following account of the origin and progress of the Board of Arbitration and Conciliation of the Hosiery and Glove Trades, of which Nottingham is the centre, has been kindly forwarded by Mr. A. J. Mundella:—

The hosiery trade, for a period of two centuries, has been centred in the counties of Nottingham, Leicester, and Derby. Leicester has long been the centre of the woollen branch, as Nottingham is of the cotton, silk, and merino branches, which form by far the largest portion of the trade. These last employ, according to Mr. Felkin's estimate, from 20,000 to 25,000 workmen in hand-frames (not reckoning the frames worked by steam power), spread over the counties of Nottingham, Derby, and the northern part of Leicestershire. The wages of these hand-frame-work-knitters are regulated by the Board of Arbitration and Conciliation, and all questions arising from wages are referred to it for settlement.

There are few trades in the United Kingdom in which there has existed so much agitation and irritation as in this. For a century past strikes have been frequent and protracted, and in some instances have led to disastrous and even fatal consequences. Luddism was an outgrowth of the opposition to improved machinery, which the frame-work-knitters believed tended to reduce wages, and was not suppressed until several of its unhappy leaders suffered the punishment of death.

Throughout the present century down to the year 1860, strikes and lock-outs continued, and in years of brisk demand the trade was constantly subjected to loss and embarrassment consequent thereon. Trades unions have existed in every branch from about 1780 to the present day. The trade has always had to maintain a sharp competition with the foreigner, and especially against the cheap labour of Saxony. The system of employing middle-masters, which is a necessity of the trade, is liable to great abuse, and the cupidity of individual employers has at times given rise to great oppression; hence there has always been cause for irritation and dissension, and however unreasonable the demands of the workmen may occasionally have been, their grievances have been many, and often calculated to embitter their minds against employers and their agents. From these dissensions both the capitalists and the workmen have been frequent sufferers. Strikes have heretofore been usually resorted to by the workmen as their only means of redress. Frame breaking and burning in effigy were amongst their worst consequences in the first quarter of the present century, and in modern times they have been embittered by gross personalities and inflammatory placards.

It was after a struggle of many weeks in the wide frame branch, in the autumn of 1860, that the Board of Arbitration and Conciliation originated. This was the third or fourth strike in the same branch during that year. The workmen struck for an advance of wages which their employers believed it would be impolitic to grant. The manufacturers met together to consider what steps should be taken to terminate the strike, and, as the branches which were at work contributed to the support of the branch which refused to work, a lock-out was proposed. Before resorting to such an extreme course some manufacturers wished to try conciliatory measures, and it was resolved to invite the workmen to a conference. This invitation was cheerfully responded to, and a deputation of employers met the workmen in the Committee-room of the Chamber of Commerce, and after a protracted discussion, extending over several days, all difficulties were adjusted upon the express condition that the Board of Arbitration and Conciliation should be formed to prevent such calamitous disputes in the future.

The Board was immediately constituted, and met for the first time on the 3rd of December, 1860, at the Committee-room of the Chamber of Commerce, where it continues to hold its meetings. At the outset it consisted of nine manufacturers, chosen by a public meeting of their own body, and nine operatives, selected by their respective trades unions. Recently the number has been reduced to seven of each, but in all other respects the rules then drawn up continue to govern the Board in its constitution and proceedings.

Questions of wages, the manner in which certain classes of work should be performed, and the rate at which new classes should be paid, constantly occupy the attention of the Board; but, in addition, other matters have arisen which have an important bearing on the material and moral interests of the workmen. One of the first subjects which demanded its attention was the abominable practice of the truck system. Some of the middle-masters whilst paying the regulation prices to their workmen, continued to keep them in a state of subjection by supplying them in advance with various articles of consumption, such as groceries, flour, cheese, bacon, &c. This, although in contravention of law, is sometimes very difficult of suppression, as it is not always done in a direct manner, but through some relative keeping a shop or store in which the employer possesses a secret interest. The goods supplied in this way are invariably charged much above the market value, besides being of inferior quality, and this is tantamount to a large reduction of wages, besides depriving the workman of his independence. The Board advertised in the public newspapers their determination to stop the system by prosecuting the offenders, and by removing the machinery from any middle-master having recourse to such practices. A prosecution was instituted in one instance, and these measures had the effect of entirely stopping this oppressive system. If it is at all practised at present it is in such a secret and mitigated manner as not to be known by the Board.

Another evil which reduced the purchasing value of the workmen's earnings was the custom of paying them in the villages at late hours on Saturday night or early on Sunday morning, when no markets were available. This was also advertised in the newspapers as contrary to the wishes of the Board, and individual employers guilty of the practice were written to in terms of remonstrance, and the evil thereby greatly checked, although, perhaps, not thoroughly eradicated. Deductions from earnings in excess of the customary charges of the trade have been steadily discountenanced and suppressed.

When the Board was first founded it was generally considered a doubtful experiment. Several manufacturers were openly or covertly hostile to it; some regarded it as utopian and impracticable; others as likely to pry into the secrets of their business; and some as derogatory to their position and independence. These objections, however, have been steadily disappearing, until at the present time there are only two or three who refuse to acknowledge its decisions; but these are as effectually governed by its regulations as its warmest supporters; and the resolutions of the Board have been generally loyally responded to by both masters and workmen.

The discussions at the Board have always been conducted in the most friendly spirit and orderly manner. There has never been the slightest contention as to who should fill the offices of President or Vice-President. The workmen propose a manufacturer as President, and the manufacturers a workman as Vice-President. Whenever any breach of economic laws has been suggested by workmen outside the Board, the operative delegates have always been the first to denounce it. The voices of reason and humanity have invariably had due weight with the delegates of both sections. And although both masters and workmen are accustomed to express their opinion of each others' individual and collective acts without the slightest reserve, no manufacturer or workman has ever been known to suffer from the free and honest expression of his views. One of the most evident results of this interchange of thought and opinion is, that the workman becomes better acquainted with the laws which govern trade and commerce, and with the influence of foreign competition; and the master learns how to appreciate the difficulties of the workman, and to sympathise more with his trials and struggles to maintain and improve his position.

It is important to notice that the success of this system is more attributable to its preventive than its curative character. Nine-tenths of the matters arising in the trade that would, if allowed to go on, produce dissension and irritation, are never brought before the Board, but are arranged by the interposition of the Committee of Inquiry, who, by taking prompt action, and by exercising a spirit of justice and conciliation, succeed generally in arriving at a satisfactory result; if unable to do so a reference is then made to the Board.

During the disastrous years of 1863 and 1864 the trade suffered terribly from the American war. The manufacturers sustained great losses, and the workmen suffered severely from want of employment. For the greater portion of that period the Board did not meet together, owing mainly to the fact that there was no occasion for its services, but the Committee of Inquiry continued its duties, and immediately trade revived the meetings of the Board were alike called for by manufacturers and workmen, and the prices of labour were raised to a level corresponding to the demand.

The strikes of former periods not only entailed great sacrifice and suffering on the workmen while they lasted, but necessitated large contributions before and after to sustain them. The trades unions sometimes levied as much as one shilling or one shilling and sixpence per week from the scanty earnings of the stocking-maker for many weeks in succession, and the clothing and furniture of scores of families disappeared during a prolonged strike. At present the contribution to the trades unions during some years does not exceed that of a single week under the old system. And the manufacturers have ceased to regard them as their natural enemies.

The facts which the Board points to as the best proofs of its success are:—that during the six years of its existence no strike or lock-out has taken place, no personal attacks have been made, and no inflammatory handbills circulated. Never in the history of the trade has there existed so much good feeling betwixt employers and employed as at the present moment. And during the past two years wherein labour has been scarce and agitation on the question of wages prevalent throughout England, the manufacturers in this branch of industry have been able to accept contracts without apprehension and execute them without delay.

The following is the report of the Board for the year 1866:—

"It affords the Board much pleasure to report that the past year has been, on the whole, a prosperous one in the hosiery trade, employment in nearly all branches having been abundant. The Board has met eight times during the year for general and special business. The committee of enquiry has also met on several occasions, and all matters in dispute which have been submitted to it have been speedily and amicably settled.

"The Board having now had six years' experience of the practical working of the system of arbitration, as opposed to strikes and lock-outs, is thoroughly convinced that in a free country where workmen and capitalists have a perfect right to enter into combinations, the simplest, most humane, and rational method of settling all disputes betwixt employer and employed is arbitration and conciliation.

"The Board is strengthened in this conviction by the fact that during the past two years the demand for hosiery has been, in several branches, of an exceptional character, and labour, in some departments, unusually scarce; and notwithstanding the workmen have preserved their trades unions, by having a central authority to appeal to, composed equally of employers and employed, all questions calculated to produce irritation and lead to disputes have been promptly settled; all inequalities in the rates of wages have been adjusted; the manufacturer has been enabled to accept his contracts without apprehension and execute them

without delay, and the rights of workmen have been jealously looked after and strictly preserved. Whereas in neighbouring counties and throughout the country a chronic warfare has existed betwixt labour and capital to the great injury of both, owing to the want of some court of appeal commanding alike the confidence of employers and employed.

"It is with much satisfaction that the Board is able to report that at no previous period in the history of the hosiery trade has there existed such a cordial understanding betwixt employer and employed as at the opening of the present year. and the Board trusts that this may long continue, believing that it is calculated to advance the interests of the trade, to improve the condition of the workmen, and to further the progress and well-being of the community."

Signed :—

Manufacturers.	*Workmen.*
A. J. Mundella, President.	J. Saxton, Vice-President.
T. Hill (Messrs. I. and R. Morley).	H. Farrands.
R. W. Smith.	T. Wilson.
T. Ashwell.	W. Foster.
J. H. Lee.	W. Straw.
T. Black (Messrs. Rogers and Co.).	G. Kendall.
H. F. Cox.	John Lamb, Secretary.

OWENS COLLEGE, MANCHESTER.—DEPUTATION TO THE LORD PRESIDENT.

A deputation waited upon the Duke of Marlborough on Thursday, the 5th inst., to make an application to the government for a grant in aid of the extension of the college. A statement had been left previously with his grace, which, after giving a history of the college and its progress, proceeded as follows :—

A conviction is now widely spread that there should be in England, as in France and Germany, colleges giving instruction, at once complete and thorough, in all the leading branches of applied and experimental science. It is felt that what is wanted is the foundation, not of workshops for teaching manufacturing processes, but of schools of science (1) in which those who are to direct the industry of the country may receive thorough training in mathematics and the principles of physical science; (2) in which those artisans who have proved themselves to be possessed of superior parts may, by acquiring a knowledge of science, fit themselves to fill more important positions; and (3) in which competent teachers may be trained both for the higher posts and for teaching soundly the rudiments of science in primary and secondary schools. It is evident that no place is more fitting than Manchester to be the seat of such a school of science; and if it is a matter of almost national importance that such districts as that of which Manchester is the centre should possess a college of these pretensions, the effort now making to enlarge and (so to say) re-found Owens College, which is already doing a considerable amount of satisfactory work in this very direction, affords an opportunity of at once and with exceptional ease supplying the need in the place where it is felt the most. It is proper that evidence should be offered that Owens College is fitted to be the channel of such an extended training in science. Owens College is affiliated to the University of London, the rigour of whose examinations is matter of notoriety, and the only university in the kingdom which gives special degrees in science. The success which candidates from Owens College have had in the science examinations of the university is conspicuous. . . . . . . The funds in the possession of the college amount, therefore, to about £120,000, yielding a yearly income of £3,700; and, by the addition of students' fees (about £2,300), the total income of the college is raised to £6,000. To provide suitable buildings, and to make the desired extension, it is proposed to raise a fund of £150,000. Of this sum it is calculated that two-thirds will be required for land and buildings, including chemical and physical laboratories, museum, &c., and one-third for the endowment of new professorships and the maintenance of the library and the scientific departments. No general canvas for funds in support of the extension of the movement has yet been undertaken. Notwithstanding (1) the sum of £9,000 has been contributed by the engineering profession towards the endowment of an engineering department; (2) the Manchester Natural History Society has, under certain conditions, made over on trust to the college its large and valuable collections, and property estimated to be worth £13,000; (3) from the general public promises of £23,000 have been received. These sums amount to £53,000, which, with the estimated value of the land and buildings now occupied by the college (£6,000), gives a total of £59,000.

Application is most respectfully made to the government for aid, on the following grounds :—

1. That the North of England stands in especial need of such a college as has been described, and that Manchester would be its natural seat.

2. That Owens College contains the nucleus of a science school of the first order.

3. That the presence in Owens College of a Faculty of Arts, by the side of the Faculty of Science, adds greatly to its value, even as a school of science.

4. That as the college is already endowed and in active operation, and as towards its extension large sums have been promised and other large sums may be confidently anticipated from the liberality of the public in Lancashire and the neighbouring counties, government can in Manchester secure at once, and by a relatively small expenditure, what could only be obtained elsewhere by a much larger outlay and after the lapse of several years.

The deputation was introduced by Mr. Hibbert and Mr. Bazley.

Mr. Neild, as chairman of the trustees reviewed the past history of the institution, and he was succeeded by the principal (Mr. Greenwood), who gave details as to its management.

Mr. Ashton, as chairman of the extension committee stated the results of a public meeting in Manchester, and said that, although £150,000 was the sum proposed to be expended by the trustees originally, the scheme had so much expanded, that that amount would be barely sufficient to put the college in the condition it was necessary to have it.

The Mayor of Manchester presented a resolution passed by the City Council, and it was intimated that there were resolutions of a similar nature from Stockport, Bolton, Stalybridge, and Oldham.

The Archdeacon of Manchester, Dr. Storrar, Alderman Bennett, Mr. Fairbairn, Mr. Graves, M.P., and Canon Birch made brief speeches.

The Duke of Marlborough, in reply, said the whole question of such colleges, and the education provided in them, would have to be taken into consideration by Parliament at the earliest opportunity. He had listened with much interest to the facts relating to Owens College, and he must say he himself was an advocate for giving grants on some principle, but the principle hitherto had been that of giving grants chiefly to metropolitan colleges. His grace then referred to the Glasgow College, and stated that he saw no reason why Owens College should not be placed on the same footing. He said the statements made to him would receive the fullest consideration.

The deputation consisted of the Principal of Owens College, with Professors Roscoe and Jack; Messrs. Alderman Neild (chairman), W. H. Houldsworth, Edward Owens, J. E. Taylor, Edward Hardcastle, and Dr. E. Wilkinson, trustees of Owens College; Messrs. Thomas Ashton (chairman), Oliver Heywood, and S. J. Stern, of

the extension committee; the Mayor of Manchester, the Mayor of Salford, the Mayor of Bolton, the Mayor and Town Clerk of Stockport, from their respective corporations; Messrs. Alderman Bennett (president) and Edmund Ashworth, of the Manchester Chamber of Commerce; Archdeacon Durnford, Canons Hornby and H. M. Birch; Sir James Kay-Shuttleworth, Mr. James Heywood, F.R.S., fellow of University College, London; Mr. Fairbairn, Dr. Joule, Dr. Storrar (London University); Messrs. Joseph Whitworth, C. P. Stewart, F. W. Walker, Manchester Grammar School: Joseph Thompson, Lancashire Independent College; A. J. Mundella, and Fox Turner. The deputation was accompanied by the following gentlemen:—Messrs. Edward Akroyd, M.P.: Edward Baines, M.P.; Thomas Barnes, M.P.; Joseph Cowen, M.P.; George Dixon, M.P.; Grant Duff, M.P.; Algernon Egerton, M.P.; William Ewart, M.P.; John Filder, M.P.; W. E. Forster, M.P.; S. R. Graves, M.P.; Lieut.-Colonel W. Gray, M.P.; George Hadfield, M.P.; W. H. Hornby, M.P.; T. B. Horsfall, M.P.; G. C. Legh, M.P.; George Melly, M.P.; C. M. Norwood, M.P.; John Peel, M.P.; John Platt, M.P.; Edmund Potter, M.P.; T. B. Potter, M.P.; R. N. Phillips, M.P.; B. Samuelson, M.P.; J. B. Smith, M.P.; James Stansfeld, M.P.; Charles Turner, M.P.; E. W. Watkin, M.P.; B. Whitworth, M.P.; and J. Laing, vice-president of the South of Scotland Chamber of Commerce.

TECHNICAL INSTRUCTION.

The Lords of the Committee of Council on Education have approved of the publication of the following explanatory memorandum to accompany their minute of 21st December, 1867. This memorandum shows fully the aid which the State affords in promotion of technical instruction at the present time:—

1. It will be seen that this minute creates three descriptions of scholarships or exhibitions for the encouragement of science instruction and for the support of students of the industrial classes while continuing their education. These are intended to supplement and enlarge existing action on the part of the Science and Art Department, and to promote secondary instruction in elementary schools, thus forming a connecting link between them and the science and art schools and classes.

2. The existing action through the Science and Art Department is to aid instruction in science in the following subjects:—1, practical plane and solid geometry; 2, machine construction and drawing; 3, building construction or naval architecture and drawing; 4, elementary mathematics; 5, higher mathematics; 6, theoretical mechanics; 7, applied mechanics; 8, acoustics, light and heat; 9, magnetism and electricity; 10, inorganic chemistry; 11, organic chemistry; 12, geology; 13, mineralogy; 14, animal physiology; 15, zoology; 16, vegetable physiology and economic botany; 17, systematic botany; 18, mining; 19, metallurgy; 20, navigation; 21, nautical astronomy; 22, steam; 23, physical geography. And in art in elementary drawing, as an education of the power of observation, and in drawing, painting, modelling, and designing for manufacture and decoration.

3. In order to place a school or class in connexion with the Science and Art Department, it is necessary that a committee, consisting of at least five persons, should be formed, who will undertake certain duties of superintendence in connexion with it.

4. As respects science, the aid consists of—(1) payments to the teachers on the results of instruction as tested by examination, (2) medals and prizes to the successful students, (3) grants to the school in aid of the purchase of apparatus to the extent of 50 per cent. of the cost, and (4) Royal exhibitions and free admissions to the Royal School of Mines, in London, and the Royal College of Science, in Dublin.

5. The payments to the teachers vary from £1 to £5, according to the class in which the student is placed. There are five classes, the fifth being the lowest. The payments are only made for the instruction of students of the artisan or weekly wages class, and those whose incomes are less than £100 per annum. The teacher to be qualified to earn payments on results must have taken a 1st or 2nd class, unless he has obtained some university degree.

6. The examinations are held in May. The examination in each subject is held over the whole kingdom on the same night. It is not necessary to enable a class to be examined and obtain prizes, &c., that the teacher should be certificated. If a satisfactory committee be formed, any class or single student can be examined, however taught.

7. Prizes, which, with some few restrictions, are open to all students, are given to those who obtain a 1st, 2nd, or 3rd class. To the best in each subject are given a gold, a silver, and two bronze medals.

8. Six royal exhibitions of the value of £50 per annum, tenable for three years, are given in competition at the May examinations. Three of these are to the Royal School of Mines, in London, and three to the Royal College of Science, in Dublin. Free admissions are given to the courses at these institutions to all who take gold medals.

9. The detailed rules will be found in the Science Directory, published by the department, price sixpence, which will be furnished on application to the secretary, Science and Art Department.

10. As respects art.—Firstly.—Towards the teaching of elementary drawing in schools for the poor. This aid consists of payments to the managers of 1s., 2s., or 3s. on account of children satisfactorily taught drawing, and who pass a very elementary examination of the first grade; and of payments of 5s. or 10s. on children or pupil teachers who pass the more advanced or second grade examination, and of prizes to successful children and pupil teachers.

The first grade consists of drawing in outline from flat examples, drawing from regular solids or objects of simple form, and of easy problems in practical geometry.

The second grade is an examination of a higher standard than that of the first grade, but in the same subjects, with the addition of perspective and mechanical drawing. Examinations are held in May in any elementary school taught by a master holding a certificate for drawing, or who has passed a second grade examination in any of the above three subjects of drawing taught in elementary schools.

11. Secondly.—Towards art instruction in night classes for artisans held in elementary schools, in literary, mechanics', or similar institutions. This aid consists of payments of 10s. or 15s. on account of artisans or their children, above twelve years of age, satisfactorily taught drawing of the second or third grades; of prices to successful students; and of payments towards the local expenses of examination.

The third grade is represented by works embracing the whole course of instruction in night classes or schools of art, such as drawing from examples, from casts or models, from nature, the antique, or the life; painting flowers, landscape, or from life; designing or drawing for decorative purposes.

12. Thirdly.—To schools of art held in rooms entirely devoted to art instruction. This aid consists of similar payments to those awarded to night classes, and of the following additional payments:—

- 20s. on account of every artisan satisfactorily instructed in art.
- £15 or £30 on account of art pupil-teachers.
- £5 or £10 on account of students trained for art teachers or national scholars.
- £3 on account of free studentships to artisans submitting advanced works.
- £10 on account of expenses of annual report and examination.

13. Prizes are given to successful students, and the

advanced studies of the schools of art are brought together in a national competition, when gold, silver, and bronze medals, and other prizes are awarded. All payments are contingent on the employment of certificated teachers.

14. Elementary schools, night classes, and schools of art are aided to the extent of 75 per cent. in the purchase of examples.

15. Fourthly.—By the maintenance of the National Art Training School at South Kensington, in which highly qualified students from local schools of art are admitted and trained as masters for schools of art, or as designers, or art-workmen. Such students receive allowances for their support of from 15s. to 40s. weekly.

16. Fifthly.—Through the National Museum of Decorative Art and the National Art Library, which are made as far as possible circulating collections for the benefit of local schools of art.

17. The detailed regulations for the administration of art instruction are given in the Art Directory.

18. As respects Elementary Schools.—By the Minute of the 20th February, 1867, additional grants are made by the Education Establishment at Whitehall, to elementary schools under inspection for instruction in subjects of secular instruction beyond reading, writing, and arithmetic. The regulations under which such grants are made are issued by the Education Establishment, Whitehall.

19. The managers of an elementary school under inspection can permit their premises to be used for science teaching provided that there be no interference with the primary purpose of the elementary school or its three attendances. A science class may thus be formed in connexion with and receiving payments from the Science and Art Department. But no payments are made to teachers on account of science teaching in respect of any instruction in science that may be given during the three attendances of an elementary school receiving aid from the Education Establishment, Whitehall.

20. In an elementary school not under the inspection of the Education Establishment, and, therefore, not receiving State aid to elementary instruction, science classes may be formed in connexion with the Science and Art Department without any restriction as to the time or manner in which the instruction in science may be given.

21. From this brief explanation it will be understood how the minute of the 21st December will affect existing institutions. This minute provides for two forms of scholarship in connexion with elementary schools whether receiving State aid as such or not. The first of these is the elementary school scholarship. Five pounds are granted to the managers of any elementary school for the support of a deserving pupil, if they undertake to support him for a year and subscribe five pounds for that purpose. One such scholarship is allowed per 100 students in the school. The selection of the student for the scholarship is to be by competition; the details of this, however, the managers of the school may arrange as they please, subject to the approval of the Science and Art Department. The payment of five pounds by the Science and Art Department is made conditional on the student passing in a branch of science at the May examination.

22. The second, a more advanced scholarship, is "The Science and Art Scholarship," of which, again, there may be one per 100 students. This is granted without any corresponding contribution on the part of the locality. The Science and Art Department makes a grant of ten pounds towards the maintenance, for one year, of the most deserving student or students in an elementary school, who have taken a first grade in elementary geometry, and free-hand or model drawing,* and passed in some branch of science, on condition that, at the end of the year, the student obtains at least a third class in the subject of science in which he originally passed or passes in some other subject. In both these cases the student must be from 12 to 16 years of age.

* The examination in drawing can, where there is no art certificated teacher, be held by the Science Class Committee to whom the necessary papers will be sent.

23. Lastly, for advanced scientific instruction, the minute offers local exhibitions to enable students to complete their education at some college or school where scientific instruction of an advanced character may be obtained. The Science and Art Department will make a grant of £25 per annum for one, two, or three years for this purpose when the locality raises a like sum by voluntary subscriptions. And if the student attend a State school, such as the Royal School of Mines, in London, or Royal College of Science, in Ireland, the fees are remitted. It is a condition that the exhibition is awarded in competition, the branch or branches of science for which may be fixed by the locality, and that the student pursues his studies satisfactorily.

Manufactures.

The Electric Organ.—Mr. Barker, organ builder, Paris (inventor of the pneumatic lever), has just patented in France and England a complete system for applying electricity to supersede the ordinary mechanical key and draw-stop action in large organs. The patentee has already built a grand electric organ of forty-two sounding stops and eight couplers for St. Augustin's, Paris, and another for Salon, near Marseilles. As the largest organs may now be played through a cable of insulated wires, positions hitherto wholly impracticable can be turned to account. The organist, with his various claviers, can be placed in any direction and at any distance away from the organ, the touch being equally delicate and rapid on every manual, whether used separately or coupled. Bryceson Brothers and Co. have the concession for working this patent in Great Britain, either as regards new organs, or applying the electric action to existing instruments.

Shipbuilding in Italy.—Shipbuilding forms an important branch of industry on the Italian coast, and since the formation of the kingdom of Italy has greatly increased. Previous to 1859 the total number of vessels launched throughout the peninsula did not amount to more than 200, measuring 34,000 tons collectively per annum. In 1866 the total number of vessels launched was 675, measuring 59,522 tons collectively, from 91 shipyards. The following will give a correct idea of the importance of these yards:—

	No. of vessels.	Total tonnage.
Sestri Ponente	33	15,805
Varazze	26	11,534
Savona	16	6,734

As regards tonnage, next follow—

Spotorno	2	1,050
Chiavari	3	1,532
Lerici	4	1,973
Recco	2	925
Pra	5	2,325
Pietro Ligure	3	1,158
Loano	4	4,129

As regards number of vessels built, follow—

Torre del Greco	46	1,026
Taranto	36	61
Amalfi	27	104
Procida	24	2,342
Lipari	24	41
Molfetta	22	282
Augusta (Catania)	22	62
Trapani	20	185
Mare largo (Gaeta)	18	618
Catania	17	144

Sciacca (Sicily)	16 ..	54
Ali (Messina)	16 ..	26
Sorrento	16 ..	25
Viareggio	15 ..	1,310
Lavagna	13 ..	1,442
Naples	12 ..	29
Castellamare di Stabia	11 ..	1,310
Limite (Leghorn)	11 ..	749
Milazzo	10 ..	28
Siracusa	10 ..	21
Spiaggia di Cassano	9 ..	1,685
Alassio	9 ..	35

The following shows the number and tonnage of vessels built since 1859:—

	No. of vessels.	Tonnage.
1860	198 ..	..
1861	216 ..	..
1862	215 ..	25,271
1863	285 ..	37,462
1864	266 ..	38,395
1865	907 ..	58,140
1866	675 ..	59,522

Commerce.

THE COTTON TRADE.—Mr. Sam Mendel's circular for March 2nd, says:—"The trade, since the beginning of the present year, has been materially improved, and especially so within the month just closed. The low value to which cotton had fallen produced a more active demand for both yarns and goods, at prices yielding a fair, and, to some extent, satisfactory profit, and at the same time a level of values that gave confidence to merchants to make investments freely for immediate and forward delivery. These operations rendered it a necessity, as a prudent measure of precaution, on the part of millowners to extend their cotton purchases to unusual figures, not only on the spot, but for arrival also, to cover contracts. These large cotton operations by the trade at once served to stimulate speculators, and for some time considerable excitement resulted, with rapid and almost daily advances, until prices reached such a point as not only to stop further purchases, but to show sufficient inducement to make resales of cotton by the trade far more profitable than either spinning or weaving, and, in like manner, numerous parcels of yarns and goods have been resold in this market at prices to yield a good profit on purchases made at the lowest rates, yet much under those currently quoted by producers, and the month closed with prices showing irregularity and weakness. During the month of January, the advance of middling Orleans reached about $2\frac{7}{16}$d. per lb., and the reduction since is $\frac{5}{8}$d. from the highest point. During the past few days the market has become much quieter. The favourite estimate of the American crop of 1867 remains at $2\frac{1}{4}$ million bales, but the uncertainty which overshadows this point, as well as the question of the area likely to come under cotton culture in the Southern States this season, baffle all attempts to arrive at definite or reliable data upon which to calculate the probable range of values during the course of the year."

THE ALKALI TRADE OF 1866.*—The Alkali Manufacturers' Association consists of two branches—the Tyne branch, comprising all the manufactures on the Tyne, and one firm having part of their works at Glasgow; and the Lancashire branch, which, in addition to all the principal manufacturers of Lancashire, includes several in North and South Wales, Ireland, and the Western part of England. The quantity of salt decomposed by the twenty-six members of the Lancashire branch was, during the year 1866, about 194,000 tons; that of the Tyne branch, during the same period, 157,000; together, 351,000 tons. As the total quantity used in the manufacture of alkali was, according to the alkali inspector's report for 1866, 371,000 tons, it appears the association represents 95 per cent. of the trade. A circular, issued by the secretary of the association, requesting the members to return the quantities of all the articles manufactured by them during 1866, was responded to by twenty members of the Lancashire branch, whose decomposition of salt amounted to 162,000 tons, and from these returns the annexed statistics have been computed. The returns made to the Tyne branch have been already published.* In addition to the articles named, there were also produced considerable quantities of chlorate of potash, Epsom salts, glauber salts, sulphate of copper, &c., of which we have no return; but, if these are included, the value of the production of the Lancashire branch would considerably exceed £2,000,000 per annum. From the quantities of the articles produced, an approximate account of the quantities and value of the articles used in the manufacture has been compiled; in the case of pyrites and manganese, these quantities have been confirmed by the amount of imports and production of these ores. The following are the quantities of the principal articles manufactured by the Lancashire branch during 1866, from returns made by twenty alkali manufacturers, with the estimated production of six:—

Manufactured Articles.	Quantity Returned.	Per Ton.			Total Amount.		
	Tons.	£	s.	d.	£	s.	d.
Soda crystals	24,978	6	0	0	149,868	0	0
Soda, ash, and refined alkali	87,314	11	0	0	960,454	0	0
Caustic soda	11,213	20	0	0	224,260	0	0
Bicarbonate soda	6,457	18	0	0	116,226	0	0
Sulphate soda	32,137	4	5	0	136,582	5	0
Bleaching powder	20,006	14	0	0	280,084	0	0
Bleach liquor	5,871	3	0	0	17,613	0	0
Total	....	....			1,885,087	5	0
Oil of vitriol (for sale) ..	18,592	6	0	0	111,552	0	0
Muriatic acid (for sale)...	13,819	0	15	0	10,364	5	0
Total tons......	220,387	Total value			2,006,923	0	0

Approximate quantities of raw materials used in the manufacture of the above articles:—

Raw Material.	Tons.	Per Ton.			Total Amount.
		£	s.	d.	£
Pyrites, foreign ..	80,000	3	10	0	280,000
,, Irish....	90,000	1	10	0	135,000
Nitrate soda	5,500	14	0	0	77,000
Salt	194,000	0	10	0	97,000
Limestone	200,000	0	6	0	60,000
Manganese	19,000	6	0	0	114,000
Lime	25,000	0	15	0	18,750
Coal	620,000	0	6	0	186,000
Total ..	1,233,500				967,750

This is exclusive of all materials used for buildings, plant, repairs, casks, &c. The number of persons employed directly by the Lancashire branch cannot be less than 5,000, and the wages paid £330,000 per annum; this is in addition to the employment given to numbers in the carriage and manufacture of the large quantity of materials used, and in the erection of buildings, &c.

Colonies.

EMIGRATION TO CANADA.—Mr. W. F. Lynn is engaged at the present time in giving lectures gratuitously upon

* This information was kindly furnished by Edmund K. Muspratt, Esq., hon. secretary to the Lancashire branch of the Alkali Manufacturers' Association.

* *Journal*, vol. xv., p. 554.

the resources of Canada, and the advantages of that country as a field for emigration. The actual consolidation of the provinces of Upper and Lower Canada, Nova Scotia, and New Brunswick, with the probable addition, at no distant date, of the remaining provinces and territory of British North America, into one large and powerful dominion, has so altered and enlarged the prospects of these colonies, that there is not, perhaps to be found anywhere a more favourable opening for an industrious man than is afforded by the new dominion of Canada at the present moment. Moreover the demand for labour there is so great, wages are so high, and food so cheap, that, taking into consideration the numbers who are now suffering for want of employment in England, Mr. Lynn is of opinion that a more general diffusion of a knowledge of these facts amongst the working classes, together with instruction as to the cheapest and best mode of crossing over to, and commencing life in that country, is highly desirable, both in the interests of England as well as of Canada itself, as a large emigration would not only relieve the over-burdened parish rates, but tend to allay the discontent which arises from poverty and destitution; that with regard to such distress as that now existing in the East-end of London, no better plan for its alleviation could be adopted or supported than that of the East-end Emigration and Relief Society, whose object was to assist men to emigrate to where they could earn their own subsistence, in preference to supporting them in charity or idleness at home. These lectures have been given recently at the Burdett Hall, Limehouse, when nearly 2,000 persons were present; also at St. Peter's, Greenwich. Mr. W. F. Lynn, whose address is 84, Gresham-house, is open to receive applications from institutions for the delivery of these lectures.

New Zealand.—A vote of £2,000 having been made for encouragement of manufactures, the Government have had under consideration the offering of a bonus of £1,000 for the first 50 tons of sugar manufactured within the province from beetroot grown in the province, and a bonus of £500 to any person or persons producing 20,000 bushels of marketable malt within the province. It has also been suggested that encouragement should be offered to meat-curing on a large scale.

Telegraphs in New South Wales.—There are now 63 telegraph-stations, and 3,346 miles of wire, costing for construction on an average £45 9s. 9d. per mile. The revenue for 1866 amounted to £30,698. In 1865 there were 138,780 messages, which in 1866 had increased to 143,523.

The Boiling-down Value of a Horse.—The *Illustrated Australian News* says:—"One of our enterprising breeders upon the Murrumbidgee, in the neighbourhood of Gundagai, recently experimented upon a fat but otherwise useless horse, as to the profit of boiling down. After the process had been carefully carried out, he realised fifteen gallons of pure oil, that he readily sold at the first offer in Gundagai, for currying purposes, at 6s. 6d. To this is to be added the price of the hide, the value of the hair, the glue from the hoofs, and the bones for manure—all of which would be realised if the process was carried out in a large and systematic manner."

Land Sales in South Australia. — The sales of Crown lands by public auction and private contract, in South Australia, for the year 1867, were as follows:—

	Acres		£	s.
Public auction	74,894	realising	95,484	19
Private sales..	67,813	"	68,151	3
Total..	142,707	.... for	£163,636	2

A comparative statement of the sales of Crown lands by auction during the years 1859 to 1866 inclusive, shows an average of 184,952 acres, and at the cost of £207,020, which gives a decrease in 1867 of 110,058 acres, value £111,566 on the average of the eight previous years, but this decrease is, to a large extent, compensated for by the increase in private sales, which have exceeded those of the corresponding period of 1866 by 31,540 acres.

Natal Statistics.—The imports into this colony during the year 1867 were £269,580, and the exports £225,671, the highest totals ever yet reached. The quantity of wool exported was 1,974,447 lbs. The land was farmed as follows:—63,260 acres under Indian corn, and produced 867,131 bushels; 1859 acres under wheat, and produced 24,504 bushels; 12,796 acres under sugar, and produced 6,826 tons; 22,155 acres were under Kaffir corn, and produced 275,172 bushels; 3,155 acres under coffee, and produced 109,666 lbs.; and 1,262 acres under cotton, producing 217,210 lbs. The population is as follows:—9,194 males, and 7,769 females, making a total of 16,963 whites, and the coloured population is about 170,850. The following is a list of the stock:—16,782 horses, 131,482 goats, 339,547 horned cattle, 209,582 woolled sheep, 42,985 Kaffir sheep, and 226 mules. The total average of land under cultivation is said to be 109,415 acres.

Notes.

Dearness of Bread in Italy.—At the beginning of last month (February) the maximum price of bread was 72 centimes per kilometre at Rovigo, and 66 centimes at Ancona; and the minimum price was 25 centimes at Sassari, and 30 centimes at Avellino, Campobasso, Cimeo, and Teramo. The maximum prices for wine were, at Milan and Turin, at the former 78 francs per hectolitre, and at the latter 58 francs. The lowest prices were at Potenza and Pesaro, where it fetched only 20 francs per hectolitre, and 22 francs at Ancona and Brescia. Oil obtains the highest prices, viz., 257 francs per hectolitre at Teramo, 240 at Porto Maurizio, and the lowest prices 115 francs for best quality, and 80 francs for second quality, at Teramo. The minimum prices were 120 francs per hectolitre at Chieti, Foggia, and Pesaro.

Italian Railways.—The Minister of Public Works has recently published the following list of lines of railway which will probably be opened to the public in the course of the present year, which are as follows:—Completion of the railway from Arona to Sesto Calende, 8 kilometres in length; Voltri to Savona, 28 kils.; Genoa to Chiavari, 50 kils.; Orvieto to the Roman frontier, 37 kils.; Caserta and Benevento, 63 kils; Bovigno and Savignano, 25 kils.; Lecce and Zollino, 19 kils.; Gioia, Taranto, and Rocca, 122 kils.; Lazzaro and Bianco Nuovo, 64 kils.; and Catania to Lentini, 28 kils., in the island of Sicily. In all, upwards of 444 kils. Of these, the railway from Lecce to Zollino, 19 kils. in length, was opened to the public at the beginning of February, and comprises the three stations of Lecce, San Cesario, and Zollino. The project for continuing this line to Otranto has now been definitely approved of by the government, and the section from Zollino to Maglie, 10 kils. in length, will probably be completed by the beginning of next year, and in about eighteen months the remaining section, Maglie to Otranto, 19 kils., will be opened. The construction of this section will occupy more time than the others on account of a short tunnel near Maglie.

Paris Cab Fares.—The Prefect of the Seine has published an ordonnance establishing a mileage tariff for public vehicles. The distance is to be marked by a meter, which comes into action at the moment the passenger enters the vehicle. The rates are fixed as follows:—Cabs carrying two or three persons, 85 centimes for the first kilomètre, and 25 centimes for each kilomètre or portion of a kilomètre in addition; cabs carrying four or five persons, 90 centimes the first, and 30 centimes for each subsequent kilomètre. The above are the charges to be made between six o'clock in the morning and half-past twelve at night; at other times the rates are to be 90 and 40, and one franc and 45 cen-

times respectively. The minimum rate is to be 8 kilomètres (5 miles) per hour. If a cab is taken beyond the fortifications and then discharged, the driver is to receive two francs in addition to his fare for the return. The above rates exceed those now in force in London, very materially as regards the first mile or kilomètre; the kilomètre is five-eighths of a mile, very nearly, and consequently the charge for the first mile in Paris will be about thirteen pence halfpenny, while a five mile journey will cost 2 fr. 96 c., or within a fraction of the London rate. The charge just quoted is, however, only for three persons, during the day time; if we take the other extreme of the scale, namely, a four or five place vehicle, after midnight, we find the price sixteen pence for the first mile, and three shillings and ninepence for five miles. An immense number of cab meters have been invented, tried, and found wanting; but the publication of this ordonnance almost leads to the supposition that the desideratum of a distance meter has now been attained. Nothing is said about stoppages, an important question.

Progress of the Suez Canal.—The works of the great Maritime Canal are progressing most satisfactorily. The position of the works of excavation up to the 31st December, 1867, was as follows:—

	Cubic metres.
Total amount excavated up to 30th December, 1867	29,874,958
Total amount excavated during the months, Oct., Nov., and Dec.,	4,080,577
Total amount remaining to be excavated	40,159,595
Total excavation in Canal from Port Saïd to Suez (160 kilometres.)	74,115,130

The works at Port Saïd are likewise being pushed forward in a most satisfactory manner. For the construction of the two piers, it is estimated that 250,000 cubic metres of artificial blocks will be required; of these 42,766 cubic metres were immersed up to the end of September; 23,063 cubic metres to the 31st December; so that there remained only 84,171 cubic metres to complete the works, which will probably be finished by the end of the year. These piers are 8 metres in width at the top, and are carried up two metres above water level. The western pier will extend 3,200 metres into the sea, and the eastern one 2,200 metres, where there is a depth of 10 metres. To open the canal, however, 8 metres in depth only is necessary, and to reach this the western pier must be carried out 2,500 metres, and the eastern 1,600 metres. These piers are contracted for at 42 francs per cubic metre. The probable cost of the Suez Canal, including the fresh-water canal, 216 kilometres in length, already completed, is estimated at 333 millions of francs (£13,320,000 sterling).

Adult Education in the Vosges.—The authorities of the department of the Vosges seem determined to obliterate the stain of ignorance from their soil, and have adopted a practical mode of proceeding which deserves notice. For the last three years the inspector of the schools of the department has called upon all the masters to furnish him, in the month of November, with a list of the conscripts in each commune, with a note appended to each name, indicating the amount of the young man's instruction. These lists are carefully examined, and the prefect then addresses a letter to the maire of each commune in which there are any youths without instruction, pointing them out by name, and requesting him to arrange with the schoolmaster, that they may be invited to attend the evening classes and learn at least to read and write. Last November the Marquis de Fleury, the Prefect of the Vosges, addressed the following circular to the maires of the various communes in the department:—"Monsieur le Maire,—I learn that several young men in your commune who come under the next conscription can neither read nor write, or possess scarcely any elements of education. It is not fit that these lists should contain any more entirely illiterate conscripts. I therefore beg that you will unite your efforts with those of the schoolmaster, to induce these young men to attend the adult classes, in order that they may at least know how to read and write by the time their names are placed on the list of the contingent, or at any rate before the drawing for the conscription takes place." A similar circular, issued by the inspector, concludes with the following sentence:—"I take this opportunity of informing you that in 1866 there were still in the Vosges 1·52 per cent. of men, and 3·53 per cent. amongst the women, who were unable to sign their marriage contract. We must, by means of adult classes, compel this blot to disappear." The percentages named above are very far below the general average of the country, and prove that the enlightened conduct of the authorities of the Vosges has already had a great effect. If the same kind of practical efforts were made everywhere, the giant Ignorance would soon be vanquished.

Correspondence.

Mr. Randall's Paper.—Sir,—In the *Journal* of March 6th I am reported as saying that there was no foreign work in the Paris Exhibition that would bear comparison with work produced in Sheffield, Birmingham, or London during the last twenty years. My remarks were made in reference to silver-work stamped in dies, viz., that there was no *stamped work* in the Paris Exhibition that would bear comparison with the *stamped work* produced in Sheffield, Birmingham, or London during the last twenty years. Thinking it my duty to inform you of this inaccuracy, I am, &c., W. Elliott.

55, Milton-road, Stoke Newington, March 9th.

MEETINGS FOR THE ENSUING WEEK.

Mon......Royal United Service Inst., 8½. Capt. J. B. O'Hea, "Cartridges for Breech-loading Small Arms, and the best form of Projectile."
Society of Engineers, 7½. Mr. F. C. Danvers, "On Engineering in India."
Entomological, 7.
British Architects, 8.
Medical, 8.
Asiatic, 3.
Victoria Inst., 8.
Statistical, 4. Anniversary.

Tues ...Civil Engineers, 8. Continued discussion upon Mr. Sandberg's paper, "On the Manufacture and Wear of Rails."
Royal Inst., 3. Mr. G. Scharf, "On Historical Portraiture."
Statistical, 8. Mr. James Caird, "On the Agricultural Statistics of the United Kingdom."
Social Science Assoc., 8. Rev. T. W. Fowle, "On Educational Difficulties in connection with the Compulsory System."
Pathological, 8.
Anthropological, 8.

Wed ...Society of Arts, 8. Mr. R. F. Fairlie, "On Railways and their Management."
London Inst., 6½.
R. Society of Literature, 4½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. "On the Specific Differences between *Primula veris*, *P. vulgaris*, and *P. elatior*; on the Hybrid Nature of the common Oxlip, &c."
Zoological, 4.
R. Society Club, 6.
Chemical, 8. 1. Prof. Kolbe, "On the Artificial Formation of Urea." 2. Mr. H. Chance, "On the Manufacture of Glass."
Numismatic, 7.
Royal Inst., 3. Mr. G. Scharf, "On Historical Portraiture."
Society of Fine Arts, 8. Mr. W. Cave Thomas, "An Attempt to Methodise the Process of Oil Painting."

Fri.......Philological, 8.
Royal Inst., 8. Prof. Matthiessen, "On Alloys and their Uses."

Sat ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 2nd March*, 1868.

30. Bill—Oxford and Cambridge Universities.
42. „ Sea Fisheries.
45. „ Court of Session (Scotland).
104. Weights and Measures—Supplementary Return.
110. Queen Anne's Bounty—Account.
111. India and Abyssinia—Return.
118. Metropolitan Improvements—Statement.

Delivered on 3rd March, 1868.

38. Bill—Lee River Conservancy.
115. Army (Manufacturing Establishments)— Return of Annual Accounts
117. Metropolis Turnpike Roads—Forty-second Report.
119. Trade and Navigation Accounts (31st January, 1868).

Delivered on 4th March, 1868.

88. National Debt (Savings Banks and Friendly Societies, &c.)—Accounts.

Schools Inquiry—Report of the Commissioners, Vol. I.

Delivered on 6th March, 1868.

46. Bill – Court of Justiciary (Scotland).

Abyssinia—Table of Contents (corrected copy).
Fisheries (Great Britain and France)—Convention.

Patents.

From Commissioners of Patents' Journal, March 6.

GRANTS OF PROVISIONAL PROTECTION.

Aëronautical apparatus—568—J. Hullett.
Animal and vegetable substances, boiling—472—J. Smith.
Bobbins—552—R. P. Faucheux.
Bookbinding—641—L. Pocock, jun.
Boots, &c.—93—J. H. Glew.
Boots, &c.—507—R. H. Rimes.
Boots, &c.—601—E. J. Nicoll and T. M. Ablett.
Boots, &c., rotary heel for—527—J. Cronier.
Bricks, compressed—541—H. Chamberlain.
Brushes—582—M. A. F. Mennons.
Chimney pots—585—J. Wheatley.
Cigars—569—J. G. Tatters, W. Keeble, and B. Newbery.
Coal, &c., cutting—600—S. Firth.
Commode-pots—588—A. De Metz.
Dress and jewellery, fastenings for articles of—597—W. H. Ryland.
Electric conductors, &c., insulating—535—W. Perkins and G. G. Tandy.
Electro-magnetic apparatus—647—A. V. Newton.
Engines, packing for steam—555—G. P. Dodge.
Excreta, &c., collecting and disinfecting human—566—P. N. Goux.
Fabrics, elastic—609—J. Macintosh and W. Boggett.
Fabrics, material for manufacturing felted, &c.—513—A. M. Clark.
Fire-arms, breech-loading—534—C. E. Brooman.
Fire plugs, &c., indicating the position and supply of—578—L. M. Becker.
Fluids, measuring—410—C. Brakell.
Furnace doors—649—F. Mittonette.
Furnaces—567—J. H. Johnson.
Furnaces—594—A. V. Newton.
Gas—576—G. Davies.
Gas—611—W. E. Newton.
Glass lamp and gas globes, &c.—617—H. Defries.
Gloves, &c., fastenings for—593—J. Needham.
Grain, cleaning—544—R. Blezard.
Grain, washing and drying—580—W. Thompson and T. Stather.
Hats, &c., ventilating—625—J. and W. Dobbs.
Horses' shoes, &c.—551—W. Edwards.
Iron, &c., treating spent oxide of—596—B. E. R. Newlands.
Irons, finished—547—W. and J. Cooke.
Keirs—543—T. Beeley.
Kilns, &c., for making bricks—528—W. R. Lake.
Lockets, &c.—562—W. Myers.
Locks—651—W. and J. Dowell.
Looms—530—R. Butterworth.
Looms—531—R. Baguley.
Looms—584—T. and J. R. Bury.
Lubricators—563—P. Bauer, J. Johnson, and W. Jones.
Lubricators—587—W. Wilson.
Manure, converting bones, &c., into—645—W. E. Gedge.
Meat, preserving—590—J. McCall.
Metal cylinders, &c., polishing, &c.—542—J. Higginbotham and L. Moore.
Mines, &c., ventilating—557—J. G. Jones.
Nails—603—R. Heathfield.
Nails for cabinet work—2988—W. E. Gedge.
Omnibus conductors, &c., apparatus for indicating the amount of money received by—502—G. A. F. Eichbaum.
Omnibuses, &c., registering the number of persons entering into and on—581—H. Walmsley and T. W. Taylor.
Paper, preparing wood for the manufacture of—633—C. Pieper.
Pigs, singeing off the hairs, &c., of—575—R. Fennelly and P. Kenny.
Piles, pillars, &c., wrought-iron and steel—591—C. J. Galloway.
Planing machines—623—E. Hutchinson.
Plants in conservatories, &c., watering—473—A. F. Bayford.
Printing machines—607—P. H. Hancock and J. P. French.
Pumps—471—H. S. Barron.
Pumps—545—J. Kirkland.
Pumps—613—G. S. Dracopulo.
Railway carriages, signalling in—495—D. Elland.
Railway carriages, &c., coupling and uncoupling—559—J. Lord.
Railway rails, fastening—537—J. and J. Thompson.
Reaping machines—635—C. Pieper.
Reaping machines, &c.—586—A. V. Newton.
Saws, hand—550—W. H. Steel.
Sewing machines—549—J. J. King.
Sewing machines—558—W. S. Guinness.
Sewing threads, treating—539—W. Weild.
Sheep, &c., shearing and clipping—573—W. R. Lake.
Ships, compositions for coating the bottoms of—3028—J. de Silva.
Ships of war, batteries for—639—G. C. Mackrow.
Ships, &c., propellers for—595—J. J. Aston.
Signalling apparatus—599—W. R. Lake.
Signals by pneumatic pressure, transmitting—516—J. Leetch.
Skirts, hoop—621—E. T. Hughes.
Smoke, consuming—546—E. Wright.
Steam-engine counters or registering machines—456—T. Smith.
Stone, artificial—615—R., J. J., and L. R. Bodmer.
Stone, dressing, &c.—302—J. D. Brunton.
Stoves, portable—532—J. and J. Hinks.
Taps—572—G. Davies.
Teeth, artificial—536—W. E Newton.
Tobacco—637—A. M. Birchall.
Trade marks, &c., producing—540—W. Betts.
Tramway rails—570—T. A. L. Murray.
Type forms, supplying with various coloured inks for each impression—592—W. R. Lake.
Umbrella and walking-stick combined—566—F. H. Renault.
Umbrellas and parasols—598—F. Sangster.
Valves, india-rubber—554—G. P. Dodge.
Valves, &c.—577—G. A. Bridgett.
Vegetable extract for culinary purposes—533—A. M. Clark.
Vegetable fibre, preparing—605—J. W. Watts.
Wheels and tyres—560—L. B. Joseph.
Yarn, sizeing—583—T. Altham, J. Clark, and S. Ridehalgh.
Yarns, washing—629—J. McLeod.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Gas purifiers, &c., centre valves for—658—C. C. and W. T. Walker.
Pianofortes, pedals and damping apparatus for—653—F. Wirth.
Water-closets, &c.—674—J. G. Stidder.

PATENTS SEALED.

2533. S. Smith.
2538. J. Bayley & T. Bayley, jun.
2544. E. J. C. Welch.
2559. J. H. Brown.
2564. J. Rae.
2567. J. Pottle.
2580. W. F. Cooke.
2584. J. Perrin.
2607. J. A. McKean.
2653. W. E. Newton.
2693. R. Wilson and J. Nuttall.
2708. G. H. J. Simmons.
2756. E. P. Alexander.
2761. J. L. Field.
2865. W. E. Newton.
2981. J. L. Norton.
3013. R. Carter.
3305. H. James and E. Drewett.
3389. C. Albisser.
3457. W. A. Herring.
3490. J. Beatty.
3712. J. Novikow.
80. T. Greenwood.
198. W. R. Lake.

From Commissioners of Patents' Journal, March 10.

PATENTS SEALED.

2314. A. McDougall.
2438. G. Haseltine.
2583. J. Wilderspin.
2591. J. Reid.
2595. J. M. Napier.
2596. S. Dalton.
2597. W. Whitehead.
2598. H. A. Bonneville.
2602. H. A. Bordin.
2603. R. Canham.
2609. G. F. Bradbury and T. Chadwick.
2621. A. M. Clark.
2623. W. W. Burdon.
2637. J. G. Willans.
2641. W. Potts.
2724. J. E. H. Andrew.
2728. A. M. Clark.
2750. I. Dimock.
2779. W. R. Lake.
2788. G. Mellor.
3003. G. J Günther.
3092. W. Cooke and W. Francis.
3207. J. D Scally.
3302. W. G. McIvor.
33. W. H. Atkinson.
179. H. A. Bonneville.
184. J. Davidson.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

585. S. Chatwood.
597. D. and J. Manwell.
617. A. Akeroyd.
669. V. Delperdange.
608. H. Taylor.
615. W. E. Newton.
639. W. Clark.
668. G. F. Ansell.
699. J. Atkins.
619. C. F. Varley.
748. B. Lawrence.
636. L. Perkins.
637. A. E. A. Aubert and G. E. M. Gerard.
642. F. Tolhausen.
660. J. T. Harris.
665. W. D. Allen.
718. L. Gantert.
648. J. Shanks.
659. W. Clark.
662. R. G. Fisher.
790. R. J. Gatlihg.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

569. H. A. Silver and H. Griffin.
604. J. Hirst, jun., and J. Hollingworth.

Journal of the Society of Arts.

FRIDAY, MARCH 20, 1868.

Announcements by the Council.

Cantor Lectures.—Notice to Members.

Owing to unavoidable circumstances the last lecture of Dr. Crace Calvert's course will be delivered on TUESDAY, the 7th of April, instead of on Friday, the 3rd of April. A special ticket for this lecture is issued with the present *Journal.*

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

March 25.—"On Horse as an Article of Food." By A. S. Bicknell, Esq. On this evening Sir John Lubbock, Bart., F.R.S., will preside.

April 1.—"How to make Railways remunerative to the Shareholders, beneficial to the Public, and profitable to the State." By Raphael Brandon, Esq.

April 8.—*Passion Week.* No Meeting.

April 15.—"On Liquid Fuel." By Benjamin H. Paul, Esq.

April 22.—"On the Cultivation of Beetroot, and its Manufacture into Sugar." By W. A. Gibbs, Esq.

Cantor Lectures.

The following is the syllabus of a course of four lectures "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," now being delivered by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture II.—Friday, March 20.

The Bleaching Properties of Chlorine.—*Bleaching Powder*, its manufacture and application to the bleaching of calico, linen, and paper pulp; the manufacture of chloroform, &c. Illustrations.

Lecture III.—Friday, March 27.

Chlorine and its Compounds with Oxygen.—*Chlorate of Potash*—Its manufacture and remarkable properties. *Hydrochloric acid*, or spirit of salt—Its production and applications in Arts and Manufactures, viz., galvanizing of iron, sal ammoniac, chloride of tin, &c. Illustrations.

Lecture IV.—Tuesday, April 7.

The Conversion of Chloride of Sodium into Carbonate of Soda.—The decomposition of common salt into hydrochloric acid and *sulphate of soda*, Glauber's salt; the transformation of this compound into *soda ash, soda crystals*, and *bicarbonate of soda*, Ballard's process; and the important and recent discovery of the utilisation of soda waste, &c. Illustrations.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Albert Medal.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

Subscriptions.

The Christmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

The first lecture of Dr. Crace Calvert's course, "On Chloride of Sodium, or Common Salt, the

Products obtained from it, and their Applications to Art and Manufactures," was delivered on Friday evening, the 13th inst.

FIFTEENTH ORDINARY MEETING.

Wednesday, March 18th, 1868; The Marquis of CLANRICARDE in the chair.

The following candidates were proposed for election as members of the Society:—

Bradford, Rev. William, 120, Cambridge-road, N.E.
Weston, Thomas, 115, Lower Thames-street, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Briggs, Thomas, Richmond, S.W.
Winsor, William Henry Benyon, 29, Kensington-gardens-square, W., and 38, Rathbone-place, W.

The Paper read was—

RAILWAYS AND THEIR MANAGEMENT.

By ROBT. F. FAIRLIE, Esq., C.E.

The Society of Arts some years ago took into consideration several popular questions relating to railways, and although, as an engineer, I have other opportunities of drawing the attention of the profession (to which I have the honour to belong) to questions of a purely technical character, I desire to bring under discussion at this Society the general subject of railways and their management, in order that something may, if possible, be done towards bringing about a much-desired reformation.

At no period in the history of our railway system could the consideration of the various questions springing out of the subject of this paper have been so appropriately introduced as at the present, when it is remembered that a sum approaching in magnitude to the national debt is involved in their consideration. Probably no less than 20 per cent. of this enormous investment is at this moment wholly unproductive, and surely no question better deserves the serious consideration of our public men than that of devising some practical remedy for this lamentable condition of railway property, affecting as it does not merely those whose capital is directly invested, but the prosperity of the whole empire, and particularly so in the case of Ireland.

The question of the regeneration of Ireland has for a long period occupied and perplexed the ablest minds in the country. It is neither my desire nor my province to deal with its political condition, but it is impossible to ignore the necessity for dealing with the social and industrial welfare of the people. Everywhere railways have been found among the chief agents of civilisation and the real pacificators of discontent and disaffection. When you make a people wealthy and prosperous, political reforms become of secondary interest and will find their solution in due time. Ireland is essentially an agricultural country; and however much we may desire to see her advance in commercial and manufacturing progress, neither agricultural prosperity nor commercial success can be expected without an economical and efficient system of railway communication ramifying throughout every district. Much has been said, both in and out of Parliament, respecting the purchase of railways in Ireland. Royal commissions have inquired, select committees have reported, and statesmen of every party have devoted their best attention to this subject; but, after all, we are as far as ever from being agreed as to the policy of that course. I cannot, as a practical man, bring myself to recommend—although much may be said on both sides—an experiment of that speculative character, involving as it does the whole imperial question of Government purchase and management. I hold a decided opinion that it is our duty to assist and hasten the development of Irish resources in every possible manner, and I know of no better plan than that of extending railways throughout every part of the island. This we know cannot be done by private enterprise because of the unremunerative character of the existing lines, arising mainly from their great cost originally and from the diversity of control and management. There are extensive districts in Ireland urgently requiring railway communication, which ought to be constructed, alike for the public benefit and the advantage of the existing lines, always providing that the character of the work be good, and the cost moderate, such as to bring them within the scope of remuneration. But whence is to come the means of accomplishing this? I should say, by uniting to urge upon the Government the adoption towards Ireland in this respect of a policy analogous to that which has been so successfully applied to India, where a beneficent system of railway legislation has allayed the spirit of discontent and disloyalty in the growth of material wealth and individual well-being. An imperial guarantee of 3½ per cent.—which would probably not involve the State in a liability of more than about £100,000 per annum—would evoke from private sources alone sufficient capital to construct nearly one thousand miles of railway. This would add 50 per cent. of mileage, at a cost (say) of £3,000 per mile, which in my judgment is ample, having regard to the circumstances of the country. It is not to be denied that to continue the extravagant system of the past would be no advantage to Ireland.

I will undertake to say that such a guarantee from the Government would only for a comparatively short time remain a burden upon the State finances, provided that the outlay were judicious, and the management adapted to the actual requirements of each particular case.

Railway management in Ireland must surely have reached the height of absurdity when we find that something under 2,000 miles of road are governed by no less than between 30 and 40 different boards of direction. Omitting three or four of the principal lines, the average mileage to each board is not over 25 miles, and each board is independent of the others in every consideration of economy and management. As a natural consequence, the rates and fares charged are in many cases greatly in excess of what we are accustomed to on this side the water, seriously restricting the interchange of productions and the energies of the people. In Scotland about one-sixth of the entire mileage of the empire produces one-ninth of the gross revenue, while in Ireland about one-seventh of the whole mileage produces only one-twentieth of the gross receipts; besides, whilst there is one mile of railway in Scotland for every 1,460 persons, and one in England for every 2,257 persons, in Ireland there is only one mile for every 3,260 persons, so that Ireland is over 123 per cent. behind Scotland in this respect. I have the greatest possible objection to monopoly uncontrolled; but if unification of management and concentration of control do not involve monopoly, while experience has shown that they are indispensable to the success of railway enterprise, and that they act and react to the public advantage, I am therefore an advocate for concentration of management, because it secures and combines moderation in fares with profit to the shareholders.

It would be idle to point out what steam intercommunication has done for mankind in a thousand ways, and how important it is to devise means to increase its usefulness. I must be content with suggesting for consideration a few of the questions upon which I think railway reform and railway economy mainly depend.

It would be of no avail to refer to the waste of past expenditure in construction, except to say that the teachings of the past are the only safe guide to the policy of the future. As an engineer I am proud to confess that our English railways, apart from the wastefulness, constitute a magnificent monument to the constructive talent of the age. But utility and

economy with due regard to safety must now be studied above all other considerations. The palatial stations of Charing-cross and Cannon-street I admire as much as any one from an architectural point of view (although there is no more convenient, elegant, but unpretending, or cheaper metropolitan station than that at London-bridge, which cannot have cost but a very small fraction of either of the former), but I want to earn dividends for the shareholders, and to give the greatest accommodation to the public at the lowest possible remunerative rate. I do not hesitate to assert that the cost of no provincial railway should exceed £10,000 per mile, including land, works, and plant, for a double line; but in many parts of England, and particularly in Ireland—where 60-mile velocities, for instance, are wholly out of the question—£3,000 per mile should amply suffice for subsidiary single lines, including rolling-stock, but exclusive of land, which I take for granted will freely be given for purposes so beneficial to the public, and advantageous to the landowners themselves. One remark I cannot help making here, with reference to the most gigantic and most improvident of all the metropolitan stations,—I mean that in course of erection for the Midland Railway, near King's-cross. This station, with its approaches, will cost a sum almost fabulous. I will only say that this outlay is a melancholy exhibition of railway extravagance, and that it goes far to explain the troubles into which railway enterprise has fallen. I believe this is the last erection of the kind that we are likely to see, and that the ambition of railway officials must, in the future, be confined to the prudent development of branch lines constructed upon a wholly new principle, which will render them a blessing instead of a reproach to our generation.

In making new railways, whether at home or in the colonies, the question of economical construction transcends all others in importance. I hold a strong opinion that the natural configuration of any country will, as a general rule, permit the working of railways upon what I shall here term the principle of surface construction, securing the public safety and convenience on the one hand, and a fair return for the capital invested on the other. Then, as to the question of maintenance,—it has never been properly treated, and it never will be honestly met so long as capital accounts remain open as a ready resource for every chairman out of which to bolster up dividends, and of every manager by which to maintain fictitious appearances. Had companies been kept face to face with only one source of supply, and that from revenue profits, they never could have fallen to their present depth of ruin and disaster. With an open credit, which we call capital, always at command, the opportunity, I may say the temptation, is ever present of debiting capital with all sorts of charges, which ought properly to have been placed against revenue. It is easy to conceive how, under such circumstances, directors of the highest honour and integrity have been led into errors which they now deplore; but their chief misfortune, in my opinion, has been the facility with which they have permitted themselves to be led away by officials with personal objects which do not appear to have harmonised with the true interests of the proprietary. All such charges as those for renewals of road, stock, and stations, ought undoubtedly to be charged to revenue without any reserve whatever; and I venture to think it would be well for a Society like this to devote some portion of its wide influence to making it clear beyond a question where the line should be drawn between capital and revenue. The closing of capital accounts is, I confess, no light matter in respect of existing companies. There can be no doubt that every new work of an original kind ought to be provided for by a special capital, if in itself of sufficient magnitude, and if not, in combination with other amounts, and in respect of any sudden or unlooked for expenditure of any considerable sums for way, stock, or works, I would have the amount carried to a suspense account, the redemption to be spread over a reasonable period, and to be made out of surplus annual revenue. If this or some analogous system be not speedily adopted, it requires no soothsayer to predict what must happen; "Coming events cast their shadows before," and with regret I say, that before many years have passed away there will be but few solvent railway companies left. It is not only the difficulty they are now experiencing in their finances, but every day is ageing the entire of their property, which must be renewed and kept alive by an outlay which will tax the solvency and ability of the best of them. Everything connected with a railway is subject to the usual law of decay, every item has a certain life, whether it be taken in itself or forming part of a whole, whether rails, bridges, stations, plant, or anything connected with them, and although chargeable to revenue, I am not aware of any case where a redemption fund has been provided for these inevitable occurrences. In future, I would imperatively close every capital account of a new line, with the authorisation of the Board of Trade, permitting the line to be opened for public traffic; this of course implies the necessary and sufficient amount of rolling stock and stations. All else, not accompanied by the creation of new mileage, ought rigidly to go to the debit of revenue.

One word as to the mode which has recently been adopted of raising capital. The Brighton Company has on two occasions, issued ordinary stock at 55 per cent. discount, thus saddling the concern for ever after with £100 of liability for every £45 received. This is the worst possible mode of raising money, because it more than doubles every expense attending the line, including employés, stores, maintenance, and renewals. This, I fear, will be no solitary instance. A much more rational way of meeting necessities would be the adoption of the system pursued by foreign governments, of contracting loans redeemable half-yearly, by drawing out a fixed percentage to be set aside from surplus profits. Working expenses are the first natural charge upon gross revenue, then interest upon debenture stock, which stock ought to be made perpetual, like the national debt; then should follow the formation of a fund for the half-yearly drawings to which I have referred, the share capital (preferential and ordinary) absorbing the remainder. There is not time to enlarge upon these views, nor do I claim the merit of novelty for them; but this statement will prove that in what I have further to say with respect to railway enterprise and management I have only two objects in view; one is to increase the security of the companies as investments of capital, and the other to assure the public that, notwithstanding the mistakes and the extravagances of a generation, the benefits of this indispensable aid to civilisation and progress may be secured fully and widely.

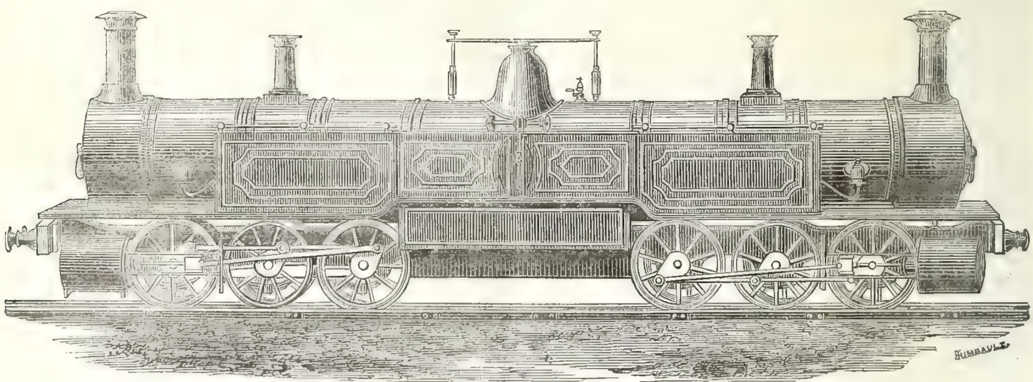
We now come to that which is no less important than all that has gone before—I mean the working of railways. We cannot recall the outlay of the past, but I firmly believe that even the most unfortunate railways can be redeemed by a wise and well-arranged system of working. I shall endeavour to show that revenues can be increased concurrent with a large reduction of expenses, and I would not be here this evening soliciting your attention unless I felt myself in a position to satisfy you how this can be done.

As to the revenue, I do not believe that railway managers, as a rule, trouble themselves to know the return derived from each train run as compared with the expense of the same. I would have a debtor and creditor account with every train despatched; showing on the one side the whole of the expenses incidental to it, and on the other the total amount earned. The experience of the last 35 years provides us with very reliable figures of the cost of train mileage, in regard of every description of expenditure; and every train that would show a deficit in balancing the account should be unhesitatingly abandoned, excepting in such special cases as do not affect the general question.

I illustrate this in detail by a reference to the published

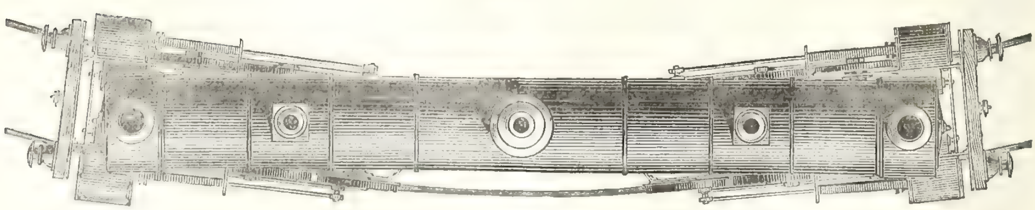
accounts of the London and North Western Railway Company, for the half-year ending June, 1866, which I have selected because it is comparatively low in the percentage of working expenses, and almost the best paying of all our railways. The gross earnings are at the rate of about 5s. per train per mile for passengers; and for merchandise 6s. 3¾d. To give shareholders the return to which they are justly entitled from this class of investment, I consider that the gross earnings necessary for this purpose ought not to be less than 7s. 6d. per mile for passenger trains at 20 miles speed, and increasing in amount to 10s. for 30 miles; 14s. for 40 miles; 20s. for 50 miles; and 30s. for 60 miles. It is absurd for companies to make so very little difference in their charge between high and low speeds as they do, knowing that whether in respect to the road, plant, or fuel, the cost increases in proportion to the velocity, and the charges should, therefore, be proportionate. I was much struck, when looking over the London and Brighton Railway accounts, to find that the gross earnings were under 4s. 10d. per train per mile, although, of my own knowledge, I am aware that many of their express trains, to and from Brighton, consist of some 20 carriages, each containing about 20 passengers, whose fares (allowing 25 per cent for season-ticket holders) must realise not less than about £3 per mile. It is clear, therefore, that the Brighton Company are running a large number of trains at a positive loss, else the average would not be so seriously reduced. If 4s. 10d. be a fair and remunerative rate (which it is not) no train should be run under that standard; and the maximum of £3 per train mile is as much beyond what is necessary as the minimum is below it; the medium between the two to be arrived at, by an abandonment of all unpaying trains, would produce to the company a handsome accession to its revenue on the one hand, and permit of a large reduction in the charges to the public on the other. I may be told that the cutting off of the unremunerative trains would be an invasion of the public convenience; but the best test of this is the patronage bestowed on particular trains, and the neglect of others which consequently do not pay. I am not forgetful that many of those unremunerative trains have been run, some from a spirit of rivalry, and some from a fear of competition; but rivalry must disappear in an effort to restore prosperity, and competition has found its level. Besides, the public are not so unreasonable as to expect that companies are to carry them without a proper return; the interests of both are identical, and neither is advantaged by a condition of things which has resulted in so much loss and misfortune. The expenditure part of the question is equally of vital importance, and I beg now to call attention to the amazing folly of railway engineers in overweighting the trains with that unnecessary and cumbersome appendage, the tender. The average gross weight of passenger trains may be stated at 70 tons; the average weight of a tender is over 25 per cent. of that, and invariably is over 200 per cent. in excess of the whole paying portion of the load carried. Now, when we know that not only is the tender costly, unnecessary, and cumbersome, but that the load of fuel and water which it conveys for supplying the engine can be made available for increasing the power and efficiency of the engine itself, I ask, what is to be thought of the persistency in continuing such an improvident system? There are at this moment working with great success on a Welsh railway engines with no tender, and where the fuel and water are in the highest degree conducive to the increase of power, economy, and safety. In their case the weight is distributed equally upon a large number of wheels, thus increasing the adhesion upon the rails, whilst the weight per wheel is proportionately reduced. (See Figs. 1, 2, and 3, the latter being section of Fig. 1

Fig. 1.



Elevation of the Fairlie Double Boiler Engine on two groups of six wheels coupled.

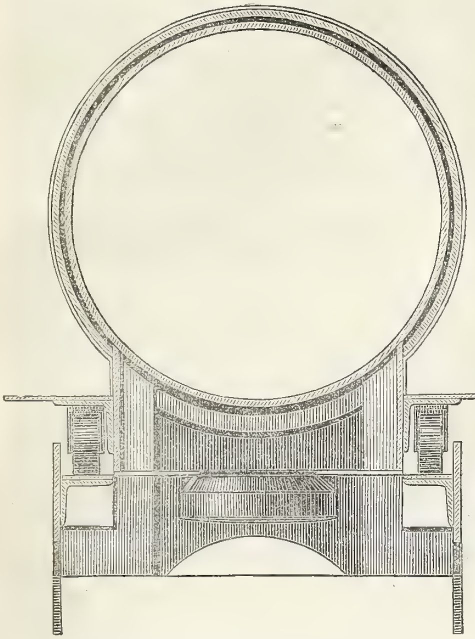
Fig. 2.



Plan showing the Fairlie Double Boiler Engine on a curve of two chains radius.

through bogie pin, to show the pivoting centre.) These advantages must at once be apparent, and, I believe, will lead to an entire revolution in our locomotive ar-

Fig. 3.



Enlarged tranverse section of engine through bogie-pin.

rangements; besides, the enormous economy which is effected in the maintenance of both engine and road is of the highest importance in the embarrassed condition of our railways. As respects the cost of tenders, and how they affect the dividends of railways, the following is given by way of illustration:—The London and North-Western Railway, which has the most uniform, and therefore the best paying, merchandise traffic of any line in the kingdom shows by its balance-sheet, already quoted, 7,333,371 tons of goods and minerals carried during that half-year, being about 46,800 tons net for each working day; the tare of this tonnage would not be less than a like amount, giving the gross tonnage per day at about 93,600. The average gross weight of each train, exclusive of the locomotive and tender, may fairly be set down at 300 tons; therefore the number of trains per day would amount to 312, but from the fact, as stated in the balance-sheet, that the gross earnings of those trains per mile are under 6s. 4d., and taking the rate of freight at one penny per ton per mile, which it is believed is a correct average, we are able to estimate the paying load of each of those trains of 300 tons gross to be about seventy-six tons, or only 25 per cent., and thus we find that the number of trains per day must really be about 609, instead of 312. It is true that merchandize is composed of classes according to bulk and frailty, in many cases less than half a ton filling a wagon, and thus reducing the proportion of dead weight to paying load, but it is also true that in all such cases charges are made not only to pay for the full carrying weight of the wagon, but leaving ample margin to cover the risk of breakage in handling. The same balance-sheet shows that each net ton carried produces to the Company a sum of 4s. 7½d., which at a penny per ton per mile gives the average distance of each ton carried to be 55½ miles; we have therefore 609 engines and tenders running 55½ miles every working day. Following this reasoning, let us see how doing away with the tender affects the question. Taking the tender to equal the weight of two loaded wagons, giving a net result of ten tons, and there being 609 in motion every day, it follows that their equivalent in net paying load would be about 6,000 tons carried per day 55½ miles, which at the same average rate of one penny per ton per mile gives the amount earnable from this source at £1387 10s. per day, and for 313 working days—representing one year—£434,287 10s. We have been speaking of merchandize and mineral traffic only, but applying the same scrutiny to the figures of the passenger traffic (provided of course, there were passengers to be carried), and substituting carriages for tenders of an equivalent weight, we should arrive at an income of a somewhat similar amount, both amounting to £868,575 per annum net earnings, equal to a dividend of over 3 per cent. on the ordinary share capital. It is well known that the cost of maintenance of tenders is fully as much, if not more, than that of the carriages or wagons which are suggested for substitution.

The method of conducting passenger traffic yielding so little per train per mile, is of such importance, and the discrepancy between remunerative and unremunerative weights hauled, is so irrational and glaring, that it deserves to be considered a little more in detail. Still quoting from the London and North-Western Railway balance-sheet, it appears that the gross produce of 9,613,195 passengers is £1,280,507, or under 2s. 8d. per passenger. Taking the average rate for each at 1½d. per mile, this gives 21 miles as the distance travelled by each, whilst the gross earnings per mile of passenger trains are about 5s., which, at a like rate of 1½d. per mile, shows that the average number of passengers per train per mile is 40; allowing for a considerable amount of luggage to each passenger, this number could not be estimated at more than four tons. Now four tons is neither more nor less than about one-twelfth of the weight of the locomotive engine and tender (the tender alone being about five times this weight), and taking the passenger trains at say 50 tons, the paying load will bear not more than one-twenty-fourth part of the gross weight of each train. It is evident, therefore, that the paying is altogether out of proportion to the unpaying load, although it is admitted that on railways such as the London and North-Western, from the circumstances of the great length and numerous unprofitable branches, there must always exist a much larger proportion of dead to paying weight than is the case with lines with no such encumbrances. Now there is no reason whatever why the present disproportion should exist, or anything like it.

This is no new subject with men who have given their serious and unprejudiced attention to it. I find that in 1849, Professor Gordon, an engineer of considerable eminence, expressed, in a very able pamphlet called "Railway Economy," similar views to those which I have advanced. In page 4, he says—"The existing railway machinery will be found to be monstrously disproportionate to the useful effect produced in four-fifths of the number of times that the machine is put in action. And to this waste of power may be most justly attributed much of the present embarrassment of railway companies."

The judicious despatch of trains, and the proportion of paying to unpaying loads, are two of the most important subjects connected with railway management. These, however, could be grappled with at any time by a really competent man, so as to enormously increase the net result even with existing stock; but there are the difficulties which always surround independent departmental control, exhibiting on all occasions a strange unwillingness to adopt any change which shall interfere with their preconceived opinions, or occasion trouble or thought in departing from a system which one is tempted to think has its own personal peculiar advantages. It seems never to have occurred to these gentlemen that in the discharge of their important duties, involving

every consideration they can bring to them, in the interest of their employers, what a close relation there is between the question of the dead weight necessary to the efficiency of the traffic and the dividends to those who have entrusted them with their important functions.

The Metropolitan Railway is, without exception, one of the greatest engineering triumphs of the age, being one of the cases where cost, it would seem, has been of secondary consideration; but, certainly, its management cannot be commended, and time will not permit of dealing with the general question. The magnitude of the traffic is evinced by the fact that during the half-year ending December 1867, nearly twelve millions of passengers were carried over the line by 348 trains on week-days and 212 on Sundays, averaging over 328 trains per day throughout the year. The distance run by each of these trains is understood to be $4\frac{1}{4}$ miles, consequently the train miles per day are over 1,396. By dividing the actual number of passengers, 11,916,924, carried for the half-year, by the number of days in the same period, we obtain 65,298 passengers carried per day, which, in 328 trains, is 198 passengers per train. This number of passengers per train for the entire distance run—say $4\frac{1}{4}$ miles—would give an average of less than 47 passengers per mile. This, however, is not the case, because the gross earnings per train mile being under 9s. 4d., the amount chargeable per passenger per mile would require to be about $2\frac{4}{10}$d. This would be above the average rate charged. It is, however, impossible to find out from the companies' balance-sheet what the real average is. To arrive at something like an average, I take 100 passengers, 50 single and 50 return journeys, from Moorgate-street to all stations, and divide these into 20 first-class, 30 second-class, and 50 third-class, which will give the average rate per passenger at 2·02d., and this divided into 9s. 4d. gives a little over 55 passengers per train per mile. The trains on this line are mostly composed of five carriages, weighing about 16 tons each, and one locomotive, weighing 42 tons, together 122 tons. Thus we have 122 tons of train weight to carry an average of 55 passengers, which at 14 to the ton is under 4 tons, being only one ton of paying load to 30 tons of dead weight. Some objection may be taken to this mode of dealing with figures. It will be said the average number of passengers given to each mile cannot be considered as the exact number travelling that distance. This is no doubt so, but it cannot materially affect the question, for if the whole average of 198 passengers travelled $1\frac{1}{4}$ mile, there would be none the remaining 3 miles; the only difference in the proportion of paying to unpaying load which could arise from this would be a slight increase of the former to the latter for $1\frac{1}{4}$ mile only, while for the 3 miles it would be wholly dead load. To prove the correctness of this calculation, we have only to assume what many might be disposed to imagine, that 198 passengers instead of 55 are carried per train per mile, the result would give 101,293,854 instead of nearly 24,000,000 now carried.

Nothing could be more appropriately said at this moment than the following quotation from Professor Gordon's pamphlet, written twenty years ago. At page 24 he says:—"These figures indicate the small portion of the mechanism of the railway system of transport that is actually brought into requisition even on the most frequented lines. Thousands, nay, millions of miles, are run by locomotives and carriages on the present system, whilst they are performing an amount of transport of passengers preposterously disproportioned to the power and capacity of the trains employed for effecting it."

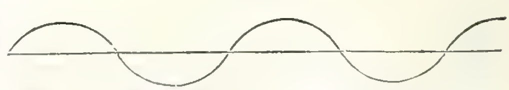
Contrast this condition of things on the Metropolitan Railway with our ordinary omnibus traffic. We find that the omnibus which has to travel over an infinitely worse road than any line, weighs somewhere about one ton, whilst it carries 28 passengers or two tons, thus giving a proportion of two tons of paying to one ton of unpaying load; but as we have included the weight of the horse, *i.e.*, the locomotive engine in the calculation on the metropolitan working, it is but fair to include the horses which haul the omnibus. Two horses with every equipment cannot weigh a ton, consequently at the very outside, the proportion is one to one, or one ton of paying load to one ton of material employed to convey it. These are very suggestive facts; they have surprised me; and that this line has earned any dividend at all under these circumstances proves its enormous productive capability. Beyond the question of proportion of effective to non-effective duty, let us consider how it all bears on the maintenance of the railway stock and road, and how they are affected thereby. I have already given the weights of the locomotives and carriages, the former at 42 and the latter at 16 tons each.

The carriages have very long wheel bases, consequently they offer great resistance to the tractive force of the engine, besides being very injurious to the rails rounding the curves.

The engines have 32 tons on 4 wheels, or 16 tons per pair. We have only to imagine this enormous weight ploughing along at 30 miles an hour to form some idea of the destructive effect, not only to the rails, but to the substructure and the machines, the effect being destructive alike to all. No wonder that the line has, as it is stated, been relaid in many places three times with steel rails since it opened five years ago. Not content with this rate of destruction to road and stock, the Metropolitan Company are now receiving, or about to receive, locomotive engines of a still more destructive character to work the St. John's-wood branch, weighing 45 tons on 6 wheels, with a wheel base of 14 feet. The only approach to a saving feature in the 42 ton engines—viz., carrying the leading end of the engine on a bissel truck with four wheels—is in these new engines omitted. The bissel arrangement does to some extent reduce the enormous friction of the engines on rounding the curves, notwithstanding which the grating and grinding noise of the wheels can be heard at a considerable distance. The spirit of rivalry between armour plates and guns is reproduced in steel rails and locomotive engines, with this difference, that the armour plates can be made to withstand the power of the heaviest guns, whilst steel rails cannot withstand the battering of these 45-ton steam hammer locomotive engines.

The destructive element of the ordinary type of locomotive is so vital, and affects the question of shareholders' dividends so much, that I would fain trespass on the time of the meeting to show how this results. The superstructure or principal weight of a locomotive engine borne on six wheels is supported on six points close to and inside each wheel. Between these supports and the wheel the carrying springs are placed. Now a very heavy engine with a great amount of overhang must, from the imperfections of the road, rock about a great deal, and the centre of gravity of the engine, instead of moving forward in a straight line, as it should do if the line and everything connected with it were perfect, forms a continuous line of curves and reverse curves on each side of the line of direction, as represented in Fig. 4.

Fig. 4.

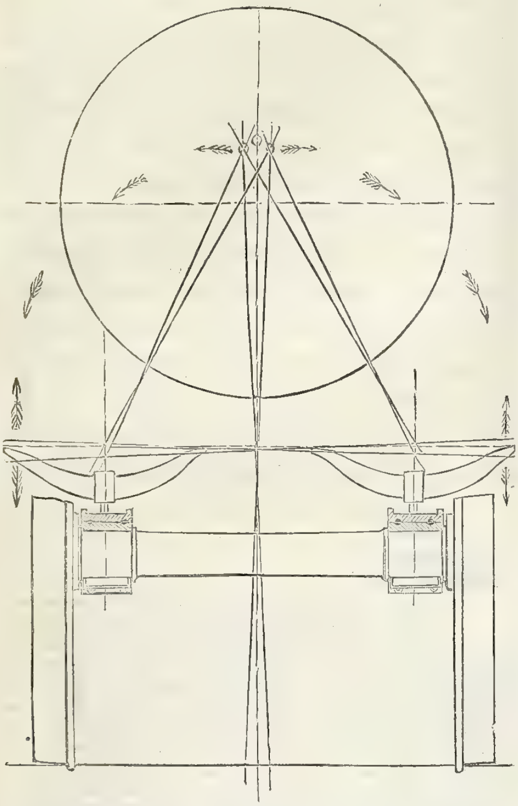


Showing the line traversed by the centre of gravity to each side of centre line of motion through the deflecting action of the springs.

This is caused at first by some defect or slight obstruction in the road, and afterwards kept up by the springs receiving and deflecting with the force of the up-and-down movement of the great body of weight resting on them, as shown in Fig. 5.

This action of the springs is caused by the oscillation of the centre of gravity to either side of the centre line of motion (see Fig. 5), and then easing them-

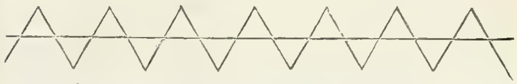
FIG. 5.



Showing the lateral movement of the centre of gravity to each side of the centre line of motion caused by the vertical action of the springs; showing also the deflecting action of the spring, and how it affects the centre of gravity; caused by an imperfect permanent way.

selves by flinging the weight from one to the other, either diagonal to, or at right angles with, the line of motion, and so repeated until the oscillations are gradually diminished; but it is found in practice that the oscillations never cease, for before one set is completely reduced another commences, keeping up a constant surging or soughing from side to side during the entire journey. The exact force of impact on the rail caused in this manner is represented by the amount of deflection of each spring beyond its normal condition. We shall be well within the mark by saying the destructive effect to the rail is over 60 per cent. more than the normal load on the wheels. Thus, in the case of the 45-ton Metropolitan engines, it is not simply this weight divided over six wheels, but a concussion of 60 per cent. in addition, or between 11 and 12 tons blow on the rails. Herein we find the explanation of the frequent necessity for the renewal of the rails. It is often argued that, because the additional load is received, taken up, and afterwards thrown off by each spring, the damaging effect on the rails is very little beyond that of the normal load, but I submit that this is not so. On the contrary, whatever extra force is thrown on a spring by momentum to flatten it beyond its normal condition, that extra force passes to the rail—not, however, as the blow of a hammer, as in that case the line of motion of the centre of gravity would be represented as in Fig. 6, but as a load graduated from its normal condition according to the velocity of the wheels and the time taken up by the

FIG. 6.

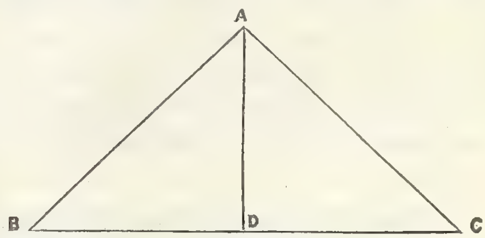


Showing the line that would be traversed by the centre of gravity to each side of the centre line of motion if there were no springs, each angle representing the blow of a hammer on the rails.

springs in their action of deflection and return, better represented, perhaps, by a double inclined plane. (See Fig. 7.)

FIG. 7.

Double-inclined plane, showing how the concussion or blow is given to the rails beyond the normal or fixed load on the wheels; caused by oscillation.



B to A is a plane representing the deflection or downward action of the spring.
A to C is a plane representing the return of the spring to its normal position.
A to D represents the greatest deflection of spring, usually amounting to from 30 to 75 per cent. beyond the normal load of six tons on the wheel.
B to C distance traversed on periphery of wheel during time taken up by the spring in its action of deflexion and return to its normal position.

The best practical illustration I can offer to the meeting upon all these points of mechanical engineering is to invite attention to the models and drawings before it of an engine which has been specially designed to meet the objections we have just been discussing. The engine does not exist as a mere abstract idea, but is daily in operation on the Neath and Brecon Railway; and within the last few days one of them which has been working over two years, has undergone a severe test in the presence of several eminent engineers, who, in consequence have accorded it their warmest approval, several of whom I have the pleasure to see here this evening, and who may probably be disposed to describe their own experience.

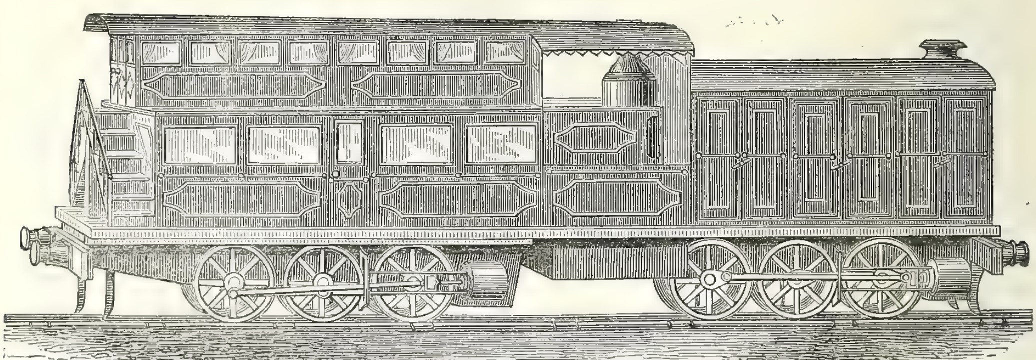
The engines are remarkable for the almost total absence of oscillation, and the graceful ease with which they run round the very sharpest curves is matter of surprise to all who have ridden on them, the sense of safety experienced when on the engine is irresistible, and the motion is so pleasantly unlike that of the ordinary engines, that it has been described by Captain Tyler, of the Board of Trade, as giving the sensation of flying, and by others as that of sailing in smooth water. In corroboration of this it may not be considered out of place here to quote a passage from the report of Captain Tyler and Mr. Eboral, who have lately returned from an inspection of the Grand Trunk Railway of Canada. In page 44, after giving a full description of the locomotive engines in use on that line, the report says, "The class of engine best suited to the climate, and for the various circumstances of the case, would, I have no doubt, be an engine running on two bogie trucks, each provided with a pair of cylinders, and four-wheeled or six-wheeled, according to the work required—and without a tender. Such an engine would be peculiarly safe to travel over a

winter road; would combine a minimum wear and tear to itself and the rails, with a maximum of adhesion, and would be the most effective and most economical that the company could employ. I had the opportunity some time ago of testing engines of this description on the Neath and Brecon Railway, designed by Mr. Fairlie, and have found the principle to be good, though certain points of detail required improvement. Such engines are also in use for the sharp curves and steep gradients of the Queensland Railway."

These engines have developed a relative power equal to two of the engines employed for hauling the goods trains on the London and North-Western Railway, whilst the destructive effect on the rails, road, and engine is greatly reduced. The employment of such engines would enable companies to double the carrying capacity of their lines without necessitating any additional outlay, and therefore they are especially valuable in the case of single lines. There are those who might consider it inexpedient to increase the present dimensions of goods trains, and in that case the engines would be too powerful, but the point is met by their permitting a very large reduction to be made in the weight per wheel amounting to so much as one-half that on the ordinary engine wheels, while its power remains equal to the best of them. It will therefore be readily understood that the life of the wheel tyres and rails would be greatly prolonged. Companies like the London and North Western, having reached, it is supposed, the maximum of load per train, have been driven to the costly expedient of triplicating their lines of rails for great distances. I venture to think that this immense outlay could have been avoided by the use of engines better adapted to the exigencies of an over-crowded traffic, whilst at the same time assuring a saving in haulage labour of nearly one-half, together with a most appreciable saving in fuel.

I have spoken of the Metropolitan Railway and its enormous traffic. That is but a portion of the prodigious traffic of the metropolis and its suburbs. This description of traffic should be treated in altogether a different manner to the main provincial lines. The Metropolitan should be conducted by stock giving the minimum of dead weight with the maximum of efficiency; this, I think, could be best done by what may be termed steam omnibuses, made to carry say 60 passengers, but with power sufficient to haul additional carriages during the busiest hours of the day—in the middle or slack time the omnibuses alone could carry the mean average of passengers. The weight of the entire machine, together with its load of passengers, would be less than that of the present locomotive engine alone. I have brought here to-night the drawing of a steam carriage, designed expressly for conducting the traffic of the proposed cheap lines in Ireland, which will be useful to show you the character of steam omnibuses (to be modified to suit circumstances) I should recommend for working metropolitan lines. This carriage would work with efficiency and economy the line over Mont Cenis. (See fig. 8.)

Fig. 8.



Fairlie's Locomotive Steam Carriage for working cheap mountain or agricultural lines.

Before closing this paper—already, I fear, too long—I desire to do justice to a gentleman, Mr. James Samuel, who, when engineer to the Eastern Counties Railway, successfully put in practice on that line very much the system of locomotive which I advocate now for metropolitan and branch lines. Mr. Samuel worked his invention for some time between London and Norwich, not only efficiently, but with very great economy. The economy was so striking as to be hard of belief. Why his system was discontinued I am not able to say; but of this we may be sure, that if the directors of that company had persevered with it, their shareholders would not to-day be mourning over an unproductive property. We should appreciate the man who in those early days was the first to remedy the monstrous disproportion between the paying and unpaying load of the trains, and it is satisfactory to be able to show you the drawings of Mr. Samuel's invention of that day.

I have thus endeavoured to bring before the Society a practical means of insuring the cheap construction and working of railways. To the noble Marquis in the chair, who is so constantly engaged in practical measures for the development of Irish prosperity, I flatter myself this must be a subject of peculiar interest. It will, I venture to think, create an impression in his mind that the Irish railway system may be completed with comparative ease, and that it cannot fail to prove remunerative. Ireland has no truer friend than the noble Marquis; and it would not be difficult to prove that as a statesman and a resident landlord he has devised practical measures for the substantial advancement of the country which have had the merit (something of a novelty) of commanding almost perfect unanimity. My plans may not command uniform assent, but at all events they are practicable. They may be opposed in some respects to established notions; but they effect the great object of giving all countries what they need in the way of intercourse at the cheapest possible expense. I submit them as in some degree a remedy for the errors of the past and of the present in financial mismanagement, and as a security against the evils of competition. With regard to Ireland, the noble Marquis will be the first to admit the advantages of substituting locomotive power for horse labour in bringing producers and consumers together. This is one of the main elements in agricultural progress. There is no reason in the world why the locomotive should not reach the remotest parts of Ireland. It depends upon surface lines worked by engines such as I have described. Sheep and cattle will increase in value; and the products of the field will never be deteriorated

and wasted by distance from their markets. All Irish industries will be stimulated, and new careers opened for labour and capital, beneficial alike to those who engage in them and to the country.

DISCUSSION.

Mr. Wm. Shelford said, that having been for some years engaged in the construction of railways, and having also been concerned in their management, he had much pleasure in endorsing the views which had been put forward by the author of the paper, although he could not agree with him in all matters of detail. Mr. Fairlie drew a marked distinction between railway management and railway construction, and between capital and revenue—the capital being employed in the construction, and the revenue being earned and administered by the management. Upon that principle a line already constructed had nothing to do with capital, but should close the capital account as soon as possible; and, of course, the only chance of improving its position lay in improving and economising the revenue. He thought, with Mr. Fairlie, that there was a wide field open for any engineer who would set himself to work to reduce the weight upon the wheels of a locomotive, and by that means to reduce the permanent way account, particularly in the direction of repair and renewal, which in all railway accounts formed very large items. With regard to lines not yet constructed, they would be able to reduce both the capital as well as the revenue expenditure, and this must be done—particularly the first—if railway enterprise were ever to take up the position it ought, and if railway shareholders were to see the dividends to which they were fairly entitled. Of the future of railway property he thought with confidence, and he could not for one moment conceive that construction was to stop owing to past mismanagement. Within his own knowledge there were districts—suburban, mineral, and agricultural—which were still in great want of railways. With capital accounts practically closed, it was not to be expected that existing companies would undertake new lines or branches; but they would work them, and could do so, both to their own benefit and that of the public. The means, therefore, which would suggest itself in any district where a railway was required would be to raise a small capital for the construction of the line, and apply to an existing company to work it at a percentage. There might be difficulties in the way; but, considering the amount of information which had been diffused on this subject of late years, by means of the press, there was no reason to despair. As the great object was to keep the capital of a company small, he thought Mr. Fairlie had done great service in showing how such a large sum was required for the permanent way in consequence of the rails being knocked to pieces by the engine, and how a great deal of the first cost in both roads and bridges might be saved by improvements in this respect.

Mr. Kintrea said, that as no gentleman belonging to the engineering profession seemed inclined to offer any remarks of a technical character, he would say, as an investor in railways, that he felt very much obliged to the author of the paper for bringing this interesting subject under their notice. He could not consider it a matter of congratulation, that although the engineers of Great Britain considered themselves at the head of the profession, out of five hundred millions sterling invested in railways, a sum of from 120 to 150 millions had been entirely lost. It was to him a melancholy reflection that such had been the practical result of all their engineering talent. If Mr. Fairlie's paper were the means of bringing before the profession and the public a method by which they would be able to redeem the past, and to secure a profit on the capital which was invested in railway enterprise, the community would be much indebted to him. Not being a mechanical engineer, he (Mr. Kintrea) was not able to enter into the details of the construction, but it certainly seemed amazing that in a country like England, teeming with wealth, abounding in population, and that population, to a great extent, rich beyond precedent, and with a great propensity for travelling, railways should be unprofitable and disadvantageous to those who had found the money for their construction. Anyone would have supposed that of all branches of industrial enterprise railways would be the most flourishing. From what he had seen of Mr. Fairlie's engine, he thought there was a great deal in his suggestions. Being desirous of learning whether that engine would be suitable to a district in Scotland, where money was of great value, he had availed himself of an opportunity of riding on one in South Wales. He found that it carried a load of 205 tons—the figures he had subsequently verified—up inclines varying from 1 in 50 to 1 in 70, and over curves of a character such as he had never seen elsewhere. He was very much astonished, and not less pleased, to find that the engine carried the load, not only with speed and safety, but also with a degree of pleasure to those who rode upon it, which might be called a new sensation. He hoped Mr. Fairlie would persevere, although he knew how difficult it was to get men in established positions to entertain new ideas. The experience of years in any particular system of railways made persons indifferent to any suggestion for improvement. It was the same with the paper-makers at one time; they declared that paper could not be made of anything but rags, at the very time when specimens were exhibited in the cloak-room of the House of Commons made from esparto grass; and now they had to admit that the introduction of this material had been of the greatest benefit. He believed it would be the same with locomotive manufacturers and engineers; the time would come when they would have to listen to Mr. Fairlie or other inventors of a similar charcter. He was a shareholder in the Great Northern Railway of Scotland, which did not earn a penny dividend, although it traversed a country rich in agricultural produce, and in the London and Brighton, which gave no return to its original shareholders, although it was one of the richest in passenger traffic; but he could not believe that under proper management such undertakings would be unprofitable. He had travelled abroad, and he found cheap fares, cleanliness, and comfort in the carriages on the Continent, while at the same time there were dividends to the shareholders; and he lamented that in England, with a more prolific traffic and a more commercial community, all this was reversed. They must not shut their eyes to what was brought before them because it was not put forward by one of the great railway engineers. For his own part, he had invested money on the faith of their scientific knowledge, and had found it a sadly losing speculation.

Mr. C. F. T. Young said the last speaker seemed to lay all the blame of railway misfortunes on engineers. He would ask whether it should not be divided amongst commercial men, lawyers, and engineers. Others might decide which class was most in fault, but certainly the whole blame ought not to fall on the engineers.

Mr. S. Sidney said he was not a shareholder in any railway, and, therefore, he could not speak with the same experience as Mr. Kintrea. He was not one of those political philosophers who seemed to fancy it was possible to obtain at once the advantages of private enterprise, of free competition, of a paternal despotism, and a close monopoly. He held the opinion that our railway system, with many defects, had given us more than any other country in the world. No doubt money had been wasted, mistakes had been made, fares in some cases were too high, and so they might go through a list of complaints; but this fact remained, that we had the railways for the accommodation of passengers and merchandise years and years before any other country had, and those who had followed in our track had been able to avoid our mistakes. It was, no doubt, a very nice thing for a shareholder in the Northern Railway of France to get a dividend of 17, 18, or 20 per cent., but it was

not at all agreeable to passengers on that line to be packed as they were packed; nor was it pleasant to the merchants and manufacturers on that line, with some of the largest of whom he was well acquainted, to be treated as they were treated, and always would be treated in a country where there was a close monopoly and no public opinion. He made these remarks to show that he had no prejudice against English railways, but neither had he any prejudice in their favour. He believed we had paid the penalty of doing things quickly, of which we had had to some extent the advantage, and that it would be of the greatest benefit if public opinion were more turned to the matter. Many of the great engineers who had laid out the leading lines of the kingdom were gone, but they had left behind them a race of pupils who not unnaturally were prejudiced in favour of the bridge which carried them over, and who felt, as the Dutch professor in the "Vicar of Wakefield," who said he had lived all his life very comfortably without Greek, and he saw no reason for learning it. But that was no reason why the force of public opinion should not be brought to bear on railway reform, and no reform could be carried out without such pressure. The valuable paper they had heard called attention to two points—the first being the financial management of the lines. It was very unjust to put all the shortcomings to the account of engineers, for a great deal was occasioned by the financial management. The first thing required, in a financial reform, was a clear statement of the accounts, and he was glad to see that Government had introduced a Bill by which all railways would be obliged not only to furnish accounts, but to furnish them in one form, which he hoped would be an intelligible one. Accounts had been elevated into an abstruse science, and whereas formerly they were merely considered as a means of showing how much was received, and how much paid, accounts were now become a sort of Egyptian riddle, so that when one learned man had delivered his oracle, another learned man was required to explain it. There would be no efficient reform until that was done, which every one, with any knowledge of accounts, knew could be done, viz., presenting them in such a form that any shareholder, even the most stupid, could understand how much money had been spent, how much had been earned, and how much of what had been earned was properly divisible in the shape of dividend. If they would turn their attention to that, it would be much better than laying down any hard and fast rule as to closing capital accounts, which, after all, could not be done. For many years past, in the great railway companies, the money matters had been in a complete state of *hocus pocus*. The secretary might know something about them, and the engineer and the principal lawyer; and what they told the directors to do, they did. No doubt they had been extravagant, but that arose, in a great measure, from the whole thing being an unnecessary mystery. It was quite impossible for those who were not mechanics to express an opinion on the merits of the engine to which their attention had been called, but one thing he might say, they knew very well that the time had been when all railway engineers had acted, or had been prepared to act, on the principle that money was no object; but times were now altered, and those who had to develop the railways of the future, must turn their attention not in the direction of magnificence, endeavouring to have the biggest and the fastest engines, and the widest rails, but rather to the question of with how little expenditure of material they could work. In that way he thought Mr. Fairlie had rendered great service, but he did not think the leading engineers were so much to blame. He was not aware of any instance in which gentlemen brought up in a certain profession, which had proved very profitable to them, changed their ways and plans without outside pressure being brought to bear upon them. Mr. Fairlie's paper would be printed, and no doubt would be widely read, and Mr. Fairlie must be content with having thrown the stone into the water, feeling assured that others would follow him, and that the circles would gradually widen until a decided effect was produced. There could not be a doubt that there was still great room for the development of railways on economical principles, particularly in rural districts, and in a country like Ireland, which had been, in many ways, peculiarly unfortunate, and for which all seemed now willing to do something.

Mr. Botly thought they were very much indebted to the author of the paper; and certainly anything which could be done in the way of establishing railway communication in Ireland would be of great benefit to that country, and the present seemed a very favourable time for approaching the subject. He was not a very great holder of stock himself, and he thought the greater part of Mr. Kintrea's observations would have been more *apropos* at a railway meeting than on the present occasion. With respect to foreign railways, he had had considerable experience of them, and he must give the decided preference to the English. Engineers were blamed, and some blamed the Government, but they must bear in mind that at the first inception of railways no one dreamed that five hundred millions of capital would be invested in them, or no doubt the mode of action would have been different.

Mr. Blackie said those who were not engineers were not able to go into the details of what had been suggested, but it was beyond doubt that there had been a deal of mismanagement in railways in other departments as well as that of engineering. He travelled a great deal, and he must say he met with a great deal of carelessness in the subordinate departments of railway management. They must also remember that engineers had had but little time in which to produce great results. When the first engine started no one supposed they were going to run 50 miles an hour, particularly on the narrow guage.

The Chairman said if no other gentleman wished to address the meeting it would be his pleasing duty to move a vote of thanks to Mr. Fairlie, and he had no doubt of its being carried unanimously, whatever might be the opinions held as to the details of his paper. He confessed he was not in a position to go into the matter in detail, as it would require an able mechanical engineer to dissect, or even to understand, some parts of the proposed system, and others he was not sufficiently conversant with railway matters to dwell upon. Mr. Fairlie had spoken of him in terms which he did not deserve; but he might say this, that from the introduction of railways he had taken the greatest interest in their progress; and in reference to a remark of the last speaker, he might say that in 1830 he was at Rainhill, near Liverpool, on the occasion of the opening of a railway, and an eminent engineer—he believed it was George Stephenson—said he should not be satisfied until he saw an engine going sixty miles an hour. He thought Mr. Kintrea had been a little too hard upon the engineers, because, although in some respects he leaned to the same way of thinking, he thought too much blame had been attached both to engineers and directors, and to what might be called the management of railways generally, and that the real fault lay in what might be called the system on which railway construction had gone on. One gentleman had spoken of free competition; but there never had been free competition, and he did not think they ever could have free competition, in the wide application of the term, in such a matter as railways. If they were just to a company they must give it, to a certain extent, a monopoly. As far as he could judge of Mr. Fairlie's plan, it seemed a good one, and he had no doubt that cheap railways could be, ought to be, and would be made, but it would be very unjust to start a cheap line to run parallel and in competition with one already made at an enormous expense. They could not therefore have free competition, and what competition there had been had been of the most mischievous description. This had arisen from the mode

in which permission to make railways had been granted, and from the system upon which companies had contended for districts. Companies had been ruining each other, not really to serve the public, but to get possession of a district, and compel the public to use their lines. The London and Brighton Railway had been mentioned, and he recollected that three years ago, when that Company, the South-Eastern, and the South-Western, were fighting as hard as they could, and projecting new lines in various directions, they were held up as models to show the good effects of free competion. But after a great deal of money had been wasted, several of the projected lines were withdrawn, and they all knew what had been the result in the case of the Brighton Company. As regards the faults which had been attributed to engineers and directors, he believed they arose in a great measure out of the system. They had been tempted to commit excesses by the difficulties thrown in the way of the formation of railways, and by the little control which had been exercised where it might have been, but where there had only been meddling interference. Shareholders had been induced to rely upon what were called the provisions of the standing orders committee, which were made one year and contradicted another, without any regular system; and instead of looking into affairs for themselves, they imagined that directors were so bound that they could not squander their money. So it went on, until the first effort was made, which was very good as far as it went, to introduce a better state of things by the establishment of what were known as Wharncliffe meetings. That was not sufficiently followed up, however, and shareholders still relied on the provisions of the standing orders, and on the Railway Clauses and Companies Clauses acts, which did not, and could not, regulate the conduct of directors. The consequence was that an immense quantity of money had been thrown away which might just as well have been spent in building a pyramid in a desert. Allusion had been made to the large buildings in Cannon-street and elsewhere; of course professional men took a pride in that sort of thing, and would run their customers, whether companies or private individuals, into much needless expense if they were not restrained. The main fault, he believed, lay with the system. What could be more absurd than for a committee to decide when people might begin to borrow, and at what rate. This they never could do effectually; the companies were obliged to apply for acts for this, that, and the other, crippling them in every possible way. When they talked about the great extent of their railways, they must recollect that if it had not been for the ingenuity of Mr. Lloyd, whose name would go down to posterity as having devised a method of driving a coach and six through an Act of Parliament, half the railways in the country would not have been made. If there had been a different system he believed engineers would have exercised themselves much more in devising plans for the cheap construction of railways, and how the expenses of working might be curtailed. He thought Mr. Fairlie had done good service in introducing his plan to the public, and he trusted it would be found that it could be safely acted upon, and that if he persevered he would meet with the success which he deserved. They could not go on making railways as expensively as they had done; but although there were so many lines, there were still many places where railway accommodation was required. Why should not every town have its railway, as every town would shortly have its telegraph? They could not everywhere have such a perfect railway as that of the London and North Western or Great Western, but they might have them made of a less expensive character, to meet the circumstances of the locality; and if engineers turned their attention to this, ways and means would soon be found. He must take some little exception to the way in which the working of the Irish railways had been spoken of, for with one or two exceptions he did not think anything like the same amount of money had been lost in that way as there had been in England. If that country was ever to progress and take the rank which, as the sister country to England she ought to take in the commercial world, there must be some large scheme for developing her resources. She had great natural resources, although her minerals were not equal to those of England. These resources were being gradually brought forward, but Ireland could not afford the immense losses which England had survived, and therefore the railways of that country undoubtedly required the attention of the Government; and he believed the public were quite willing that it should be given, and that they should be assisted in any way consistent with sound commercial principles. He would conclude by moving a vote of thanks to Mr. Fairlie.

The vote of thanks having been passed,

Mr. Fairlie, after thanking the meeting for the same, expressed his great disappointment at the way in which the paper had been discussed, as not one of the main points brought forward had been in any way touched. He had asked whether it was right that 20 tons of dead weight to one of paying load should be carried on the Metropolitan line; and he had hoped to hear this question discussed, because, if true, it was a most extraordinary state of things. Again, was it true that the London and North-Western could increase their dividends a certain rate of per centage by adopting a certain course, and if so, why was it not done at once? Why should the Brighton line run trains producing as high a rate per mile as £3, and yet only make the average 4s. 10d.? Those were the questions he had hoped would have been discussed. The question was how to improve the dividends, and bring back a large portion of the money which had been lost. He contended that the only way was to adopt a new system of construction and management altogether. He had not the opportunity of answering a single question, for not a challenge had been thrown out to him on any one point, nor had any one attempted to deny that what Mr. Samuel did 20 years ago on the Eastern Counties had resulted in a saving of expenditure to the extent of one-half. He had been at a great deal of trouble and research in examining the accounts of the different companies, and had laid the results before them in as clear a form as he could, and he thought the question deserved the attention of everyone.

NATIONAL MUSICAL EDUCATION.

Last year the heads of the musical profession addressed an appeal to the Government and the Royal Commissioners of the Exhibition of 1851, in favour of a Government School of Music and a National Opera. The memorial was as follows:—

"Understanding that the Government and the Royal Commissioners of the Art Exhibitions are being petitioned to contribute still further to the maintenance of the Institution called the Royal Academy of Music, we, the undersigned professional musicians, residing in England, realising the fact that the Royal Academy of Music has failed to promote the highest interests of musical art—that the Government grant has simply prolonged its existence, but not extended its usefulness; and feeling, moreover, assured that any further repetition of such attempt can only end in a similar failure, and prove equally discreditable to the country and wasteful of its funds—do hereby respectfully advise the establishment of a New School of Music, in which every advantage may be offered to musical students, to be presided over by competent professors, appointed by the State and responsible to it for the efficiency of the Institution. Connected with such an Academy, we would further advise, if possible, the establishment of an English National Opera, believing by such agencies a genuine and useful impulse might be given to the development of musical

genius in this country, so as ultimately to redeem it from the disgrace of being the only European nation that fails to cultivate its own national music. Respectfully soliciting your consideration of our appeal,

"We remain, &c.,"

This memorial was signed by upwards of 250 persons, among whom were many of the most eminent of the musical profession.

TECHNICAL EDUCATION OF GIRLS IN FRANCE.

In France, as in England, the want of some means of enabling young women, respectably born and educated, but left by circumstances dependent or destitute, to earn their own livelihood, has long been felt. The only pursuit open to them—that of teaching—is one for which they are often not adapted either by inclination or education, though there are many occupations which they could with advantage embrace if they had been fitted for them by previous habit and training. With the object of providing for this want, the Vicomtesse D'Anglais (née Fernande de Jaubert), with the assistance of some sisters of a religious order, founded in 1854 the establishment of *Notre-Dame-des-Arts*, of which she herself was made the first superior. She first established herself in a small house in the Rue du Rocher, in Paris, but in 1863 removed to the mansion known as the Château de Madame Adélaide, in the park of Neuilly, which is situated in the midst of gardens and grounds of above four acres in extent.

The institution itself is a boarding school only, and is primarily intended for the benefit of the orphans of men of the learned professions, literary men, and artists; these compete for scholarships with which the school is endowed. Pupils are, however, admitted on payment, and are placed on exactly the same footing as the orphans, except that they do not compete for the scholarships. These pupils are the children of well-to-do parents, who are unable to make any certain provision for them, but by sending them to an educational establishment of this description they give them the means of becoming independent. The terms for paying pupils, including board and schooling, are 1,200 francs for French girls, and 2,400 francs for foreigners. Notwithstanding the high fees there are several foreigners, notably English, in the school.

During the year 1866-7 the number of inmates amounted to 130; the present year it is 140. The school is managed by eighteen ladies and sisters, including the attendants. Besides these there is a staff of fifteen assistants (*demoiselles auxiliares*), recruited from the old pupils of the school, who take part in the instruction.

The endowments for the scholarships are furnished by grants from the Ministry, from the General Council of the Department of the Seine, and from the Municipal Council of Paris. By a peculiar arrangement, a pupil can be admitted to all the benefits of the school, and the whole of her education is assured by one payment, fixed by tariff, on her entrance. This enables private or public societies, or individuals, to provide for the education of the daughters of *employés* who may have died in service without leaving sufficient means for their families.

In addition to the subjects of a general education, particular attention is paid in this school to the teaching of music and of decorative art; it is this element which renders the instruction technical in the real sense of the word. The subjects of decorative art which are practically taught are:—Designing patterns for tapestry; church ornaments and jewellery; painting on porcelain, china, and enamel; painting on glass, and church windows; painting in oil and water-colour, crayon drawing, and painting on ivory; lithography; engraving on wood and steel; embroidery in general, and especially of church vestments; artificial flower making. A permanent exhibition of the results of the instruction in decorative art is established in the institution of Notre-Dame-des-Arts, and is frequently visited by both French and foreign artists and manufacturers.

To raise the standard of education at this institution as high as possible, a course of superior practical study has been formed, which extends over four years, and the fee for which is 1,500 francs. The institution trusts to the sale of the productions of the pupils to defray the expenses, which of course considerably exceed the fee. Pupils who may have received their general education at other establishments are admitted to this superior course, after having passed an examination on the same terms as the girls from the lower school.

In order to maintain its connection with the old pupils, and to enable them, should they wish it, to turn their acquirements to account, the institution is about to establish a co-operative society of Notre-Dame-des-Arts for the production and sale of articles of embroidery, drawings, paintings, engravings, &c. As a first step towards the realisation of this project, a monthly journal, called the *Album de Notre-Dame-des-Arts*, has been published since the 1st December, 1867. This contains musical compositions, lithographic drawings, wood engravings, &c., and is intended to form an educational periodical, bringing together teachers, present and old pupils of the school, and their families.

THE COMPARATIVE MORTALITY OF EUROPEAN CAPITALS.

The following is from the *British Medical Journal*:—

In a recently-published work by Dr. Vacher, of Paris, "On the Comparative Mortality from Ordinary Diseases in London, Paris, and the chief Continental Cities during the year 1866," a great number of interesting facts are given, which bear upon hygienic questions, and also upon matters of general interest. Paris presents the lowest death-rate, the proportion of deaths to population being 1 to 43·4, London stands second in the list, the deaths being 1 to 41. The rate is highest in Berlin, where the numbers are one to 30. In Paris, London, Vienna, and Stockholm, one-fourth of the whole number of deaths is put down to diseases of the respiratory organs. In all the chief cities, more deaths are due to phthisis than to any other single cause; one death out of four in Vienna, one out of eight in London, and one out of 16·8 in Stockholm, are the proportions given by Dr. Vacher, who states that tubercular disease of the lungs becomes less prevalent as the northern parts of Europe are approached; and alludes to a fact indicated by Dr. Leared, of the Great Northern Hospital, that in Iceland this disease is quite unknown, and not expressed by any word in the language. Those who have been moved by the taunts of French satirists on the depressing influence of the fogs and cheerless climate of Albion, will probably be startled to learn that, whilst the suicides in London amounted, in 1868, to 258, in Paris, where this crime is alarmingly on the increase, they were no less than 847; 717 of which were in males, 125 in females, and five in children. In London the number of murders was 138; in Paris, 13. Some curious details are also given concerning still-born children. In Paris, the number in one year reached to 4,356: this excessive amount, however, is partly explained by the fact that, according to the French law, all infants who do not survive longer than three days are considered as *mort-nés*, and also non viable fœtuses, and even abortions in which the sex cannot be distinguished from insufficient development of the organs. In Paris, the proportion of still-born boys to girls is as 42 to 34, whilst in children who live it is as 35 boys to 34 girls. This difference, Dr. Vacher holds, is only partly due to the difficulties of parturition caused by the larger size of the cranium in boys, and is owing in

some measure to some obscure cause which still remains for embryologists to determine. The proportions of deaths in hospitals to those at the individuals' homes are, in Paris, one to three; in London, one to five; in Vienna, one to 2·1; in Brussels, one to two.

Fine Arts.

Annual Exhibition of Works of Living Artists in Paris.—The Paris *Salon* opens as usual on the 1st of May, and will remain open until the 20th of June, A further modification in the method of electing the jury has been adopted; as before, one-third of the jurors are to be named by the authorities, and the remainder by the artists themselves; but the basis of the art suffrage has been very materially extended. Previously only those artists had votes who had received a medal of the first class, or an honorary decoration; now, every artist who sends in one or more works for the coming exhibition, and who has had even one work received at any former exhibition, with the single exception of that of the revolutionary year, 1848, when there was no previous examination by a jury, has a right to vote for the jury; and, in addition to this, the franchise is extended to young artists who have won the Grand Prize of Rome at the Ecole des Beaux Arts. This is a very near approach to universal suffrage, and is hailed with much interest by the body of artists. The preliminary lists of names for election are already circulated, and they include those of the best artists of the day, with the exception of the Professors of the School, and some others who, it is well known, will be included in the official list. No provision has been made for the voting of those artists who reside at a distance from Paris, but we believe we may assert that the omission will be supplied in a day or two, and that the artists in the provinces or elsewhere will be enabled to send up their balloting lists by the post, or through their agents in Paris. The jury, as before, will act in sections, and it is necessary for the reception or rejection of the works sent in that two-thirds of the members of a section should be present. A majority is required for the admission of a work, but in case of the numbers of votes being equal, the work is allowed to pass. The right of admission of their works without examination is retained by the members of the Institute, by those artists who have been decorated, have received a medal at a former exhibition, or won the Grand Prix de Rome.

Sale of the Works of the Late Théodore Rousseau.—The sale of the pictures, sketches, studies, drawings, and water colour works of the late famous landscape painter Rousseau, is announced to take place on the 20th of April, at the Hôtel Drouot, Paris.

A Relic from Jerusalem.—The architect employed in the reconstruction of the Church of the Holy Sepulchre is having moulds taken from the tomb of Philippe d'Aubigny, recently discovered, for the Salle des Croisades, in the Palace of Versailles.

Discovery of a lost Statue by Canova.—It appears, by the *Journal de Frankfort*, that a statue of Napoleon the First, by Canova, which stood in the Salle des Etats in the time of Jerome, king of Westphalia, has been found hidden in a barn in the garrison of Cassel. Unfortunately, at the time of the retreat from Moscow, the statue was removed and mutilated, the arms, it is said, having been sawn off. The French consul has applied to the Prussian authorities for the statue in question.

Manufactures.

Havre Maritime International Exhibition.—Mr. P. L. Simmonds is officially charged with the duty of visiting the principal seaport towns of the United Kingdom to afford information to intending exhibitors at this interesting gathering, which is to open in June. The various ship and boat builders, engineers, sailmakers, provision dealers, outfitters, and coal agents, are likely to be well represented.

Quicksilver Mines in Italy.—In Tuscany there are four mines of quicksilver, but at the present time three have been abandoned on account of the low price now obtained for this metal. The only mine now worked is that of Siele, near Castelazara. The quantity of ore extracted in 1864, was 3,000 quintals (300 tons), which yielded from 2 to 2½ per-cent. of quicksilver—about 6,000 kils. Quicksilver is also found in the neighbourhood of Agordo, in the Venetian provinces. The veins of sulphide of mercury are said to be most extensive, but are worked on a very small scale. The following is the annual produce of quicksilver in Italy:—

Mines.	Quintals.	Value.
Castelazara	3,000	3,600 francs.
Agordo	44,608	53,000 ,,
Smelting Works.		
Castelazara	66	34,200 ,,
Agordo	230	91,840 ,,

From 1863 to 1865 the imports of quicksilver were 10,900 kils., of the value of 71,100 francs; and the exports 1,000 kils., of the value of 2,700 francs.

Science and Industry in Russia.—The Russian Society of Acclimatisation announces a second exhibition for the encouragement of agriculture, to open at Moscow on the 27th of July, and to close on the 16th of August in the present year. The Society offers a considerable number of gold, silver, and bronze medals. The Council of the University of Moscow has determined on the creation of an industrial museum, to be opened gratis on Sundays. The Professors of the University propose also to establish courses of lectures on the applications of science to industry, and on the apparatus and implements to be found in the new museum. The Agronomic Society of Moscow has now under discussion the formation of an agricultural museum. The Russian Geographic Society continues to exhibit much activity. At one of its recent meetings Mr. Lerch gave a detailed account of his recent visit to Central Asia, and especially concerning the ruins of Djankend and Sauran, and Mr. Prioroff presented drawings which he had made of remarkable objects found in the ruins of Djankend. An account was also read of the Witim expedition, undertaken for the discovery of a practical route between Nertschinsk and the goldfields of the basin of the Léna; besides the chief results in view, the commission is occupied with geological observations, and has also sent home a rich collection of plants and birds. The commission, under Mr. Daniloff, appointed to visit the northern coasts of the Sea of Azoff, and to study the formation of the sand banks, and the effect of water on the higher banks, has completed its work. The Society has established branches at Vilna and Orenbourg. The port of Odessa was free of ice on the 5th of February, and the arrival of three steamers ordered by the Society of Commerce and Navigation for the transport of the anthracite extracted from the mines of the Don, was expected. The following is the official account of the quantities of gold furnished by the Government of Jenissëisk during the years 1861 to 1866 inclusive, and of the number of workmen engaged in the workings:—

	Gold pouds.*	Workmen.
1861	605	16,375
1862	559	18,640
1863	557	14,370
1864	499	15,995
1865	487	13,800
1866	482	13,900

* A poud is rather more than 36 lbs. English.

Commerce.

WINE GROWING IN FRANCE.—According to the most recent official returns, the area of land devoted to the cultivation of the vine in France, is 5,384,600 acres. In 1840 the total acreage under cultivation of vines was 4,870,840 acres; in 1850, 5,387,070 acres. The diminution since 1850 must, to a certain extent, be attributed to the disease amongst the vines. The average annual produce of wine in France at the present time amounts to upwards of 1,100 millions of imperial gallons.

MINES IN FRANCE.—There are computed to be 1,184 mines in France of all kinds, of which 598 are coal, 249 iron, and 337 of other minerals. The total value of coal and iron raised last year amounted to 472,000,000 francs.

IMPROVEMENT IN TELEGRAPHIC DESPATCHES.—Within the last few days the French telegraphic administration has introduced an ingenious check against accidents or intentional alterations in telegraphic despatches, on Hughes' system. Heretofore the strip containing the message was merely gummed on to a half-sheet of paper in which it was despatched, and might with little trouble be detached and changed. To prevent this, the despatch, after being attached to the paper, is passed between a pair of watering rollers, so that any displacement will be shown by the interference with the lines of the pattern; and, in addition to this, the words "Empire Français, Ministère de l'Interieur, Administration des Lignes Télégraphiques" run across the surface of the despatch, and form an additional guarantee.

EXPORTS OF GRAIN FROM ITALY.—In 1867 the exports of grain from Italy to France amounted to 457,000 quintals of wheat, 5,000 quintals of maize, 8,000 quintals of barley, and 195,000 quintals of oats. In previous years the average exports to France did not amount to more than 50,000 quintals. Judging from the exports that have been made during the first two months of the present year, it may be fairly anticipated that the exports in 1868 will be even greater than that of 1867.

COMMERCE IN FRANCE.—The administration of the Douane has recently issued a comparative statement of imports and exports of the special commerce of France, that is to say, exclusive of foreign articles imported, and re-exported, for the past seven years, namely, from 1861 to 1867, both inclusive. The total of the imports and exports together has increased within that period from £174,720,000 to £245,120,000, but the exports have not kept pace with imports, as the following table shows:—

	Imports. Frs.	Exports. Frs.
1861	2,442,000,000	1,926,000,000
1862	2,199,000,000	2,243,000,000
1863	2,426,000,000	2,643,000,000
1864	2,528,000,000	2,924,000,000
1865	2,642,000,000	3,088,000,000
1866	2,793,000,000	3,181,000,000
1867	3,156,000,000	2,972,000,000

So that while the imports have steadily increased every year since 1862, the exports have remained nearly stationary for four years, and exhibit a deficit in 1867 as compared with either of the two preceding years. This latter falling off is attributable to bad harvests, which caused grain to be imported instead of being exported; thus the exports of 1867 include 796 millions of francs against 500 millions in 1866 for the principal items of food, the increase being made up of 206 millions for wheat and flour, 46 millions for cattle and other animals, 5 millions for meat, and 27 millions for butter, cheese, and other articles. The imports of materials for manufacture, on the other hand, only exhibit an increase of 32 millions of francs, in a total of very nearly 200 millions; thus, while there was an increase in raw hides, wool, silk, flax, manures, and forage, there was a falling off in cotton, to the extent of 85 millions of francs, and also in coal and petroleum. In the exports of manufactured articles we find a diminution,—in silk tissues, 48 millions, woollen tissues, 18 millions, cottons, 12 millions, and refined sugar, 2 millions of francs; and augmentations—in furniture, 6 millions, objects of virtù, 12 millions, articles de Paris (fancy articles), 5 millions of francs. In the exports of raw material and food the same year (1867) exhibited a falling off in grain and flour to the extent of 122 millions, wine, 43 millions, spirits, 9 millions, cattle, 22 millions, and mules, 5 millions of francs; and an increase in fruit for dessert, to the extent of 4 millions, oilcake, 2 millions, wool, 17 millions, silk 5 millions, and cotton, 3 millions of francs.

COAL MINING IN ITALY.—A company has just been formed at Naples for coal mining in the Neapolitan provinces, and in consequence of experiments that have been made at the naval arsenal, the government has ordered 50 tons, which are to be supplied from the mines of Giffoni, Valle Piana, in the Principato Citeriore. The experiments that have been made with this coal at Naples prove that it is of excellent quality, and most suitable for gas manufacture.

Colonies.

COLONIAL WOOL.—The following is a statement of the imports of colonial wool into Great Britain during 1867, compared with those of the previous year:—

	1867.	1866.
New South Wales and Queensland	101,695	82,184
South Australia	44,961	40,510
Victoria	170,444	141,931
Western Australia	3,596	3,565
Tasmania	15,943	16,422
New Zealand	76,729	64,243
Cape of Good Hope	128,287	106,794
Total	541,655	455,649

Showing an increase of 86,006 bales, of about 400lbs. each, over the imports of last year.

IN THE MELBOURNE SAVINGS BANK the deposits, during the year ending with June last, were smaller than during any of the preceding nine years. From the decennial statement it appears that prior to 1865 the amounts deposited increased steadily, year by year, from £362,678 in 1858, to £480,332 in 1864, but 1865 witnessed an enormous falling off, and a still further decline took place in each of the subsequent years. The amount of deposits received was:—

In 1864	£480,392	In 1866	£353,679
1865	419,934	1867	348,554

LABOUR IN QUEENSLAND.—The cotton and sugar planters of this colony are exerting themselves to introduce South Sea Islanders into the colony, as there is a feeling that the introduction will be very beneficial. The labour of the coloured race is preferred to that of the white men, because of its cheapness, and the ability of the Polynesians to work in the open air in summer without difficulty. There are many people who object to this proposal, and they have presented a petition to the Governor; meanwhile a Bill has been passed by the Legislative Assembly for regulating the introduction and employment of the South Sea Islanders.

THE IMPORTS INTO WESTERN AUSTRALIA for the year ended 30th September, 1867, were £216,299, against £202,338 for the previous year; and the exports were £167,819 against £157,137 for the previous year, the present returns showing an increase in both cases. The principal exports were wool, £90,965; sandal wood, £22,090; horses (380), £8,360; flour, £5,190; lead ore, £10,824; copper ore, £4,155; timber, £4,537; whale oil, £1,542; provisions, £3,371.

Publications Issued.

Recollections of the Paris Exhibition of 1867, by Eugene Rimmel. *(Chapman and Hall.)* The work is what its title professes it to be, a description of the plan and leading objects of the exhibition. It appears that the author undertook to write a description of the exhibition for two newspapers, the *Courrier de l'Europe* and *La Patrie*. In this work he was assisted by several of the French and Foreign Commissioners, as well as by some of the exhibitors, and the articles were published at Paris in the form of a book, entitled "Souvenirs de l'Exposition," with numerous engravings, principally borrowed from the "Illustrated Catalogue" issued by Mr. S. C. Hall in connection with the *Art Journal*. The present work is an English version of the foregoing.

Notes.

Primary Instruction in France.—Heretofore general education has been left almost entirely in the hands of the Government in France, but it is now admitted that with all the good-will in the world a Minister of Education cannot do everything at once; the cost stands in the way on one hand, while routine raises all kinds of obstacles in the road. Much has been done, but there still remain 650 communes without schools for primary instruction; and a great friend of education, the Comte de Madre, has just published a work entitled "Moyen de Créer et d'Entretenir des Ecoles, Spécialement par Voie d'Association," containing not only a collection of documentary matter, but suggestions as to the best method of bringing individual efforts and association to bear effectively on the subject. M. de Madre looks upon association as preferable to individual efforts, the latter having frequently too much the air of personal patronage. It may be mentioned that efforts of the kind recommended by the author have been made with success in one instance at Bellevue, near Saint Cloud. M. de Madre gives a curious illustration of the working of the common school system, and of the operation of short-sighted or purely selfish ignorance in France; he says, that in many communes the schools are frequented especially by the children of the poor, while those of small farmers or graziers are kept at home to watch the cattle in order to save a few centimes a day to their parents. The effect of this, says the author, will be the reversal of their social position, for in the next generation the employer's children will be inferior to those of the labourer; a hint for improvident or selfish parents, which certainly is worth recording.

New Organ at Notre Dame.—The old organ of Notre Dame, which was constructed in the time of Louis XV., by Thierry Lescope, one of the most famous constructors of that time, was repaired and improved at the end of the last century by the celebrated organ builder Clicquot; between 1832 and 1838 the organ was again repaired by the makers Dalery; and, lastly, in 1863, the government commissioned Messrs. Cavaillé-Coll to restore the organ completely, and introduce all the most modern improvements. The work is just finished, and the result is highly spoken of. The new organ has 110 registers, distributed over five key-boards for the hands, and one for the feet. It has twenty-two compound pedals, and about 6,000 pipes, of which the longest is said to be 32 feet long. The instrument embraces about ten octaves, that is to say, the entire range of appreciable tones. The movements are transmitted by means of pneumatic arrangements, similar to those applied to the organ of Saint Sulpice. The bellows, or rather the air chamber, contains 25,000 litres, or about 5,500 gallons of air, and is supplied by six pairs of pumps, giving 600 litres of air per second.

Paris Universal Exhibition.—The Imperial Commission has just issued a notice to the subscribers to the guarantee fund, informing them that the advances made are now receivable, with the addition of 5 per cent. calculated from the 20th of July, 1865 (when the guarantee list was opened) to the 20th of the present month. The Commission adds, that all the materials in the Champ de Mars have now been sold, and that, in a short time, the guarantors will be informed of the amount due to them in the way of profit.

Annual Cattle Show in France.—The annual show of cattle and animals, which has taken place at Poissy without interruption since 1844, is to be held this year at the new Cattle Market, at La Villette, Paris. The Minister of Agriculture has issued the programme of the show. The animals are to be received and weighed on the 4th and 5th of April; on the following day the jury makes its awards, the public being admitted in the afternoon by payment of five francs each person; on Tuesday, the 7th of April, the admission will be one franc; and on the following day the exhibition will be thrown open gratis. The prizes, which will be distributed by the Minister of Agriculture, amount to 160 in number, and to more than £3,200 in value; besides medals of gold, silver, and bronze, for the three classes of rewards, the money prizes amount to 67,250 francs for horned cattle, 9,150 francs for sheep, and 5,050 francs for pigs. In addition to these a Cup of Honour wil be given in each section, of the respective value of 3,000, 1,500, and 800 francs. A very fine show is anticipated.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, 8½. "A Journey to Lhasa and the Source of the Brahmaputra by a Pundit, under the direction of Capt. T. G. Montgomerie, R.E."
Social Science Assoc., 8. Mr. G. W. Hastings, "On the further Amendment of the Law of Evidence in Civil Cases."

Tues ...Civil Engineers, 8. Continued discussion upon Mr. Sandberg's paper, "On the Manufacture and Wear of Rails."
Ethnological, 8.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

Wed ...Society of Arts, 8. Mr. A. S. Bicknell, "On Horse as an Article of Food."
Geological, 8. 1. Mr. Henry Woodward, "On some New Forms of Palæozoic Corals." 2. Prof. Harkness and Mr. H. A. Nicholson, "On the Coniston Group." 3. Dr. A. Leith Adams, "Death of Fishes on the Coast of the Bay of Fundy."
Archæological Assoc., 8½.

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
Philosophical Club, 6.
Mathematical, 8.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."
Society of Fine Arts, 8. Mr. T. R. S. Temple, "On the Modern French Drama."

Fri........Society of Arts, 8. Cantor Lectures. Dr. F. Crace Calvert, F.R.S., "On Chloride of Sodium."
Royal Inst., 8. Dr. Carpenter, "On the Unconscious Action of the Brain."
R. United Service Inst., 3. Major S. Bevan Edwards, R.E., "An Organisation for the Army of England."

Sat ......Royal Inst., 8. Professor Roscoe, "On the Non-Metallic Elements."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 7th March*, 1868.

113. Irish Reproductive Loan Fund—Account.
River Plate, No. 1 (1868)—Correspondence.
Foreign Office Agencies—Statement.
Foreign Office Agencies—Names, &c.
Education—Revised Code.
Public General Acts—Cap. 7.
Public Petitions—Fifth Report.

Delivered on 9th March, 1868.

48. Bill—Fairs (Ireland).
120. Piers and Harbours—Report of the Board of Trade.

121. Malt and Barley—Returns.
122. Malt and Barley—Return.
124. Consolidated Fund—Abstract Accounts.
125. Abyssinia—Letter.
126. Committee of Selection—First Report.

Delivered on 10th March, 1868.

74. Navy—Estimates (1868-69).
75. Greenwich Hospital—Estimate.
81. Revenue Departments—Accounts.
Mexico—Papers relative to the Withdrawal of the British Mission.
Boundary Commission—Report of the Commissioners.

Delivered on 11th March, 1868.

52. Bill—County Financial Boards (No. 2).
67. Civil Services—Returns.
82. Works and Public Buildings—Abstract Accounts.
83. Woods, Forests, and Land Revenues—Abstract Accounts.
85. Naval Receipt and Expenditure—Appropriation Accounts.
87. Army and Militia Services—Appropriation Accounts.
131. Prison Dietaries (Ireland)—Return.
Public Petitions—Sixth Report.

Delivered on 12th March, 1868.

53. Bill—Railway and Joint Stock Companies' Accounts.
26. Navy (Designs for Ships)—Circular Letter.
84. Navy—Statement.
105. East India (Revenues)—Return.
106. East India (Loan)—Return.
130. Railway and Canal Bills—First Report.
136. (I. to V.) Railway, &c., Bills—Board of Trade Reports.
Heligoland and Hong Kong—Agreement, &c.
Portugal—Correspondence respecting Commercial Relations (1866-8).

Delivered on 13th March, 1868.

49. Bill—Metropolis Gas.
54. „ Oyster and Mussel Fisheries.
59. „ Compulsory Church Rates Abolition (amended).
112. Supply—Return.
The "Tornado" (No. 1, 1868)—Correspondence.
Railways—Report by Colonel Yolland on Electrical Communication.

Delivered on 14th March, 1868.

96. Storm Warnings—Letter.
134. Farnham Union—Report of Mr. Lambert.
138. Duchy of Cornwall—Account.
139. Civil Services—Supplementary Estimate.
Public Petitions—Seventh Report.

Delivered on 16th March, 1868.

127. Spirits, &c.—Return.
Coal (British Colonies, &c.)—Reports from Her Majesty's Secretaries of Embassy and Legation.

Patents.

From Commissioners of Patents' Journal, March 13.

GRANTS OF PROVISIONAL PROTECTION.

Advertisements, exhibiting—631—O. Ollivier.
Anchors—703—W. J. Armstrong and C. Browne.
Axles, &c., bearings for—642—T. Hill.
Bedsteads for military purposes—564—J. M. Kilner.
Blinds, raising and lowering venetian—660—L. Boyce.
Boats, &c., building—664—W. E. Newton.
Boilers—657—T. Blocksage.
Boilers—679—J. Robinson.
Boilers, feeding—634—G. T. Bousfield.
Boots and shoes, heels for—632—J. L. Jaquet.
Bottles, feeding—646—J. Perrett.
Bottle stoppers—663—J. Adams and H. Barrett.
Bottle stoppers—669—G. Eldridge and W. C. Loe.
Bottles, &c., caps or covers for—675—A. S. Stocker.
Bridges—548—E. W. Young.
Cans or vessels to contain liquids—667—J. H. Bass.
Carriages and chairs, folding—684—T. Trotman.
Chlorine, &c., manufacture of—662—W. Weldon.
Composition, non-conducting—619—F. Le Roy.
Drilling machines—622—E. Hutchinson.
Fabrics, finishing—685—W. E. Newton.
Fabrics, finishing woven—661—J. B. Whiteley.
Fabrics, preparing for dyeing—659—R. E. Green.
Fabrics, washing, &c.—672—R. Mills.
Fire-arms, breech-loading—655—J. R. Cooper.
Fuel for household purposes—259—J. Mason.
Furnaces—579—C. Cochrane.
Glass furnaces—682—T. Warren.
Glass, &c., moulds for moulding—677—C. E. Brooman.
Iron and steel, manufacturing—686—C. Sanderson.
Iron and steel, manufacturing—688—J. Gjers.
Iron, &c., decarbonization of molten—462—H. T. Humphreys.
Jute, &c., preparing—683—J. F. Low.
Liquids, &c., pumping and measuring—643—R. Laidlaw and J. Thomson.
Looms—626—J. J. and E. Harrison.
Lubricators—620—J. Elce.
Luggage labels—697—A. H. Hill.
Millstones, dressing—707—J. Rawsthorn.
Motive-power—695—G. Lindsley.
Muffs—627—J. C. Davies and E. Zahn.
Nails, &c.—561—M. Henry.
Oils, purifying hydrocarbon—648—F. Lambe, A. C. Sterry, and J. Fordred.
Paper fabrics, &c., rendering waterproof—440—N. C. Szerelmey.
Paraffine, treating—610—J. Fordred, F. Lambe, and A. C. Sterry.
Paving—678—J. Leacock.
Piles, constructing—711—S. Sharrock.
Printed surfaces, &c., laying metal leaves on—68—L. Simon.
Printing machines, lithographic—671—J. Christie.
Railway fastenings, steel spring—418—A. B. Ibbotson.
Railway trains, signals for—538—A. M. Keighley.
Respirators—713—A. A. Usher.
Sea, preventing collisions at—608—J. S. Gisborne.
Sewing machines—681—G. Thomas.
Ships' bottoms, preventing the fouling of—668—W. M. Bullivant.
Signal indicators for mining and other purposes—638—R. Ramsey and J. Cooke.
Spinning and twisting machinery—652—R. and J. W. Gaunt.
Taps—676—R. Howard.
Telescopes—701—B. Solomons.
Tuyeres, hot blast water—689—C. Coohrane.
Umbrellas and parasols—606—A. Stenger.
Valves for pipes, flues, &c.—715—C. Cochrane.
Washing machines—650—W. E. Newton.
Weighing apparatus, portable—474—J. Thornton and W. F. Voss.
Wells, sinking—699—J. L. Norton.
Window sash fastenings—687—T. S. Whilock and H. Harford.
Wire, coated—624—G. W. R. Pigott.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Fibrous materials, treating—818—W. R. Lake.

PATENTS SEALED.

2599. W. G. Brownson.	2615. T. Turner.
2606. G. Pickin.	2645. F. T. M. A. Guyon.
2610. W. J. Cunningham.	2811. N. F. Taylor.
2613. W. Brailsford & J. Gadsby.	

From Commissioners of Patents' Journal, March 17.

PATENTS SEALED.

2625. T. Adams and G. J. Parson.	2699. A. Tod and J. Heatley, jun.
2632. J. Rust.	2791. S. Johnson.
2636. T. Bletcher.	2817. R. P. Faucheux.
2639. J. H. Sams.	2837. J. H. Johnson.
2640. W. W. Gibson.	2867. H. B. Barlow.
2649. R. Raffault.	2887. W. R. Lake.
2650. S. Dreyfous.	2898. B. Latham.
2652. W. Hall.	2971. A. V. Newton.
2664. J. Baird.	2991. H. Adcock.
2667. T. Muir.	3381. E. H. Bentall.
2669. J. Rives.	19. E. J. and W. A. Krüss.
2673. G. W. MacGeorge.	69. S. Goldstein.
2674. C. Ritchie.	76. J. Dawson and J. Howorth.
2698. J. Musgrave.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

779. W. Menelaus.	722. N. N. Solly.
671. E. A. Phillips.	736. J. Ramsbottom.
693. J. M. Napier.	893. W. M. Fuller.
697. R. M. Roberts.	913. A. V. Newton.
2921. H. C. Davis.	914. A. V. Newton.
695. J. Tann.	765. J. C. Stevenson.
701. R. Marsden.	730. J. F. Brinjes.
712. R. A. Brooman.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

637. E. T. Truman.	753. J. Chatterton & W. Smith.
638. E. A. Pontifex.	506. J. Taylor, jun.

Registered Designs.

4929—Feb. 13th—An improved collar—J. Jowett, 48, Conduit-street, Regent-street, W.
4930—Feb. 20th—A brace or band buckle—J. Stokes, New-street, Walsall.
4931—Feb. 22nd—Shape or configuration of a surgical sole, for use in cases of malformation—W. H. Spratt, 14, Brook-street, Hanover-square, W.
4932—Feb. 24th—A blind pulley—Cope and Collinson, Sumner-row, Birmingham.
4933—March 2nd—Improved universal saw iron—W. Wright, Albion-street, Birmingham.
4934—March 5th—Lock plate shutter fastening—J. G. Stidder, 15, Hanover-street, Long-acre, W.C.
4935—March 6th—An improved metallic neck tie fastening—J. Hill, Harford-street, Birmingham.
4936—March 6th—A holder for gas lights and lamp shades and reflectors—L. Leoni, 34, St. Paul's-street, N.
4937—March 14th—Call bell—W. Tonks and Sons, Birmingham.
4938—March 18th—A fastening—E. Holt, Willenhall, Stafford.

Journal of the Society of Arts.

FRIDAY, MARCH 27, 1868.

Announcements by the Council.

Cantor Lectures.—Notice to Members.

Owing to unavoidable circumstances the last lecture of Dr. Crace Calvert's course will be delivered on TUESDAY, the 7th of April, instead of on Friday, the 3rd of April.

Artisans' Reports on the Paris Exhibition.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

April 1.—"How to make Railways remunerative to the Shareholders, beneficial to the Public, and profitable to the State." By Raphael Brandon, Esq.

April 8.—*Passion Week*. No Meeting.

April 15.—"On Liquid Fuel." By Benjamin H. Paul, Esq.

April 22.—"On the Cultivation of Beetroot, and its Manufacture into Sugar." By W. A. Gibbs, Esq.

Cantor Lectures.

The following is the syllabus of a course of four lectures "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," now being delivered by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture III.—Friday, March 27.

Chlorine and its Compounds with Oxygen.—*Chlorate of Potash*—Its manufacture and remarkable properties. *Hydrochloric acid*, or spirit of salt—Its production and applications in Arts and Manufactures, viz., galvanizing of iron, sal ammoniac, chloride of tin, &c. Illustrations.

Lecture IV.—Tuesday, April 7.

The Conversion of Chloride of Sodium into Carbonate of Soda.—The decomposition of common salt into hydrochloric acid and *sulphate of soda*, Glauber's salt; the transformation of this compound into *soda ash*, *soda crystals*, and *bicarbonate of soda*, Ballard's process; and the important and recent discovery of the utilisation of soda waste, &c. Illustrations.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

Albert Medal.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

Institutions.

The following Institutions have been received into Union since the last announcement:—

Gloucester, Free Library Institute.
Oldham, Gladwick and Analytical Institute.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Saturday, March 14. Present—Benjamin Shaw, Esq., Chairman, Capt. Grant, Harry Chester, Esq., and G. F. Wilson, Esq., F.R.S.

Mr. John A. Blake, M.P. for Waterford, attended to give information on the sea fisheries of Ireland.

Mr. Blake—Perhaps you may anticipate that my statement would be a lengthened one as to the existence

of fish in the Irish seas, but I can dispose of that in less than five minutes; and it may be interesting, because the facts have been disputed by some parties. With respect to the point that the coast of Ireland is not adequately fished, I would submit to the consideration of the Committee one or two facts:—In 1846 the number of vessels and boats employed in fishing upon the Irish coast amounted to 19,883; the number of men and boys engaged in the same year was 113,073. In the year 1866 the number of vessels and boats engaged was 9,444, showing a decrease in 20 years of 10,439; and the number of men and boys in the trade was 40,663, showing a decrease in 20 years of 72,410. The time when the numbers amounted to the highest figures was immediately prior to the disastrous famine of 1848; and I could produce the highest authorities to show that in the opinion of those most competent to judge, the Irish coast, if properly fished at that time would have given full occupation to twice the numbers then employed. The Repeal Association of that day took a great deal of trouble to point out what the food resources of Ireland were, and very able essays were written, the truth of which was universally assented to, showing that the coast of Ireland was not a quarter fished. Assuming that to be so, it follows that it is not one-eighth fished at present. The decrease is mainly owing to the effects of the famine of 1848. No class suffered so much at that time as the Irish fishermen. Most of them held little patches of land, the produce of which was destroyed. People had not money to buy fish, and a change took place in their diet by the introduction of Indian meal in the place of potatoes. It was found that the use of Indian meal with fish produced dysentery, and this further checked the consumption. Numbers of the fishermen emigrated, and many went to the workhouse, and several died. At the present time there are the remains of fishing boats rotting on the beach round the coast, the owners having been unable at that disastrous time to keep their boats and gear in order, and many have never since resumed their occupation. There can be no doubt whatever that the Irish oyster fisheries are capable of enormous extension. I venture to say that they might be increased to the extent of a million sterling, and give an enormous amount of employment. The following are the figures as to the amount of fish caught in Ireland:—The whole amount of sea fish, exclusive of oysters, is £335,000, and the amount of oysters is about £45,000; and that is not sufficient to supply London for one month. I took a great deal of trouble to discover what is the amount of fish actually consumed in London, and had some difficulty in doing so. I wrote to the head official at Billingsgate, who could give me no information, nor could Mr. Francis Francis. I was thrown on my own resources, and after considerable research I arrived at the conclusion that in the whole of the metropolis £5,000,000 worth of fish is consumed in the year, 800,000,000 of oysters alone. Ireland exports very little fish at present. In fact, nearly £150,000 worth of foreign caught fish is consumed there annually. £80,000 worth is sent there annually from Scotland, and large supplies also come from Newfoundland and Norway, principally herrings and cod fish. Formerly, as is shown by my pamphlet, Ireland was a large fish exporting country. The fishermen of England and Scotland preferred coming to the Irish coast to fish, instead of their own. The Dutch at one period paid Charles I. £30,000 for the privilege of fishing off the Irish coast, and they continued doing so until the time of Oliver Cromwell, who drove them off. In 1556 the King of Spain paid £1,000 a year to the English Government for the same privilege, and in the same way England drew a large revenue by granting licenses to the French, Dutch, Swedes, Spanish, and other fishermen. At the time of the Commonwealth various petitions were presented, stating that the Irish interfered with the English fishermen, and that they fished with more success, and so forth, and, in consequence, by the Act of Transplantation, the Irish fishermen were nearly annihilated. Cromwell drafted many of them off into Connaught, and he actually transported and sold several cargoes of fishermen to Barbadoes. A great many Scotch and Cornish fishing boats still frequent the coast; sometimes there is a fleet of 200 sail, especially off the east coast, near Howth. There is a very famous bank near Waterford, called the Nymph Bank, where there is a large amount of flat fish, such as turbot and sole. Great efforts were made, and a company was formed shortly after the Union for the purpose of fishing; but when the Company's Bill came to a second reading, several fishing communities in England petitioned against it, representing the great injury they would suffer, and it was lost by a majority of one. I might multiply instances to show that there is as much fish in Ireland now as at any time, although the fishermen have so greatly decreased in numbers. I state most confidently that, taking the matter at a very low estimate, the supply of food to the kingdom might be increased by £2,000,000 at least from Ireland, and that by means which seem so very small compared with the result that it is a subject of astonishment they have not already been adopted by the Government. For several years I have been so impressed with the importance of this subject that I have brought it repeatedly before the House of Commons; but I was unsuccessful until last year, when I obtained the appointment of a Select Committee upon the subject. The rule in such cases is for the Government to nominate half the committee, and the member who obtains it to nominate the remainder. The gentlemen whom I named were not all favourable to my views, as I wished to win them over by the witnesses who would be produced. A great many of the gentlemen appointed by the Treasury were not anxious that the means I suggested for the resuscitation of the Irish fisheries should be adopted, but, as I understood, agreed with the views of the Treasury. However, the committee sat a considerable time, and examined a number of important witnesses, and, after two months' investigation, they came to conclusions entirely carrying out the suggestions which for a number of years I had offered. The list of the committee is given in my pamphlet; and in their report they say that the points they considered were—1st, the condition of the sea fisheries; 2nd, whether the restrictions imposed on particular modes of fishing were advisable; 3rd, whether the fisheries admitted of a greater development; 4th, whether the State could judiciously assist in developing the fisheries; 5th, the expediency of framing regulations to facilitate the making of agreements between the owners of fishing craft and crews; 6th, of vesting the chief authority, with regard to the fisheries, in the Lord Lieutenant, and placing the general control and superintendance under a special board; 7th, of consolidating the several statutes relating to the fisheries. One matter, which it was considered had considerably tended to prevent the due development of the fisheries, was the restrictions imposed upon a particular mode of catching. For instance, in every bay and estuary where trawling could be carried on restrictions had been imposed upon it; these restrictions were imposed at the instance of the line fishermen by the Board of Works, who, unfortunately, acquiesced in their views.

The Chairman—Are those restrictions different from those in force in England?

Mr. Blake—There never were any such restrictions in England. The Fisheries Commission was appointed for the purpose of considering whether they were desirable, and they were reported against. Similar restrictions existed in Scotland, but a bill was brought in last year for the purpose of removing them altogether. In Ireland, wherever trawling could be successfully carried on in bays, these restrictions exist, and that prevents the catching and supplying to the consumer of large quantities of fish. At certain periods large shoals of fish come into the bays and estuaries for shelter, and there they might be cap-

tured, but in consequence of these restrictions they are not, and after a certain time they go off again, and are lost. The idea was that fish deposited their spawn in the shallow waters of bays and estuaries, but that is by no means certain: it is not known where the spawn is deposited. But even if they did deposit their spawn in the shallow waters, it would be in situations where the trawl would not affect them. The Committee were of opinion that it was by no means proved that these restrictions were expedient, and recommended the total abolition of all restrictions on sea fishing, leaving to a future board, to be appointed, to determine by experience whether it was desirable to re-enact these restrictions with respect to trawling. The Committee also recommended a better superintendence and inspection of the fisheries, which at present is very inadequate. Upon the third head the Committee were very strongly in favour of the policy of aiding the fishermen by loans. It has been proved by experience that this system has had a very beneficial effect in Ireland. As I have already said, many fishermen have been obliged to give up their occupation through want of means to carry it on. There is a society called "The Society for Bettering the Condition of the Poor in Ireland," whose funds at command perhaps amount to £30,000. They have devoted about £20,000 of that to the purpose of aiding fishermen to procure boats, gear, &c.; and during a period of many years that they have been in operation, they have done an immense deal of good to a vast number of fishermen, and they have never lost a shilling, the amounts lent always being faithfully returned to them. The Society of Friends, in Ireland, has also, on certain occasions, lent money to the fishermen for the same purposes, and it has always been repaid. Miss Burdett Coutts had greatly assisted the fishermen on the island of Cape Clear, but in her case the money was given as a gift.

Mr. CHESTER—Were the advances made originally as loans, and then turned into gifts?

Mr. BLAKE—No, they were made as gifts in the first instance. The gifts were turned to the best account, and enabled a number of men, who were completely stricken down by poverty, to make a fresh start, and they are now in a very comfortable position. We recommended to assist in resuscitating the fisheries by aid of that kind. In the first place we recommended that the sum of £10,000 should be given for the purpose of loans, to aid in the establishment of curing-houses round the coast. The fishermen often go to sea and bring home a quantity of fish, and after supplying the immediate wants of the neighbourhood, what remains is a drug; it often becomes useless, and sometimes has to be sold for manure. If curing-houses were established the surplus fish would be disposed of, and a ready sale could be obtained for it at times when fresh fish was scarce. We considered that if Government offered to lend half the required amount on good security, it would lead to the establishment of such a number of curing-houses round the coast as would supply the great want that exists in this particular; and fishermen would then go more confidently to sea, knowing that if they could not sell the whole of their fish fresh it would not be wasted. We also recommended that the State should lend, in the same manner as the Society for Improving the Condition of the Poor, a sum of £50,000, not all at once, but extending over a series of years, say £10,000 a year, until the whole was expended, and that that should be kept revolving, as it were. In no instance should anything be given as a free gift, and nothing should be lent except on good security; the person borrowing giving his own security, that of his boat, and of two approved sureties. That would be advantageous in this way—the man would feel that he had to repay the loan, which would be a stimulus to his exertions; and his two sureties would also keep an eye upon him, to see that he did not flag in his industry. We all came to the conclusion that the chief means, at all events, by which the fisheries could be resuscitated would be a system of loans of this kind.

Captain GRANT—Are you aware that very great opposition was offered to English fishermen when they went to Ireland to fish, and that acts of violence were committed by the fishermen, in some cases almost amounting to murder?

Mr. BLAKE—The opposition was not against the Englishmen as Englishmen, but against trawling. So far from having a prejudice against Englishmen and others coming to fish there, the Scotch, I may say, go there in great numbers, and are always very well treated; sometimes they have 200 or 300 vessels there, on the east coast. But, if Irishmen went there with trawls they would be treated quite as badly as the Englishmen you refer to. Several English companies have been formed for fishing—some on my own coast, near Waterford, and the Irish have never shown any prejudice against them as Englishmen; their prejudice is simply against trawling. We consider that Ireland has fair claim to these loans, inasmuch as Scotland has received, since the union, a million and a quarter more for the development of her fisheries than Ireland has; and Scotland now receives £15,000 a year for her fisheries, and has a numerous staff of inspectors, whilst Ireland has only one. Giving the full benefit to everything which comes from the Consolidated Fund, Scotland receives between £8,000 and £10,000 a year more for the development of her fisheries than Ireland does.

Mr. CHESTER—How is that money administered?

Mr. BLAKE—By the Scotch Fishery Board. There is a large unpaid board, consisting of noblemen and gentlemen, and they have a secretary and a numerous body of inspectors.

Mr. CHESTER—Allow me to ask you this question: without going into remote history, but reckoning, say, from the union, at the beginning of the century, during what period of ten years have the Irish fisheries been most flourishing?

Mr. BLAKE—In the year 1819, when an extensive system of bounties was introduced, there were 27 bounty vessels and 188 men engaged in the fisheries, and they received a bounty of £573. In 1822, three years later, the number of vessels had increased to 28,380, and the men to 44,892. In 1829, when the bounties were taken away, the trade fell off again considerably, but it subsequently revived again, and, I should say that from 1836 to 1846 was the most prosperous period, after they had recovered from the depression caused by taking away the bounties.

Mr. CHESTER—As a matter of fact the bounties seem to have greatly increased the Irish fisheries, but they arrived at their maximum sometime after the bounties were discontinued? You think, under present circumstances, a system of bounties is necessary for a certain time to revive them?

Mr. BLAKE—Not bounties; loans.

The CHAIRMAN—What analogies can you produce for such a system of loans? Here in England we have loans made by the Commissioners of Public Works, for the purpose of assisting in draining land, erecting farm buildings, and so on; but what is the nearest analogy you can give for a system of granting loans for the purchase of fishing-boats, nets, and gear?

Mr. BLAKE—I can only point to the great success that has attended the loan system, at the time of the bounties, which did more good than anything else. The Society for Bettering the Condition of the Poor in Ireland has always about £20,000 out in this way, and they have never lost a shilling. A large sum of money was raised in 1822, for the purpose of relieving the poor people in the famine times; this was the origin of the fund. The money was not given entirely for the fisheries, but for other objects also. I cannot offer any other analogy. Money is advanced for improving the land, but not for improving the fisheries. I contend that the sea offers as good a field for enterprise, and will yield even a better return than the land. Many fishermen would be able to obtain sufficient security to satisfy the Government, and thus it would tend considerably to

improve the condition of the coast population. I would not lend anyone money without good security. The system has already worked well on a small scale.

Q.—Was there not an occasion, some time ago, when boats were provided for the men, and they were too idle to use them? Did not something of that sort occur after the famine?

Mr. Blake—No; the Government advanced £5,000 for the establishment of curing-houses, and wherever they where put up, and the Government became the purchasers of the fish, the men were very industrious, and the Government made, in some instances, 40 per cent. by their dealings. They were then given up, on the supposition that they would be taken up by private individuals, but the country was so unsettled that this did not prove to be the case.

Mr. Chester—Under what arrangements is the fishing generally carried on? Does one man own a good many fishing-smacks, or does a single vessel belong to a good many owners?

Mr. Blake—Except on the east coast, where the herrings are caught in the greatest quantities, the fishing is mostly carried on by individual fishermen. Upon the east coast there are some few companies; that is to say, a fishing boat of 50 tons would be owned by the captain, and perhaps some people on shore may have a few shares in it. Mr. Good, of Dublin, the largest owner of fishing boats in Ireland, has 13 trawling vessels; and there are some two or three other owners of trawling vessels, but generally speaking, the fishing is carried on by small fishermen, and that is the only way in which it can be, on the whole, successfully carried on in Ireland. There is not one instance of a large fishing company being established which has not been a failure. The reason is this. Fishing, beyond everything else, requires the most careful supervision of the parties personally interested in the matter. Every spar, rope, and sail must be looked after with the greatest care, and unless a man has a personal interest in the concern he will not exercise that continual care.

Mr. Chester—Might not that be attained by the principal of co-operation; each man employed having a certain share in the boat and her earnings?

Mr. Blake—That would do very well with small companies, but where there is a large company, with directors, secretary, a manager, and all that, all drawing salaries out of the concern, and exercising insufficient superintendence, the result has always been a failure as far as experience has yet gone. I could name half a dozen companies which have been started from time to time, chiefly with English capital, and which have failed every one of them. The fishing can be carried on more successfully by individual fishermen, and one reason for that is the tempestuous character of the Irish coast. It is desirable that such fishermen should possess a little land, because there may be weeks together when they cannot go to sea at all. It is only the man who lives close to the coast who can tell by certain indications when he should go out; and then if he can stay out but a day or a few hours, he may catch some fish, and return, and he has his little bit of land to occupy him and keep him from the public-house when he cannot go to sea. If you have fishing boats owned by companies, you then have regular crews to man them, who have no other occupation; they would be very often in port a week or two at a time, unable to go out, and during that time they would give themselves up to drinking and idleness, and when the time came for fishing it might be difficult to get them together. There is a great want of harbours, especially on the western coast, and that is one of the reasons which prevent more persons engaging in fishing enterprise.

The Chairman—You said that on the east coast there were some small fishing companies. Is it not also the fact that, in spite of all these disadvantageous circumstances, there is a marked increase in the east coast fisheries, and does not that tend to show that that system works better than the other? Or to what do you attribute the fact that, whilst there is such great depression on the Galway coast, on the eastern coast, at Cork and Bandon, there is a large increase in the number of vessels engaged?

Mr. Blake—The east coast is much more frequented by the herrings than the other. Last year there were £150,000 worth of herrings taken upon the east coast.

The Chairman—That would not apply to Cork and Bandon. How is it that the east coast, and the Cork and Bandon fisheries, seem to be exempted from the operation of those causes which operate so prejudicially on the western coast?

Mr. Blake—The increase in the Cork and Kinsale fisheries was in the six years from 1861 to 1867, but that return includes the inland fisheries. Bandon is an inland place, and therefore there could not be sea fisheries there. There is a great deal of salmon which comes over the different railways, and is included in that return.

The Chairman—That would not apply to the whole of the east coast. How is it that the increase on the east coast has been so large—between Dublin and Drogheda from £842 to £1,314, and from Dublin to Wexford £1,080 to £2,565—more than double?

Mr. Blake—That return rather confuses you, because it includes the large increase which has taken place in the inland fisheries. To explain why the east coast appears so much better than the south and west is a matter which it is hardly worth while to go into.

The Chairman—It might be very important, because it might arise from a superiority of harbours, or from a superiority in the character of the people, or from a superiority in the fishing boats and gear, or from the partnership system.

Mr. Blake—Hitherto the greater part of the east coast fishing has been carried on by Cornish men and Scotchmen. Then the Society for Bettering the Condition of the Poor have made considerable advances to parties on the east coast, and, as I state in my pamphlet, the tonnage has increased there very considerably. As regards the Kinsale Company, that is a local company, and has, I believe, turned out pretty well. Then there has been a good deal of mackerel caught there of late, which has sent an immense quantity of fish over the Cork and Kinsale Railway. The east coast fishing has also been improved by the operations of the Society to which I have referred. Mr. Andrews, one of the witnesses examined, says: "At Howth most amazing results have been consequent through the application of the Society's funds. The Howth boats in 1862 numbered only four or five, manned by natives of the place, the boats being ill-formed and ill-adapted to cope with the superior equipment and skill of the Scotch and Cornish boats. In the year above mentioned the Society influenced some spirited individuals to embark largely in fishing, and by example and employment of the fishermen, have improved the means and condition of the latter, and secured to them some of the advantages which had for so many years been reaped by strangers. Now there is a fleet of vessels of a much superior class, owing, in a great degree, to the loans from the Society."

The Chairman—What induced them to give that aid especially to fishermen on the east coast; and if it answered so well there, why was it not extended to the west coast?

Mr. Blake—The society has only £30,000 at command for all purposes, of which the improvement of the fisheries is only one. It gives aid to flax-spinning and local manufactures, on a small scale, so that about £20,000 is the amount it can spare for the fisheries. It is the remains of a charitable fund raised for the relief of distress in 1822. They have lent the money principally to the east coast fishermen because, in their view, they got better security from them. They do not go about seeking people to take loans, but grant them to those who apply, and who can give good security. In the

county of Kerry, at Dingle, the fisheries have been raised from a very low condition to a prosperous one by means of these loans.

The CHAIRMAN—Do you think it likely that the system of loans would induce an improved system of fishing in Galway, or that the people would set themselves against the use of larger boats and better gear? I see the report of the Fishery Commissioners refers to the opposition of local fishermen in Galway to improved methods of fishing; and unless some security were taken for better appliances being used, it appears to me that very little good would be effected.

Mr. BLAKE—In speaking of Galway, I think you refer to a place called Claddagh, in the Bay of Galway; but Galway is a wide district. I believe the Commissioners refer especially to the opposition of these Claddagh fishermen.

The CHAIRMAN—They use the most wide terms, referring to the whole west and south coasts, and they speak of the severity of the weather, the depth of water, the want of shelter, and the opposition of local fishermen.

Mr. BLAKE—The improved method we are anxious to introduce is trawling. I propose to remove all restrictions from trawling, and if there is any opposition on the part of the fishermen it ought to be suppressed.

The CHAIRMAN—The prejudice against trawling is not confined to Irishmen. The Scotch also make the greatest possible opposition to trawling, and cry out that the fisheries will be destroyed if the system is not abolished.

Mr. BLAKE—It is in reality a struggle between two interests, the line fishermen and the trawlers. But the small fishermen use what is called a "pole-trawl" themselves.

The CHAIRMAN—That affects the question very materially upon a stormy coast. It is only by the introduction of larger vessels, which can hold the sea in tempestuous weather, that this great wealth of fish can be brought to light. The question is, what chance there is of introducing these larger vessels, and what security can be obtained on this point, before the loans are granted.

Mr. BLAKE—I think that would follow. If this system were adopted it would tend to the formation of small companies, which are the ones most likely to succeed. It would also help the poor man to set up his small boat, and he is the most important man of all, for the extent of trawling ground is very small compared to the large extent of coast where trawling cannot be carried on at all. If the fisheries are to be developed you must help these small, and, what you may think, insignificant men.

The CHAIRMAN—Do you think the Irish coast is worse than that at the north of Scotland; about the Hebrides, for instance, where fishing is carried on successfully?

Mr. BLAKE—I consider part of the west coast of Ireland the worst in the world. Those who have not seen it can form no idea of what it is like. There are not so many islets to break the force of the waves as about the Hebrides. The whole force of the Atlantic wave is expended on the shore. I have seen places where the waves swept away a small house some little distance in; and in some places there is a line of rocky coast or beach, half a mile in width, from the sea continually sweeping over it.

Mr. CHESTER—If Parliament established such a fund for granting loans, do you think it would be desirable or not to require the co-operation of some local body before any Government aid was afforded? To say, for instance, in Galway, if you raise a certain sum by local effort to be expended in this manner, we will back it with so much more—perhaps a larger sum. Would not that cultivate the local interest, and improve the security to the Imperial Government?

Mr. BLAKE—Your theory is very good, but there are many circumstances which would prevent its being carried out. I should say that the Government Inspector of Fisheries in Ireland, Mr. Barry, who is willing to give evidence here, is strongly in favour of loans. He is a very experienced officer; and a number of experienced witnesses who were examined before the Select Committee were all in favour of the plan, and of opinion that it could be successfully carried out.

The CHAIRMAN—We have no doubt as to the demand for fish, and that, practically speaking, any quantity can be consumed. The question is whether it can be brought to market. What presses on my mind is the question what guarantee have you that the existing prejudices can be overcome, so that the fishing can be carried on upon a large and substantial scale. Are the Cornish boats which come to the east coast better, or better found than the Irish boats?

Mr. BLAKE—Some of the Irish have as good boats as those. I would not grant the loans except on condition that good boats were introduced; and by having a larger staff of inspectors it could be easily carried out. The first thing to ascertain, when a man applied for a loan, would be that he could give good security, and then the condition should be imposed that the boat should be of an approved description.

Mr. CHESTER—In the same way as when loans are made in England for public improvements, drainage, and so forth, the Commissioners require the plans to be laid before them before a grant is made.

Mr. BLAKE—I would not make a grant unless I were satisfied that the fishing was to be carried on in the best possible manner.

The CHAIRMAN—As to the means of transport; if there is a large take of fish, what prospect is there of bringing it to a profitable market?

Mr. BLAKE—There are increased facilities now afforded by the railways, and there will be more as they become developed; but still, in certain places, especially on the west and northern coasts, there is no adequate means of reaching distant inland markets, and it is in such places that the establishment of curing houses would be of such value; so that after the immediate locality was supplied the remainder of the fish might be preserved for future use. The plans I suggest, including the appointment of additional inspectors, would cost, I believe, about £3,000 per annum, or about £2,000 annually more than is at present expended on the Irish fisheries. In speaking of good boats, the conditions of the locality must be considered, because in some places boats of 40 tons should be employed, whilst in others, a boat of 10 tons would be the right thing.

The CHAIRMAN—It appears to me that your plan embraces two objects; one to develope the fisheries of Ireland for the benefit of the United Kingdom; and the other a *quasi*-eleemosynary one of assisting a certain class of Irish fishermen. It might be, might it not, that to advance the second object it might be very desirable to encourage the use of a small class of boats, whilst such a thing would be very undesirable looking only to the first, and to that end only the best methods of fishing should be encouraged.

Mr. BLAKE—The first great thing is to remove the restrictions which now exist, and then, I think, will follow the formation of small companies for working the fishery in that way, with boats of 40 or 50 tons, costing, say, £500. If government would advance half that sum on the security of the boats and the persons connected with them, I think these companies would soon spring up.

The CHAIRMAN—You think the boats would be worked by part-ownership, and not by a system of each man having his own little boat, which, it seems to me, would be fatal to any chance of improvement.

Mr. BLAKE—There I differ with you. There is a vast amount of coast which can only be fished in that way, by small fishermen living on the coast, and having a bit of land to attend to when they cannot go out. A man like that would go out and catch his fish, and be driven in again by the weather before a larger boat could come from the nearest harbour. I am quite satisfied that in order properly to develope the fisheries of Ireland you must en-

courage this class of men. I think one inspector, as at present, with a well-qualified assistant, might do a good deal, so as to try the plan on a small scale at first. The success of it, however, has been already proved by what has been done by the society I have before mentioned. The expenditure of £5,000 or £10,000 a year for a few years seems almost ridiculous when you propose to benefit, not only the fishermen on the coast, but the coast population. I have no doubt that a good deal of fish would go to England from the west coast; there is very good railway accommodation from Galway to Dublin. There is room for an immense development of the trade on the east coast. The Nymph Bank is about 50 miles long, some miles in width, and there is room there for twenty times as many boats as now go there. I think there would be a good margin of profit left on the sale of the fish if the trade were properly conducted.

The Chairman—I am afraid that one great difficulty would be that the railways would not work well with the small fishermen, because the take would be inconsiderable and uncertain.

Mr. Blake—At Waterford, Howth, Kinsale, and other places I could name, there are small fishing companies, which get on very well. They have boats of from 30 to 50 tons, and find very profitable occupation for them. Large companies have been tried, but they do not answer. More money, probably, has been lost relatively in Irish fisheries than in anything else. This is owing to the expenses of management, and the want of a rigorous system of supervision and economy in the working. Mr. Good, of Dublin, who owns 13 vessels, is a rope and sail maker; and although he looks after the boats as well as he can himself, he cannot make more than 8 or 10 per cent. out of them. Sometime ago he started a few boats, not owned entirely by himself, but shared by a clever old Scotchman, who sees every boat go out and come in, and looks after the expenditure in every way very keenly. Out of these boats they make 2 or 3 per cent. more than out of the others.

Captain Grant—I do not see how men working singly can make a profitable occupation of the trade unless there is some one who will buy the whole of the fish when they come in, and send it off. They cannot send away the fish by rail themselves. In our fishing towns there are men ready to take the whole cargo at a certain fixed price per ton, and who take the risk and responsibility of disposing of the fish. Unless something of this kind could be secured in Ireland I don't think the fish would find a market.

Mr. Blake—In the larger ports there are dealers who purchase the fish in that way; and there is a class of men, called "jolters," who travel about the country for the same purpose. They know as well as possible when and where there is likely to be a take of fish, and make their movements accordingly. The fisherman sends his family about to sell what fish they can in his immediate neighbourhood; and the jolters are always going about looking out for purchases. The fisherman could not always depend upon selling his fish in that way, and for that reason I advocate the establishment of curing houses, which I believe would pay well. I do not contemplate the fishermen themselves paying for the curing of the fish, but that persons, perhaps borrowing half the necessary capital from the government, would set up curing houses as a speculation; buying the fish from the fishermen and curing it. There would be no question of a demand for it. Ireland consumes £150,000 worth of foreign cured fish now, which shows what an opening there is; and some curing houses have been successful.

Mr. Chester—The points just raised seem to depend on the development of the trade; and the fact of these facilities for disposing of the fish, all of them requiring more or less capital, is no reason why they should not be called into existence as the trade becomes developed.

Mr. Blake—Precisely.

Mr. Chester—Is it your opinion that if there were a more efficient system of inspection (I do not say a word against the present inspector, but if he had more assistance), many of these difficulties which have been mentioned would be removed. If the inspectors were constantly going about pointing out what arrangements were expedient, and suggesting how difficulties should be overcome, as has been done in England, would not a great deal of good be accomplished? Lord Carlisle sent agricultural instructors about the country, and I do not see why fishing instructors should not be employed in the same way?

Mr. Blake—That would be very advantageous indeed, but it would not accomplish everything. Mr. Barry does all a man can do, but he is not enough.

Mr. Chester—Is there any uniform law regulating the fisheries in England, Ireland, and Scotland?

Mr. Blake—There is no law at all in England as to sea fisheries, nor any inspector. They do not even collect statistics. Anyone fishes who likes, and when and where he likes. In Scotland there is the Board I have mentioned, but there is no law at all for England or Wales. As far as the law goes, I think it would be a great advantage if there were no more restrictions in Ireland than in England.

The Chairman—My great difficulty is this:—There seems in Ireland a great disposition to till the land, and no doubt there is the same disposition to get as much as possible out of the sea; but I am afraid there is not enough of a commercial spirit to make the best of it when it is got, and that it will end with supplying the immediate neighbourhood, instead of sending the fish to England to supply the great centres of consumption.

Mr. Blake—In 1846, before the trade was almost annihilated by the famine, there was an immense deal sent to England. It was collected by the jolters, who were always going about with their horses and carts, and forwarded. Bacon and other produce is sent from Ireland in considerable quantities. The Board of Works have the power of making any bye-laws they please, and in every bay and estuary they have drawn a line from headland to headland, within which no trawling is allowed by vessels of a certain tonnage. Into these bays come immense shoals of fish, which cannot be captured by the small boats, and may not by the larger ones.

Mr. Chester—Is trawling only carried on in the bays and estuaries?

Mr. Blake—Oh, no; it is carried on in the deep sea, but in all the bays and estuaries, where it could be conducted most successfully, it is prohibited. In some bays it could not be done at all. There must be a peculiar bottom to allow of trawling.

The Chairman—Is it not a fact that Professor Huxley and others have declared that fishermen are entirely mistaken in supposing that trawling destroyed a large quantity of spawn, and that what the fishermen supposed to be spawn was not spawn at all?

Mr. Blake.—Yes; with the exception of the herring it is not known where any fish spawn.

The Chairman—As I understand, the evidence not only negatives the supposition that the spawn is destroyed by trawling, but is absolutely in favour of that process.

Mr. Blake—If the fish do spawn in the bays and estuaries it must be as the herring does, on rough bottoms, where the trawl would not work. I would remove all restrictions, but keep up a system of inspection for the sake of supplying information, and to superintend the laying out of the loans. I say—catch as much as you can, in season and out of season. Anything which man can do to catch fish does not amount to one-tenth of the extent to which they devour each other. Mr. Barry is in favour of the system of loans, and also another experienced officer.

The Chairman—In what stage is your bill?

Mr. Blake—Some few changes were introduced into it in accordance with the recommendations of the Committee, and the Government promised to consider it in

the recess, and I am now watching and waiting to see what they will do. I am afraid their hands are too full for them to do anything. Something considerable might be done in Ireland with oysters by artificial culture. The proposed convention with France would soon annihilate the best oyster beds, as it goes on the system of having no protection for the oysters in the breeding season. If you could give an increase of food to the country to the extent of £1,000,000 to £2,000,000 by a loan of £50,000 I think it would be a very judicious outlay, even if the amount of the loan were entirely lost.

The CHAIRMAN—Oyster fisheries must be conducted on a system of culture to a great extent. Do you deal with that in your bill?

Mr. BLAKE—To some extent. I would have oyster instructors, as there is an immense deal of ignorance on this subject. The ground that answers for breeding does not do for fattening, and *vice versâ*. It should be undertaken by companies or by individuals, as in France. By increasing the facilities for the ascent of salmon up the rivers in Ireland, the amount taken, which has gone down to £300,000 worth a year, might be increased to a million sterling, and I believe it might even be increased to two millions. I would have every river in the kingdom as free for the fish to pass as the high road is for passengers.

The CHAIRMAN—Do you propose loans to oyster companies, or merely powers to appropriate portions of mud for fattening, and so on?

Mr. BLAKE—That is all that is proposed by the bill. But I think loans would prove useful, too, in developing the oyster fisheries.

CANTOR LECTURES.

The second lecture of Dr. Crace Calvert's course, "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Art and Manufactures," was delivered on Friday evening, the 20th inst.

SIXTEENTH ORDINARY MEETING.

Wednesday, March 25th, 1868; Sir JOHN LUBBOCK, Bart., F,R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Drummond, Peter Robert, Perth.
Foster, George, Rochford, Essex.
Jeffery, Walter, 35, Eastgate-street, Gloucester.
Wilson, Edward, Hayes, Kent.

The following candidates were balloted for, and duly elected members of the Society:—

Phillips, John, Epsom.
Stewart, Captain the Hon. Randolph, 85, Eaton-sq., S.W.

The Paper read was—

HIPPOPHAGY: THE HORSE AS FOOD FOR MAN.

By A. S. BICKNELL, ESQ.

THE HISTORY OF HIPPOPHAGY IN ANCIENT TIMES.

The word Hippophagy, I need hardly say, is derived from the Greek ἵππος, a horse, and φάγω, I eat. Our dictionaries do not contain it, but nevertheless it is not new. Claudius Ptolemy in the second century called certain races who subsisted on horse-meat "Hippophagists."

The practice of eating horses existed in very early times. Herodotus (B.C. 484—408) tells us it was the custom of the Persians on their birthdays to furnish their tables more plentifully with meat than at other times. "The rich serve up oxen, horses, camels, and asses, roasted whole; but the poor use smaller animals." The Chinese, Tartars, Cossacks, and many Asiatic and African tribes still consider the flesh of horses a delicacy.

Virgil (B.C. 70—19) speaks of the fierce Gelonian or Scythian who drank milk thickened with the blood of horses; and Horace (B.C. 65—8) says, "I will visit the Briton inhospitable to strangers, and the Concanian (Spaniard or Thracian) delighting in the blood of horses." From which passages we may safely infer that if the Gelonian and the Concanian drank horse-blood they also consumed horse-flesh. Martial in the first century, Sidonius Apollinaris in the fifth, and many other writers of more or less eminence during the early Christian period, also bear testimony to the fact that hippophagy was commonly practised throughout Southern Europe and the East. The legend of the Centaurs arose from stories told of the Sarmatians and Thessalians, who lived and even slept on horseback, eating as their common food raw horse-meat and cheese made from horse-milk. Till the eighth century the horse was certainly considered fit for food; what, then, was the cause of an entire change of opinion in this respect? It is easily discovered in the following circumstances:—Between the years 731 and 741 St. Boniface, the apostle of Germany, complained to Pope Gregory III. that one of the chief obstacles to his success in converting the Germans arose from their attachment to the practice of sacrificing horses and Christian priests to idols, the special inducement to offer the former being the partiality of the people for the meat. He thought that if the horse could be brought into disrepute by a Papal censure it would be of much advantage to his mission. Gregory replied in these terms:—"You say that some eat the wild and very many the domestic horse. This, most holy brother, you must never allow to be done, but, with the assistance of Christ, prevent it by all means, and impose a suitable penance; for it is filthy and execrable." This prohibition, strong as it was, nevertheless failed in its object; for about ten years later St. Boniface complained to Gregory's successor, Zachary I., that the horse still stopped the way to the complete conversion of the heathen, and his Holiness thereupon added his interdict to that of Gregory. "Beavers," he said, "hares, and much more the wild horse, are to be avoided." Zachary seems to have taken a curious interest in cooking, for shortly afterwards jays, crows, and storks were forbidden by him; and in a letter to St. Boniface he says, "You ask me how long lard is to be kept before being eaten. The Fathers have ordained nothing on the subject, but the advice I myself give is that it should not be eaten till it has been smoke-dried or boiled over the fire." In the greater portion of Europe, however, these Papal interferences ultimately were effectual, and gradually, when the prohibition was forgotten, the meat, from being merely considered forbidden on religious grounds, came to be suspected as unwholesome and uneateable. Moreover, in the middle ages, when animals were generally numerous in proportion to the population, and food was plentiful, necessity did not indicate the advantage of employing the horse and ox otherwise than for those purposes to which they at first sight seemed by nature best adapted—the strong, lean, and active horse for draught, and the fat, sluggish ox for meat. Quite in our own day yet another cause for the aversion to horse-meat may be found in the sentimentalism engendered by the horse himself, which, by inducing many to proclaim him "the friend of man" and "our faithful servant," has invested him with a special protection.

In the far north, however, the sturdy Icelander defied the sovereign Pontiff. Neither the authority of Gregory, Zachary, nor even the command of the Apostles "to abstain from meat offered to idols, and from

blood," to which the missionaries pointed, could prevail against the strong attachment of these people to the customs of their forefathers. They were willing to be Christians, but insisted on remaining hippophagists, and in the year 1000 they triumphantly proclaimed that "all Icelanders should be baptised and adore the same God, continuing to expose babies and eat horse-flesh;" till at length the Popes, considering the case hopeless, yielded, and to this nation alone baptism was accorded with permission to eat the "execrable" food, a permission the Icelanders avail themselves of to the present day.

But even in Italy the meat was used long after the time of Zachary. At a council held in the year 787, under the presidency of Gregory, Bishop of Ostia, the faithful were exhorted in these words: "Many among you eat horses, which is not done by any Christians in the East. Avoid this." And in England, somewhat later, Egbert, Archbishop of York, told his flock that "horse-flesh was not prohibited, though many families would not buy it."

In 1629, a tragic event in the annals of Hippophagy occurred in France. A groom named Claude Guillon, was condemned to death and executed for having eaten part of a horse at Saint-Claude on a Saturday in Lent. As a contrast to which it is worth mentioning that on the 27th of February, 1848, the Parisian insurgents cut up, distributed, and ate a horse which fell dead on the pavement during the combat.

The History of Hippophagy in France.

Géraud, the distinguished physician, was the first who advocated the use of horse-flesh—or, as I propose henceforward to call it, *chevaline*—in France. In 1786, he demanded that the meat should be publicly sold, and told his countrymen a large supply of good provision was wasted. Huzard, whose authority is unimpeachable, tells us, that during six months in 1793-1794, "une partie de la viande consommée à Paris provenait de chevaux abattus, et il n'en résulta pas le moindre inconvenient, même pour ceux qui en firent un usage continuel. Quelques particuliers, il est vrai, ayant découvert l'origine de cette viande (qu'ils avaient prise, jusque-là, pour de la viande de bœuf) firent quelques plaintes qui furent consignées dans les procès-verbaux des commissaires de police; mais aucun ne parle de maladies ou même d'indispositions occasionnées par cette nourriture." In 1811, a commission, composed of Cadet, Pariset, and Parmentier, was appointed by the Board of Health, to consider the advantage of allowing horses to be used for food, and they unanimously recommended that the meat should be sold in special places, after being examined and certified as sound by capable inspectors. Parmentier, I may observe, was the minister who, with the assistance of Louis XVI., overcame the prejudice of two hundred years' standing entertained by the French against the potato, and though an octagenarian in 1811, had been placed on this commission on account of his celebrity and popularity. In 1813 Marc said—"Why do we abstain from an aliment as wholesome and savoury as any other meat, and which would be a great resource for armies?" The French Government, did not, however, feel strong enough to encounter the opposition which they knew a decree establishing chevaline as an article of food would provoke; and an anecdote told of an incident which happened a few years later well shows how inveterate the prejudice at that time was supposed to be. Richerand, the eminent surgeon, and Brillat-Savarin were dining together in Paris about the year 1825, when the latter related that a short time before he had been entertained at the house of a former officer of the Grand Army, who announced, after regaling his friends with excellent meat, dressed in various ways, that the dishes were all made of the flesh of a horse whom a recent accident had crippled for life; the host adding, that having acquired a taste for the meat during the campaign in Russia, and thinking it a pity so much excellent food should be wasted, he had for that reason ventured on this little experiment. "Et pourquoi," said Richerand to Brillat-Savarin, "n'avez vous pas ajouté cette anecdote à celles qui émaillent votre charmant petit livre?" "Docteur," replied Brillat-Savarin, "vous connaissez mieux que moi le préjugé qui retarde l'usage alimentaire de cette viande; préjugé que je n'étais pas assez fort pour oser attaquer; à vous, M. le Professeur, tirez le premier!" But in spite of this appeal Richerand declined to commence the attack, although his "Traité des Erreurs et Préjugés en Hygiène" afforded him an opportunity.

The first serious step to remove the prejudice against chevaline in France was taken, however, in 1825, when the Prefect of Police appointed a commission of six most celebrated and competent men to examine the question. Parent Duchâtelet presided over their deliberations, and their report, signed and approved by all in 1826, contained these memorable passages:—"Nous ne pouvons disconvenir que cette chair ne soit fort bonne et fort savoureuse; plusieurs membres de la commission en ont mangé, et ils n'ont pas trouvé qu'il existât entre elle et celle du bœuf une différence sensible." "Cette nourriture était très bonne et très recherchée dans les temps reculés. Elle n'a pas changé de nature, et elle convient autant aux estomacs de nos contemporains qu'à ceux de nos ancêtres." "Non pas seulement;" the report continues, "aux estomacs forts et robustes, mais encore aux malades et aux blessés ordinaires, dont elle répare les forces et consolide la convalescence." In short chevaline furnishes "des substances alimentaires saines abondantes et à vil prix." Yet the commission, so far from being composed of enthusiastic hippophagists, contained a majority of those who shared the popular prejudice.

At this time Larrey, a man of high renown among his countrymen, took the question up. As chief of the medical staff during the Russian campaign, his experience in military hospitals and on battle-fields probably exceeded that of any surgeon before or since, and his experiments rendered his opinion of the greatest value. Writing in 1827, he said—"J'ai fort souvent fait faire usage de la chair des chevaux avec le plus grand succès, aux soldats et aux blessés de nos armées. Dans quelques-unes de nos campagnes du Rhin, de la Catalogne, et des Alpes Maritimes, j'en ai fait donner en plusieurs circonstances à nos soldats; mais c'est surtout pendant le siége d'Alexandrie, en Egypte, qu'on a tiré de cette viande un parti extrêmement avantageux. Non seulement elle a conservé la vie aux troupes qui ont défendu cette ville, mais encore elle a puissamment concouru à la guérison et au rétablissement des malades et blessés que nous avions en grand nombre dans les hôpitaux. Elle a de même contribué à faire disparâitre une épidémie scorbutique qui s'était emparée de toute l'armée. On faisait journellement des distributions regulières de cette viande, et fort heureusement que le nombre des chevaux a suffi pour conduire l'armée jusqu'à l'époque de la capitulation. . . . . . Je fus le premier à faire tuer mes chevaux, et à manger de cette viande. Après la bataille d'Eslingen (1809), isolé dans l'île de Lobau, avec la majeure partie de l'armée Française et environ six milles blessés . . . je fis faire de la soupe avec la chair d'une assez grande quantité de chevaux dispersés dans cette île. . . . . Tous nos soldats trouvèrent cette viande et ce bouillon d'une très bonne qualité. Le Maréchal Masséna, commandant en chef des troupes, se trouva fort heureux de partager mon repas, et en parut fort satisfait. Ainsi l'expérience démontre que l'usage de la viande de cheval est très convenable pour la nourriture de l'homme." In remembrance of Larrey's soup on the island of Lobau, Masséna used afterwards to have horse-soup on his table in Paris, and Larrey was his guest.

Scarcely less important services to the cause of Hippophagy were rendered by the MM. Villeroy, who published a complete treatise on the whole subject in the "Memoirs of the Academy of Metz," 1830. Five years

later (1835) Parent-Duchâtelet, called the Howard of France, in conjunction with two coadjutors appointed by the Board of Health, presented a second report, confirming the views expressed in the first; and from that time to the present a host of Frenchmen, celebrated in science, medicine, and literature, one after the other, have recorded their opinion in favour of using horses for food, and have strongly denounced the prevailing prejudice. Among them may be mentioned Richard (Du Cantal), Guerrier de Dumast, Séguier, Amédée Latour, Dureau de la Malle, Pouchet, Auzias-Turenne, Orfila, St. Hilaire, Lavocat, Renault, Lortet, De Valmer, Barral, Montalembert, G. Decroix, Baron Cloquet, Dr. Blatin, and Milne Edwards. Lastly, if it be urged that the opinion of one practical gourmet, gastronomist, or cook be worth more than that of a dozen scientific men with undiscriminating palates, Chevet, the prince of *chefs*, declared in 1856 that "quant à la question de la qualité de la viande de cheval, elle est bonne à la nourriture de l'homme."

But contemporaneously with what may be termed the literary assault upon the prejudice in France, with such weapons as lectures, pamphlets, books, and reports, more convincing proofs of the soundness of hippophagist views were exhibited to the public. Horse-dinners were given throughout the country. M. Renault, director of the great veterinary school of Alfort, near Paris, set the example. On the 1st of December, 1855, he invited eleven professional men to dine on a paralytic horse twenty-three years old, and at the conclusion of the repast the company unanimously agreed that the soup was "supérieur, et qu'il est impossible d'en distinguer le goût du goût des consommés de bœuf;" that the boiled horse was "bon et très mangeable; and that the roast horse was so "exquis" that nothing could be "plus fin, plus délicat, ou plus tendre." A fortnight later M. Lavocat, professor of anatomy, gave a similar dinner at Toulouse with success, the horse being seventeen years old, and worth only seventeen francs. Immediately afterwards a dinner, organised by Dr. Munaret, the physiologist, took place at Lyons; and St. Hilaire repeatedly assembled private parties of friends to eat chevaline in his house at Paris. Chevet likewise aroused much curiosity in the capital in 1858 by a dinner given to sixteen literary and scientific gentlemen, and concerning which the editor of the *Constitutionnel* wrote in these terms:—"Le bouillon de cheval avait un petit goût de poule fort agréable; le filet rappelait le chevreuil; il y avait une terrine à nulle autre pareille. On y servait encore des petits pâtés à la moelle de cheval qui avaient un grand mérite." In Algiers, the Society of Medicine, on the 5th of July, 1861, passed resolutions in favour of establishing the sale of chevaline, and eighty of the principal inhabitants attended a grand banquet. Also about this time M. Decroix, at present first veterinary surgeon to the Guard of Paris, called in France the apostle of hippophagy, commenced the persevering efforts in the cause which, more than those of any living Frenchman, contributed to the success ultimately attained. Amongst other steps taken by him he offered to give 200 francs to any one opening a horse-restaurant, and 300 francs to whoever would open a horse-butcher's shop, and at the same time he distributed a series of admirable pamphlets on the *viande de cheval* adapted for all classes of readers. It was, indeed, time that an open sale should be permitted, unless a dangerous clandestine trade was to be connived at; for the Parisian poor, both aware of the excellence of the meat and attracted by its cheapness, were already selling and eating the new aliment, and, through the denunciation of an informer, four persons were imprisoned in 1864 for having substituted chevaline for beef.

It is, however, possible that even the energy of M. Decroix and the labours of St. Hilaire would have failed in attracting the notice of the Government had not another method been adopted. On the 6th of February, 1865, a magnificent banquet took place at the Grand Hotel, to which 129 of the most distinguished literary and scientific men at the time in Paris subscribed and came; including 24 physicians, 8 veterinary surgeons, 16 editors, and men of mark in all the learned professions. Three horses were eaten; one 11 years old, costing 35 francs; a second, 18 years old, costing 20 francs; and a third 22 years old, costing 40 francs; moreover, that it might not be said "La sauce fait manger le poisson," the animals were killed immediately after being bought, and when slaughtered were in such a state of extreme emaciation that the fat of all three did not even yield the quantity required to cook the dinner. The success attained being complete, and the public thereby prepared for an alteration in the law, M. Pietri, the Prefect, then felt justified in asking the Emperor's permission to sign a decree allowing horses to be sold for food. "Signez, M. le Préfet," humorously replied His Majesty, "c'est un pas vers la vie à bon marché."

Accordingly, on the 9th of June, 1866, a decree legalised the slaughter of horses in special abattoirs, and the sale of the meat for human food, with certain severe restrictions. To celebrate this victory the Parisians, on the 9th of July, 1866, gave a second grand banquet upon a still more splendid scale than that of 1865. No less than 180 visitors attended, and M. de Quatrefages, as on the former occasion, took the chair. It is, however, impossible for me to enumerate here the roll of distinguished names amongst this company. Suffice it to say that the literature, science, and art of France were adequately represented.

All impediments being now removed, a man named Antoine opened the first horse-butcher's shop in Paris, at 3, Place d'Italie, and his neighbour, a publican, started in business at the same time as horse-restaurateur, with the following advertisement on an immense cloth outside his house:—"Beefsteak et consommé de cheval. Bouillon et viande 20 centimes." He meant horse-steak, but the working classes sympathised with his literary difficulty and patronised his restaurant extensively notwithstanding. Since that period twenty-three shops have been established, and are at present (March, 1868) carrying on a brisk trade. Horse-restaurants, however, there are none; the difficulty being to meet with men possessed of sufficient capital who are willing to embark in a speculation which, while it would not be more profitable than that of an ordinary restaurant, would probably be a more precarious investment.

During the first twelve months 2,312 horses were eaten in Paris, and it is a remarkable fact that not one of the number, on the second inspection after death, proved to be in an unhealthy condition. Rollin and Co. are at present the largest purveyors of horses for food. In their stables sixty animals can be accommodated at once, and they have extensive pasturage land adjoining. By aid of a steam engine sausages are made by them which, at the last competition, were adjudged equal to those of Arles, and the very lean horses fit for this purpose are now termed "saucissons" while yet alive.

Thus eighty years elapsed since Géraud first declared that chevaline was good food for man, and it required thirty-one years of incessant agitation to obtain from the Government the authorisation of the sale in France. Yet probably no nation had learnt by more bitter experience the wholesomeness and the value of the meat which, on account of a mere prejudice, it annually wasted. At Genoa, in 1800, when Marshal Masséna was blockaded by the English and Austrians; at Hamburg, in 1813, when Davoust was attacked by the allies; at the siege of San Sebastian, in the same year; and in the retreat from Moscow, when scarcely a man would have returned alive had they not fed upon their horses—on all these occasions the French must have been compelled to admit that, even under the most disadvantageous circumstances, the food which saved them was neither repulsive nor injurious.

The History of Hippophagy in Other Countries.

Turning now from France we find that chevaline is used for food in no less than fifteen other States; the date of the legal decree authorising the sale in each being as follows:—

Iceland	always	Saxony	1847
Russia	always	Austria	,,
Denmark	1807	Belgium	,,
Wurtemburg	1841	Switzerland	1853
Bavaria..........	1842	Prussia	,,
Baden	1846	Norway	1855
Hanover	1847	Sweden..........	1855
Bohemia	,,		

The Icelanders alone, among European nations possessed of an historical antiquity, have never been deterred from hippophagy, and it has been practised among them continuously since the eighth century. As I have already mentioned, even the anathemas of the Supreme Pontiff were entirely disregarded.

In Denmark the people returned to the custom of their forefathers as long ago as 1807, and strange to say, the English were the cause of this step on their part, for during the siege of Copenhagen in that year, provisions were so scarce that the Danish Government had temporarily been obliged to authorise the sale of chevaline, and when peace ensued the inhabitants declined to abandon their newly-acquired delicacy. The Danish regulations are curious. After the veterinary inspector has examined an animal destined for food and certified it to be sound, he stamps a mark on each of the four hoofs, and when the carcass is cut up, one of these must remain attached to each quarter, thus affording buyers a sure guarantee of the soundness of the meat they purchase. In the Danish gaols the prisoners are fed upon chevaline, and it is sold boiled, roasted, salted, and as sausages.

The re-establishment of hippophagy in the German States is due to the Munich Society for the Protection of Animals. Committees organised banquets throughout the country, and the practical German mind heartily responded to the appeal. At Königsbaden, near Stuttgart, 150 persons dined together on the new meat in 1842, and no less than 200 at Detmold in 1847, in which latter year Hanover, which appropriately exhibits a white horse on its armorial bearings, issued many licenses for horse-abattoirs. At Vienna public opinion seems to be somewhat unstable, for in 1853 an *émeute* took place to prevent a dinner, while in 1854, 32,000 lbs. were sold in a fortnight, and it was estimated than 10,000 of the inhabitants eat no other meat. In 1863 the horses sold numbered 1,954. Berlin consumed 1,507 horses in 1865, and there were already five abattoirs in 1853.

Perhaps the most extensive hippophagist business in any country is carried on in Belgium. In Ghent the manufacture of sausages—first called Boulogne, and then Bologna—employs many workmen, and at Vilvorde, near Brussels, the meat of all animals, including the horse, is sold in the same shops. I may mention, that there are two systems of sale practised on the Continent; that of Germany and France, where chevaline must be sold in a special shop; and that of Denmark and Belgium, where it is vended by the ordinary butchers. I think the former is the better plan, unless the Danish custom of marking the hoofs is enforced.

I believe the only European countries where horses are not used for food with the open sanction of the law, are Holland, Portugal, Turkey, Greece, Spain, Italy, and the United Kingdom. Concerning the four first I have no information, but in Spain, horses killed in bull-fights were eaten till quite recently, and during the Peninsular war the Spaniards commonly were hippophagists. The southern Italians, also, in several districts, preserve strips of the meat by drying them in the sun.

Among the civilised nations of the world there now remains but one great country where either prejudice is so strong or ignorance so great that the flesh of the horse is looked upon as carrion and excites disgust. Are we, however, to assume, that because we shudder at the idea of such food, it is never eaten by us? May not the wish be father to the thought? Without questioning the genuineness of various kinds of foreign sausages, tongues, pies, and preserved meats, which we consume in large quantities, it is at least somewhat startling to find that every week in London alone, about 200,000 lbs. of chevaline free from bone dissappears; and by no means reassuring to know that the quantity bought by purveyors to the feline and canine species does not correspond to the total somehow disposed of. Where does the meat go? It is not sent out of town, and none is thrown away, for no distinction is made between the meat of sound and diseased animals. The Zoological Gardens use on an average 2,361 lbs. a week, an imperceptible fraction of the quantity missing. Moreover, it would be strange in itself if among the large number of poor in our metropolis hunger had as yet disclosed to none the truth of Larrey's words, "that horseflesh is very good food to nourish man." If others are convinced that horses, both sound and unsound, are not used for food in England, while I congratulate them on their firm faith, based, however, on supposition only, I must, at the same time, candidly confess that my investigations and knowledge induce me to entertain an entirely different opinion.

The Characteristics of Chevaline.

There is no important difference between the meat of the horse and that of any other animal used for food. It contains the same salts almost in the same proportions, and the same chemical elements. There is nothing in the blood or the juices throughout the body of an unusual character. The chief distinction between chevaline and beef is that the former contains more of the nitrogenous substance called creatine, discovered in 1833 in beef-tea, than the latter. Liebig, speaking of this creatine, which is present in nearly all vertebrates, attributes to it a "great part in the vital action." He found that while 220 lbs. of chevaline contained two ounces and a third of creatine, there were only two ounces in the same weight of beef. The German physiologist, Moleschott, a high authority on such matters, agrees in opinion with Liebig, and other men of science have declared that the meat is richer than beef in "nutritious soluble azotes." Even the ancients seem to have had some suspicion of this fact, for Hippocrates, the Father of Medicine, who lived in the fifth century B.C., after saying beef is indigestible,, tells us "horseflesh is lighter." But whether, as Liebig affirms, there be an excess of creatine, or, as other chemists assert, an unusual quantity of nutritious soluble azotes, or only the "osmazome" spoken of by Larrey, it is clear that there is some mysterious substance present which is considered by all to add to the nourishing properties of the meat; and when, as has been shown, Larrey found it so admirably adapted to the cure of the sick and wounded, one finds it difficult to believe it can be unwholesome for others.

If an ordinary observer were to compare the same joints from a horse and an ox, he would scarcely detect any difference, except that the former was leaner. The horse, passing his life in a constant state of training, and his health being dependent on his enjoying continual exercise, cannot be fattened like a bullock and remain well. The little fat in him is also of a different nature, for though harder when raw, it melts at a temperature of about 70 degrees, and forms an oil which, when strained, is excellent for frying.

Chevaline strongly resembles beef; when fresh it is scarcely to be distinguished, but after a short time may be recognised by becoming darker. There is a slight difference in the scent, and a peculiar, but by no means unpleasant, taste after it is cooked, which cannot easily be described. Writers have compared it to game, chevreuil, and venison, though, for my part, I think the flavour depends much upon the

age of the animal, an old horse yielding meat with a more decided taste than a young one. When slices are cut with the grain they outwardly resemble hare, but when cut transversely they might readily be mistaken for fillet of beef. The inferior portions of an old horse are harder than those of a young ox, and I have no hesitation in admitting that all chevaline requires about one-sixth or occasionally even one-quarter longer cooking than beef. For soup no meat answers better; in fact, I think it superior to any other, notwithstanding that it will be found a little troublesome to remove the surface oil, which, unlike the grease in any ordinary *consommé*, does not cake when cold. My opinion is that the meat of an old horse, though not less wholesome, is less palatable than that of a prime four-year-old ox, but that the best parts of a young horse are superior to any beef; however, *de gustibus non disputandum*, and it really depends upon whether you prefer a rich tasteless food, or one of a drier and more marked character. It has been asserted that chevaline will keep an unusual length of time, but the opinions of those competent to judge are at issue on this point. In the experiments I have made, the horse has always been victorious over the ox; but I attach little importance to such trials, as, without incurring great expense, it is impossible to obtain meat from two animals which can fairly be compared.

The Objections to Hippophagy.

The principal objections made to the use of chevaline as food are seven in number:—

1. *That, on account of the value of a horse, only old or diseased animals would be killed.*—The first part of the objection, that the horses would be old, is only valid on the assumption that they are therefore worse, but I decline to allow that anyone has a right to assume on theory that which is abundantly disproved by fact. The flesh of a horse does not harden like that of a bullock. At all the horse-dinners, both in France and England, old animals have been eaten, and found sufficiently tender. I do not assert that the meat of an aged horse is equal to prime beef, but I do fearlessly say that an old horse is far better eating than an old ox, and that the meat is preferable to much of the beef one finds on private tables. M. Leblanc, of the Imperial Academy of Medicine, expresses the truth when he says, "Vieux bœuf, mauvaise viande; vieux cheval, bonne viande." My objectors always compare old chevaline with young beef, or the superiority of the former would be much more apparent. Neither is there any real advantage in meat being from a young animal; for, although whiter and more tender, it is far less nutritious, and that which is produced slowly and naturally is better for food than that which is formed by quick and artificial fattening. The average life of a horse extends to twelve years, consequently the horses which I used at the dinners on the 19th of December, 1867, and the 6th of February, 1868, being respectively 18, 20, 22, and 23 years old, had long passed the age at which we should expect to procure a supply for general consumption.

The force of the second part of the objection, that if the horses were not old we should at least be compelled to use those which were diseased, is not very clear. Why should we slaughter diseased horses more than diseased oxen? We inspect the latter—I fear in a very careless way—and I would inspect the former stringently. The diseases to which cattle are liable are quite as common as those peculiar to horses, and far more difficult to recognise, yet no one fears to eat meat on that account. In Paris it is actually safer to eat *viande de cheval* than any other animal food; for while beef, mutton, and pork, as in England, only pass through a very superficial inspection, the former is much more minutely looked after. Every horse destined for consumption is first examined by the Government veterinary inspector before being allowed to proceed to the abattoir; after death the carcass is again inspected, lest there should be internal disease; and finally no joint is allowed to pass the *octroi*, to be taken to the butcher's shop, unless accompanied by a certificate of its soundness.

The regulations in Paris are indeed unnecessarily severe, but they were purposely framed to meet the prejudices of the poor. If in England we are satisfied with the present inspection of our meat, there would be no ground of complaint that the precautions I should adopt would be insufficient.

I regret that I cannot now discuss the question of what results would be likely to ensue if, by accident, some diseased meat were consumed. Very much misapprehension prevails on the subject, but as the public mind is more accustomed to respect time-honoured convictions than to listen to scientific evidence when it is novel, I will only say at present that larvæ capable of development into tapeworm in man have never been discovered in chevaline.

2. *That chevaline, even when sound, is unwholesome, hard, and nasty.*—Concerning the wholesomeness of the meat, are not the opinions of Liebig, Larrey, Moleschott, Parent-Duchâtelet, Brillat-Savarin, Chevet, and Francatelli sufficient? Are there not at the present time tens of thousands of human beings in Europe, and millions throughout the world, who are both hippophagists and enjoying perfect health?

Nor has the hardness of the meat anything to do with its nutritive properties. If meat is hard when we eat it, the fault is our own. In no country is there such entire ignorance of the simplest rules of the culinary art as in England, and meat will often be tough as long as we do not understand how to make it tender.

That there is a saying, "*Dure comme du cheval,*" is no wonder, if we look at the circumstances in which chevaline has generally been eaten. A starving garrison perhaps at last resolves to kill their horses; and, with all their prejudices still in full vigour, they carry their purpose out. Then, with averted faces, and sick at heart, they satisfy their hunger on the spot. The most emaciated, and in every respect the worst, animals have been selected, neither rest nor time for fattening has been granted, and the meat, owing to the necessities of the case, has not even had the advantage of being hung a day or two. Would an ox be better than a horse under such conditions? Larrey relates that the soldiers in the retreat from Moscow knocked their chargers down, and ate them while the flesh was yet warm.

Chevaline, though of a firmer and more compact texture than beef or mutton, cannot be compared in this respect with pork; but neither this hardness so often spoken of, nor this closeness of grain, in any way affects the excellence of the meat, if it be kept and cooked a little longer. To those who, without experience, say it is nasty, I reply that by far the majority of those who have tasted it are of the opposite opinion.

3. *That there are so few horses we cannot afford to diminish our stock by eating them.*—England is better supplied with horses than most other countries where hippophagy is practised, and where no scarcity has resulted in consequence. Useless horses would diminish, and all those which die from accidents would be worth more money; but it is not to be supposed that the value of a horse for food would ever affect the price of sound animals required for draught. Whatever number were eaten, it is certain that for years it would not be a tenth part of those available, and therefore we need not fear. At present worn-out or injured horses are worth only 30s. to 50s.; whereas if sold for meat they would fetch £5.

4. *That butchers would be injured.*—On the contrary, their trade would be extended by the addition of a new branch. The more meat of all kinds sold the better for them. Moreover, chevaline would only supplement, not supplant, the provision we already have. The less noted among the veterinary surgeons and the knackers would, however, lose; the former because when horses were better treated there would be fewer requiring their care; and the latter because a considerable portion of the

animals now killed by them would then go to the butcher. In France the veterinary surgeons, to their honour be it said, were for humanity's sake foremost among the prime movers in obtaining the decree of 1866. It would no doubt be better if the change caused loss to no one; but any innovation which benefits the mass must always be a misfortune to the few, and though we may deplore the fact, nevertheless private interests must yield to those of the public.

5. *Objection on the ground of religion.*—We are told that the passage in Deuteronomy xix. 3—8, forbids our eating horses because they do not divide the hoof. Let us be honest, and apply the text fairly. We are there commanded to eat the goat, the pygarg, and the chamois, and are prohibited from eating the hare, the coney, swine, and all fish that have no scales. Do we carry this out in practice? Hams made from the claw-footed bear, which does not chew the cud, are sought as delicacies, and Deuteronomy is forgotten.

I regret to be obliged to answer objections of this nature; but if a Scripture warrant for eating whatever butchers will sell is required, it is easily found in the words of St. Paul—"Whatsoever is sold in the shambles, that eat, asking no questions for conscience' sake" (1 Corinthians x. 25); or in the admonition to Peter (Acts x. 13—15). The advantage, however, or the disadvantage, of eating horses, is a question to be determined by evidence and common-sense, and not one which can be settled by perverting texts of the Old Testament.

6. *Sentimental objection.*—That the horse is a "noble animal"—"the friend of man"—"our faithful servant"—and consequently that it is cannibalic to eat him. Yet no one raises his voice in favour of sheep who give us wool, or oxen that work for us in the fields. If we may not kill an animal for food when he is possessed of more than a certain amount of intelligence, what punishment ought not to be inflicted on those cruel tribes and still more cruel sportsmen who hunt the elephant and stew the monkey? Larks are commonly 2s. 6d. per dozen, and as an adjunct to our national supply of food can be of little value; but no one remembers their musical genius as a plea to spare them. But even from another point of view—that of humanity, killing horses for food may be advocated. Some will smile at the idea of kinder treatment of horses consisting in slaughtering them, but after a little reflection it will not appear so absurd. With the exception of a few pet animals who are cared for by their masters to the end of their lives, horses pass from one step of degration and misery to another, till they either fall dead upon the road, or are killed by the knacker for dogs and cats. We are apt to think of the "noble animal" as he is in his prime, and we do not recognise our "faithful servant" in the jaded beast covered with sores and wounds that slaves in a night-cab or wearily tries to drag a dust-cart. Let horses when they are past work have a brief rest before they die, treat them as if they were worth somthing, not as living carrion, and the interest of master and servant will be identical. When a horse will fetch £5 for food there will be an object in preserving him in health and good condition, and if we finally bestow upon him a sudden and painless death, we shall be rendering him a better service than by sentimentally calling him "the friend of man," while we are consigning him to every species of torture and lingering agony. All the societies for the protection of animals save our own have been in favour of hippophagy; "justice and compassion" towards the "noble animal," they say, demands it. Some sentimentalists seriously urge that if chevaline were adopted for human food the poor dogs and cats would starve. Sad may that be, but better than listening to the cry of hungry children, or the wail of famine from the sick and poor. From those who feed poodles upon fricasseed chickens one may expect a short-sighted view of human as well as of equine distress, but it will not proceed from the sensible and educated.

7. *The national prejudice.*—This is in reality the root of all the objections. Divest your objector of his artificial reasons, and you have before you simply a man with a prejudice. It is often said to me that, whether right or wrong, at all events the prejudice is so strong that it cannot be overcome, which is precisely the same as saying people are so stupid that they cannot be taught. I know that

"On ne détruit pas si aisément
Le préjugé ni l'habitude,'

but I should be sorry to think so badly of my countrymen as to believe they are quite insensible to reason and to fact. Other prejudices have been overcome, and why cannot this one be conquered too? The potato, for two hundred years after its introduction in France, was considered poisonous; a medical man as late as 1772, said tea was "as bad as opium;" another warned people against coffee as a drug, "black and bitter as soot;" and the Highlanders and the poor of London long persisted in rejecting rice as dried maggots. It is strange, however, that there should be a prejudice against this meat in particular, for the horse is the cleanest of animals, herbivorous, graminivorous, and most dainty in his diet. We eat as delicacies pigs, ducks, eels, lobsters, crabs, prawns, shrimps, and fish of all kinds, any of which will feed upon the corpses from a wreck or putrid offal. In India bullocks may be seen devouring garbage like swine, and even in England they are far less fastidious than horses, yet the bare idea of eating the latter is intolerable. The real cause of this is easily detected. Before the mind's eye rises the figure of the itinerant vendor, with his half-boiled, jagged lumps, and you look away with an inward prayer that the human race may never come to this. Most of us are acquainted with the appearance of that food, but not so many have seen the refuse with which thousands of the poor are nourished, and they little dream that beef and mutton may look less tempting still. That the prejudice in England is strong I admit, and it is to be regretted that some of the papers exert their influence with the poor to make it even stronger; nevertheless, let us not despair—a prejudice is but a phantom after all; attack it boldly in front and it will fly.

The Advantages of Hippophagy.

Besides answering the seven preceding objections, it remains for me to show that certain advantages may reasonably be expected to ensue from the use of chevaline.

1. *The privations of the poor would be diminished.*—At present the poor get very little meat, and that little consists chiefly of scraps, for which they pay about 4d. a pound. On Christmas-eve I saw a heap of odds and ends sold in small quantities at that price, which was barely fit for human food, yet prejudice prevented the purchasers from accepting the excellent joints and steaks of fresh meat which I was willing to give them. I am not surprised, for some of those who should instruct the poor, encourage them in the idea that there is enough beef and mutton in the country for everybody, and that the greediness of the upper classes alone stands in the way of an equitable division. A newspaper which is a favourite among the lower orders said recently—"Whilst there is plenty of good, wholesome, savoury food in England for its hard-working inhabitants, it is shocking to think that even the suggestion should be ventured of making the English working-man a competitor for the horses' carrion with the knacker." The writer would not tell his readers that 23,000 of our population die annually from starvation; that the quantity of meat, including bone and fat, available per head for the inhabitants of the United Kingdom, is not two ounces a day; and that the supply being necessarily unevenly divided, the majority of the poor obtain far less; whereas seven ounces a day is the minimum quantity of animal food required in our country and climate to maintain a proper condition of physical and mental activity. I should like the poor to have

their daily meat as well as their daily bread, and not only good meat, but at a reasonable price. We should be no nearer getting cheap meat, I am constantly told, even in the event of chevaline being popularised as food, for it would soon be as dear as beef. The logical deduction, however, is surely this—that if one meat fetches as much in the market as the other it must be as good, and then why should it be wasted? Either equal prices will be accompanied by equal excellence, or inferior quality will go hand in hand with cheapness. Whenever the prejudice is overcome, and chevaline is acknowledged as wholesome and nutritious, the mouldy trimmings at 4d. per pound will go to the dogs and cats, and good fresh meat will be obtainable at 2½d. to 3d. per pound instead.

2. *Millions of pounds of meat would be available for human food which are now wasted.*—There are now about 1,500,000 horses in Great Britain. Of these one-twelfth, or 125,000, annually die. Each horse would yield about 300 lbs. of meat without bone, and consequently the 125,000 would produce 37,500,000 lbs. of meat yearly, or sufficient to feed 235,107 people all the year round on the full allowance of 7 ozs. a day each, or 822,874 on the present average consumed. It will be remarked immediately that I have deducted nothing for those animals which die of disease; and I have not, because it is impossible to estimate precisely what that allowance should be. St. Hilaire and the French authorities think one-fourth is ample to take off, and they fairly say that we must not base our calculation on the number of diseased horses found in the knackers' yards of great cities, nor even on the number in the country, for few but those which are wholly unfit for anything else are sent to the slaughterer, and the humane treatment which would be the consequence of an enhanced value of old horses would banish much of the disease at present existing. Let my hearer, however, deduct what he pleases. Though I agree with the French estimate myself, let others deduct half, or even three-quarters, if they are so minded; for if one-quarter only were fit for food, would it not be worth while to give the existing average of 2 ozs. of meat a day to 205,718 people who are now starving? Some say that, though we do not eat chevaline ourselves, it is not wasted. But to this I cannot assent. A thing is wasted when not applied to the highest purpose for which it is available.

3. *Horses would be better treated in their old age.*—The condition of an old horse at present is that of ever-increasing misery. After being well kept and cared for, as soon as his powers become enfeebled he is sold to a harsher master, who values him merely for the amount of work he is able to perform. The "noble animal" becomes a mere motive power, to be strained to the utmost till death stops the machine. From one step of degradation to another the horse descends, till at last "the friend of man" becomes an object from which we turn as painful to our sight, and as if he had been born in this deplorable condition, and had not become so by the cruelty of mankind. There is no inducement now to persuade the owners of worn-out horses to treat them kindly: they look on death as an enemy gradually approaching to steal their property, and by every violent means they goad their wretched animals to fresh exertion, that they may earn a little before they die. How much better would it be for the horse were his life somewhat shortened in exchange for good treatment to the end! If his dead body represented a moderate value for food, his master would strive to keep him in health, and have an object in saving him from needless suffering. Those who think of the "faithful servant," and would protect him by their sentimentalism from sharing the fate of the ox and sheep, build their conceptions on the image of favourites as they knew them, and they shut their eyes to the picture they present when discarded from their service.

4. *Horses would yield an important supply of food to armies on a campaign.*—In every expedition many horses are disabled by accident or the enemy, and I maintain that the meat of these would be far better for troops on a march than that of the exhausted oxen following in the rear. How often do we not hear of our soldiers living upon biscuit and preserved provisions, or undergoing the severest privations for want of animal food, and yet at the same time they are wasting thousands of pounds of fresh meat, which, as regards its nutritious properties, is even to be preferred to beef! In the Crimea what suffering could have been avoided had those in authority but had the courage to eat the dead horses instead of burying them! Two French divisions, however, were wiser than ourselves, and were rewarded by health and strength accordingly. The others shared our prejudices and our starvation. I have heard it stated that animals killed suddenly without bleeding, as might happen from a shot, are unwholesome, but the assertion has no foundation in fact, for the only effect is that of rendering the meat a little darker. Whenever the authorities in the British army recognise the excellence of chevaline as food we shall hear no more of "horrible and heartrending" famine decimating our soldiers.

5. *Education will be advanced in England.*—The hope of enlightening those who live in the shadow of ignorance, and are wedded to a prejudice, is of itself sufficient reason for those to persevere who are at all able to assist in establishing the truth. It is indeed important that the poor should have more and better food, but scarcely less necessary that a great nation should judge all things dispassionately according to the weight of evidence adduced, and abstain from hazarding strong opinions as mere prejudice may prompt. Yet in England we see the curious spectacle of a whole people clinging obstinately to an antipathy for which there is no real cause, and declining either to examine for themselves or to admit the validity of the researches of others. On a recent occasion I explained this question to 1,000 English workmen, and offered to give them meat gratis as long as my supply lasted. Out of that 1,000 men seven applied to me. If chevaline were as uneatable and unwholesome as its worst opponents declare it to be, the position taken up by many would be no more defensible, for they do not know that the meat is bad, having never tried it themselves, and they can show no testimony to confirm their assertions. When they will listen to argument, and pass an honest judgment after actual experiment, they will be better entitled to differ if they please from all that the long catalogue of great men in Europe have proclaimed on this subject.

I regret that the limits of a paper will not permit me to state the results which have followed the agitation of this question in England since October, 1867. I can only say that the prejudice exists far more strongly among two classes than any others; first, among mercantile people, and, second, among mechanics earning six shillings a day. The former are possessed with an antipathy amounting almost to mania; and the latter owing to the counsels of certain cheap weekly papers, think they are being cheated by the rich, in order that they may secure all the beef for themselves. Professional men of every kind, excepting doctors and artists, have generally been willing to listen if not to taste; and the very poor—perhaps owing to their distress—have usually received with gratitude all the chevaline I could distribute.

On one point we should probably all agree—that meat, especially in temperate climates, is necessary for man, and that there is not enough for our present population. The difference of opinion is only on the means by which the quantity may be increased. To me it seems that there are four principal methods of attaining that result:—1. By increasing our live stock, working our fisheries more effectually, and importing more largely from abroad. 2. By procuring preserved meat from countries where cattle are in excess. 3. By acclimatising new animals. 4. By using chevaline. And the wisest course, I think, is to adopt all these plans, for even then we shall not have arrived at such prosperity as to be able to give every inhabitant of the United Kingdom daily

seven ounces of meat. I especially advocate the use of chevaline because it alone appears to be able to render immediate and important aid. Years would have to elapse before our cattle could be materially increased, even were the necessary capital forthcoming. Fish will not entirely supply the place of animal food; and imported meat, whether fresh or preserved, will never be cheap. Some time perhaps new species of animals may be acclimatised, but the one eland offered for sale at fifty guineas, last December, does not lead us to expect at present in that direction much food for the million.

In our horses, however, we have at hand, and ready for use, a supply of fresh meat equal to about $\frac{1}{47}$ of the whole quantity annually consumed in Great Britain; meat, moreover, which is not only wholesome but excellent, and which could be sold at less than half the price of beef. If I am asked how I propose to persuade people to lay aside their prejudices, and assist in obtaining a sale of this new article of food, I reply that we must first set an example to those below us in station by eating it ourselves, for we cannot expect the poor to eat that which we reject; and next we must endeavour to establish authorised slaughter-houses and strict inspection as at Paris. It is also much to be wished that the Society for the Protection of Animals—the only one in Europe, I repeat, that has not given its adhesion to hippophagy—would interest itself in the matter.

My desire is not to produce a new flavour for gourmets, even were chevaline delicate enough to earn for me their gratitude in this respect, but to aid, as far as I am able, in effecting these objects:—

1. That millions of pounds of good meat may not be wasted.
2. That the poor may have more and better food.
3. That horses may be more humanely treated in their old age.
4. That a national prejudice may be overcome, and education advanced—in short, I trust I may with modesty say that my wish is to do good.

An immense quantity of chevaline now passes for beef, and I should like to see it sold openly under its true name, and the purchasers protected by the safeguards of the law. I also desire that the poor of England may be better nourished as regards their bodies, better instructed as regards their minds. National prejudices should not exist in great countries, and it seems to me the duty of everybody to assist in putting them down.

The question is not whether chevaline is as good as beef or mutton—for the poor get little of either—nor whether it tastes like one thing or another—"with a far-away echo of game"—but whether it is fit or unfit for human food. "Why," in the words of a great man who laboured successfully in this cause, "should millions of pounds of excellent meat be wasted, when there are millions of men who cannot obtain it?"

Against this, as against all other innovations which run counter to established prejudices, ridicule and misrepresentation are freely used; but some will always judge dispassionately for themselves, and to those I say with confidence—test this meat fairly, and see whether you do not find it tolerable—nay, more, unexceptionable food. To-day many will laugh at the bare notion of feeding human beings upon horses, but does it not often happen that those who laugh at novelties to-day are the very first to bless them to-morrow?

DISCUSSION.

Mr. Botly said they were much obliged to any gentleman who brought forward anything which might afford a new supply of food. If there were any veterinary surgeon present, however, he should like to know whether what he understood Mr. Bicknell to say was correct—that glanders was not a contagious disease, for he knew a gentleman in Wiltshire who lost the whole of his horses through one glandered animal coming amongst them, and he also knew an instance where a human being had taken the disease and died?

Mr. Field (President of the Royal Veterinary College) thought the last speaker had rather misunderstood what Mr. Bicknell had said. There was no doubt as to glanders being highly contagious, and he had understood that Mr. Bicknell had not said the contrary; all he had asserted was that the flesh of a glandered horse, if eaten, would not be injurious.

Mr. S. Sidney said there could not be the least doubt, from what he knew previously, as well as from the evidence now adduced, that horseflesh was not unwholesome, but a food that could be resorted to if no other could be got. He had had experience in eating horse-meat, both before the recent agitation on the subject and since, when it was cooked in a simple manner. He did not think it was fair to introduce it dressed by a French cook, who could make an excellent dinner out of an old shoe. The whole question fell to the ground as regarded the working classes, if it were necessary that the meat should be treated in that way. The horse was inferior to the animals which were generally eaten, because it was an active animal; as long as the horse was worked as at present, and lived an active life, his flesh would not be so good as that of an ox or a sheep, which was well fed and never worked. The only object of introducing horse-meat would be as a matter of economy; but those who enjoyed an ordinary income were able to pay 7d., 8d., or even 10d. for their meat. He did not pay the slightest attention to the testimony of the numerous foreign witnesses who were brought forward in favour of eating horse. On the Continent they really did not know the difference between good meat and bad. The kind of beef they had in England came from an animal which never did any work in its life; which was all the summer in a nice grass field, and was then finished off in the winter with hay and roots, and perhaps a little cake. But the life of an ordinary beast on the Continent was very different; it worked hard, and its meat was consequently inferior. Therefore the Continentals being so learned in cookery, and so ignorant in meat, he did not think they were good authorities on the question. They must all sympathise with the philanthropic motives of a gentleman like Mr. Bicknell, who endeavoured to bring forward any plan of supplying more food to the labouring classes, but he entirely distrusted the figures which had been given of 23,000 persons having died of starvation. There was a workhouse in every parish, and more than one relieving officer, besides a large amount of private charity throughout the whole kingdom, and all he would say was that if these persons died of starvation, it must be because they refused to ask assistance. He did not believe in persons dying from starvation, unless in very exceptional cases. He thought that mechanics who earned 6d., 7d., or 8d. an hour would not eat horse-flesh as long as they could afford to buy beef and mutton. If they could not buy the high-priced pieces they were not confined to them, and he thought Mr. Bicknell had been rather unfortunate in the market he had gone to by his description of what was sold at 4d. per lb. At the East-end there was a large quantity of merino mutton, which would not do for a west-end club, but which, properly cooked, made very good food, and it was sold for a reasonable price. He quite agreed that our working classes were exceedingly ill-fed in a number of instances, but a great deal of that was owing to bad cooking. He would therefore suggest that if attention were paid to affording some instruction in the art of good cookery to the lower classes, a great deal of good might be accomplished.

Mr. W. L. Scott said he had supplied Mr. Bicknell with the figures with reference to the number of persons who died from starvation, and he wished to explain that he referred to those whose lives were shortened because they had not food enough. The remark as to the defective state of English cookery was very important; but still the fact remained, there was a certain number of animals, producing a certain number of pounds of meat, killed every year, and there was a certain number

imported; and even if all this were properly cooked, there was not enough animal food for the people. He had pursued some independent inquiries with regard to the question of using horsemeat for food, and he did not find the same difference as Mr. Bicknell had between the amount slaughtered and that accounted for. In round numbers, there were 1,300 cats' meat men, but who preferred to be called "carriers" in London, and their vocation was to feed something like 150,000 dogs, and 250,000 cats. He believed he was correct in saying that about 46,000 horses were annually slaughtered in London, many being brought up from the country on purpose by contract; the prices being from 15s. to 55s. each. Allowing 250 lbs. of dog's-meat to be produced from each horse, there would be about 11½ million lbs. as a total. On inquiry as to each carrier's daily average, he found that the total amount sold did not very largely differ from this. His analysis of horse-meat did not show the same amount of creatine as was given by Liebig; perhaps, however, Liebig had not taken the best quality of beef, and had very superior horse-meat to compare with it. He had taken ordinary beef, and as good horse as he could get, and the figures he got were 1·3 per cent. of creatine in beef, and not quite ·9 per cent. in horse-meat.

Mr. Hyde Clarke said he was not aware that there was any necessity for legalising the sale of horseflesh in Turkey, because there was no prohibition; nor was it the fact that the Turks would eat anything. There was in that country an inspector of markets in most towns, and likewise a legalised tariff, similar to the assize of bread which used to exist in England; that tariff only included beef and mutton, although other articles were sold. Buffalo and camel flesh were used to a considerable extent in some parts of Turkey, but he could not say whether this was the case with horseflesh, though it was certain there was no prohibition. He thought the advocates of this movement would comply more with the public taste if they spoke of horse-meat instead of horseflesh.

Mr. Kernaghan had heard that evening for the first time a discussion on this subject, and his opinion was that the reader of the paper had stated a great many arguments in favour of the use of horse-meat, but he had heard no arguments to the contrary. The question must resolve itself into this—Was horseflesh good for food or was it bad? If it was bad, by no means adopt it, but if it was good, he saw no reason why it should not be used. Mr. Sidney had referred to the excellence of the continental cookery, but that had nothing to do with the question, and he thought the tendency of that gentleman's observations was rather in favour of utilising this new kind of meat, because he said that by this mode of cookery it could be made available in a manner and to an extent to which it could not be made available by English cookery. That was simply a great reason why such a system of cookery should be encouraged, and why flesh which had not hitherto been utilised should be brought into use. It was admitted that the high price of ordinary meat put it out of the power of the labouring classes to use it, and he therefore thought that every exertion should be made by persons of influence to bring before the people of this country the fact that another description of food was in existence, which had not hitherto been brought into use, and if there really was no objection to it he thought it the duty of everyone to endeavour to remove the foolish prejudice which now existed on the subject.

Mr. Warriner could quite indorse what had been said by Mr. Bicknell, as to the quality of horse-meat. The first time he had tasted it was at Aldershot, where a 6-year old horse, to which an accident had happened, was killed and cooked, and the result was that the soldiers, to whom a portion was given in ignorance, did not discover the difference between it and their ordinary meat. He had also tasted it in Paris, and thought it very good. He there tasted also mule meat and donkey meat, and he gave the preference to the last. It would require a great deal of effort to break down the public prejudices in this matter. When he was sent to Ireland, at the time of the famine, at first they tried to feed the people on soup made from meat, but after the first week they were obliged to discontinue it, and substitute cereals, principally Indian meal, which was then introduced for the first time. This Indian meal had ever since remained a staple article of food, but that had only been accomplished by perseverance and good cooking. He thought the main thing wanting in England was improvement in cookery.

Mr. Kernaghan, asking permission to add a few words in explanation, said the Indian meal which had just been referred to was an instance in which prejudice had been overcome in the matter of food; and the same thing might take place with regard to horse-meat. To his own knowledge, when the Indian meal was poured into Ireland, in 1848, by tons, at a low price, persons preferred to die in the ditches rather than use it, and yet the prejudice was overcome, and it was now a staple article.

Mr. Edward Wilson said the evidence of all who had paid any attention to modifying the food of the people tended to strengthen the conviction that it was a very difficult matter to deal with, and that those who attempted such a great modification as was sought by Mr. Bicknell had entered upon a very arduous task indeed, and one which could only be accomplished by great patience and discretion. Instead of disputing as to the number of those who actually died of starvation, he thought they ought to consider the question of how far the bulk of the people were under-fed. They ought not to wait until a man dropped down dead from starvation before they tried to discover if something could not be done to improve the diet of the great bulk of the population, especially agricultural labourers. Having lived for many years in Australia, where the people were better fed than anywhere else, and where the labouring men had as much animal food as they liked, when he came back to England and saw what the people had to eat, he could not help being deeply struck with the great deficiency in animal food. They knew by statistical returns that there was not enough beef and mutton, pork, &c., to provide our artisans with animal diet, and therefore it was a matter of great interest when they were assured, on high authority, that there was a new article of flesh meat, which was wholesome, and might be made quite palatable. He thought they should look seriously at the question, and not turn aside from it too readily. There was a great deal of prejudice on the subject, which it would require very long and patient effort to break down. His own idea was that the more simple the preparation of the meat the better, and it was highly important that the nomenclature applied to the anatomy of the horse should be avoided as much as possible. He certainly should not feel his own appetite towards the meat at all increased if he found it presented, as it was at the Langham Hotel, described as "boiled withers." He did not think there would be any difficulty in giving a dinner of horse meat to a large number of men who were inclined to try it. The Crystal Palace might not assist them, and there might be difficulties with hotel keepers, but as summer came on they might hire a tent, where horse should be served up, and, by giving a little encouragement in the shape of beer, on condition of a certain quantity of the meat being eaten, he had no doubt a goodly number of diners would be attracted. He would also suggest, as another means of breaking down prejudice, that criminals in gaols, and people in workhouses, where the quantity of food was not over-abundant, should have the option of being supplied with horse meat on a larger scale than their ordinary diet, and, if it was wholesome and palatable, when they came out and mixed with their fellows, they would all be so many apostles of hippophagy.

Mr. Woodley said they had been told of the strict supervision which was exercised in France over the sale

of horseflesh, but if, as Mr. Bicknell stated, a French gentleman had partaken of animals which had died of all sorts of diseases without injury, that inspection appeared to be unnecessary.

Mr. HILTON thought the last speaker had rather misunderstood the paper on the subject of diseased meat. He believed that the inspectors' supervision of meat in England only referred to the meat itself after it was killed, and in that state—whether beef, mutton, or horse—inspection would be necessary, in order to see that it had not become putrid or bad by being kept too long or from being badly packed. That was a very different thing to inspecting the animal before it was killed to see whether it was diseased. It might be said that in cats' and dogs' meat we already had horseflesh in its simplest form; but this, he believed, was the root of all the prejudice on the subject. The first thing to do was to get over the peculiar appearance which it had when prepared in this form. If a horse was cut up in joints, all the offal being trimmed off, then the prejudice would be much more easily overcome. Mr. Kernaghan had given them a notable example of how prejudice in matters of food had been overcome, and he hoped the statement made as to the number who died annually of starvation would not be treated lightly. It was too much the custom to fancy that these statements were exaggerated, but it was only those who were in the habit of going into the poorest neighbourhoods who were aware of the immense amount of suffering produced by lack of sufficient nourishment. A large number of the poor died many years before their time from this cause, and, in a certain sense, they might be said literally to die of starvation. They were told there were relieving-officers, and so on; but that was always the cry—"We have got parochial officers and workhouses, and it is quite contrary to the regulations, and very wrong for people to die:" but they did die, nevertheless. Meat was now so dear that the moment a man was out of work, or if he died, it was impossible for the family to get even the smallest portion. Then, again, the matter might be regarded in another respect. A poor man who got his living with the aid of a horse, if the poor animal broke his leg, or any other accident happened to him, so that he had to be killed, his present value was only 30s.; but if the public prejudice could be overcome, there would be available 400 or 500 lbs. of good meat, which could be distributed at a great advantage to the community, and with great benefit to the poor owner, who would get £6 or £7 for the horse. In this way, instead of poor old horses being used up to the last, as they now were, when they began to get out of condition, they would be sent to some place where they would be fatted and got ready for the butcher.

The CHAIRMAN said he had tasted horse, and it appeared to him very excellent meat, indeed, as far as his taste went, quite equal to ordinary mutton. He was not speaking of *entrées* and delicately-cooked dishes, because he quite recognised the fact that it was impossible to judge of meat otherwise than in the plain form. It had been said that the meat must be tough, because of the work which a horse underwent, but there was a proverb as to the excellence for the table of a hunted hare, and if a hare that had been hunted was so good, he did not see why the horse that had hunted it should be so bad. Such questions, therefore, could not be settled by *à priori* reasoning, but only by experience, and as far as his own experience went it was favourable. There was no necessity for all to be agreed in this matter; if some liked horse, and some liked mutton, there was no reason why each should not follow his own taste; and they had no such great variety of solid plain meat that they need reject a new kind. By the discussion on this question he was reminded of a story which was current at the time penny papers were first introduced. It was said that an old woman went to a railway station and bought a copy of the *Daily Telegraph*, and when she had read it, she said she did not see that the penny papers were a bit better than the sixpenny ones. To some extent it was the same with this matter. It was not a question whether the meat was better than beef or mutton, but whether it was a solid, sound, and wholesome substitute for it. They had heard a good deal of the question of diseased meat, and some seemed to object to the topic having been introduced. He should have been disposed to agree with this view in an ordinary way, as, although the subject might be very interesting, it was somewhat unpleasant; but bearing in mind that Mr. Bicknell was addressing a learned society, he thought he was very well advised in having spoken in the way he had. Of course, if horse-meat were introduced it would be inspected as carefully as any other kind. It seemed to him that the best way to act in this matter was to establish a shop, as a means of introducing this meat, and he would be happy to assist Mr. Bicknell in establishing one where it might be retailed to those who were disposed to buy it. He did not think, if it were a good and wholesome food, as he himself had no doubt it was, that our artisans were so stupid that they would not adopt it, if it could be sold at a much cheaper price than any meat now placed before them. It was true they were prejudiced in the matter, but as that prejudice did not rest upon any solid basis, it would soon give way. The horse was a clean feeder, and there was really not a word to be said against the use of this food; the only thing was that it was something new, and to which people were unaccustomed. Not only in Europe, but in many other parts of the world, horse-meat was an important article of food. Perhaps savages were not very good judges, but, whatever their experience might be worth, it was decidedly in favour of this meat. On all these grounds he could not help thinking that now the matter had been discussed it would be soon introduced here as well as in other parts of Europe. On these questions, however, it was very little use arguing; everyone must judge for himself, and Mr. Bicknell would invite those se present to make this practical test in the lower room, and he thought that they would come to the conclusion that there was nothing objectionable in horse-meat.

Mr. BICKNELL said he would answer the objections *seriatim*, although some had been almost disposed of by the Chairman. As regarded catching disease from horses, it depended a great deal on the state of health of the person who came in contact with them. What he had meant to say with regard to glanders was, that it was not so contagious as was generally supposed, there being an idea that anyone who came in contact with a horse suffering from that disease would take it as a matter of course, but if that were the case, those who were in the habit of slaughtering horses would all have been dead, whereas no case of contagion had occurred in the largest establishment in London for the last 30 years. As regarded French cooking, at the large dinner at the Langham Hotel he had a plain joint which he thought was large enough, for it weighed 280 lbs., and many of the dishes were as plain as ordinary cooking could make them; but he did not think they could get 164 gentlemen to come and eat chops and steaks and pay a guinea and a-half for their dinner, and therefore elaborate cooking was naturally introduced on that occasion. He had always said that this meat was intended for the poor, and not as a new flavour for the rich; and, therefore, if it were slightly inferior to beef or mutton, that was no objection to it. It might be very good, although not equal to some other kinds of meat. The foreign witnesses who had been referred to he considered quite deserving of credit, and many of them had no better establishment for cooking than the ordinary workman of England. The gentleman who knew most about it had an old soldier's servant as cook. He had tried it himself in his own house in forty or fifty different ways, and there was no French cooking whatever required. When he said that 23,000 persons died of starvation annually, he did not mean, of course, that they had nothing at all to eat, but, as had been ex-

plained, that their lives were cut short by deficiency of food. It was said that mechanics would not buy horse-meat as long as they could buy beef or mutton, but the question was what they would do when they could not get beef or mutton. He did not think 4d. per lb., which he had quoted for the lowest class of meat, was exceptional, for he had visited other low neighbourhoods and found it the same, but he was told that occasionally it was sold off at 3d. late on Saturday night, in order to clear the shop. When he said the Turks would eat anything, he only spoke jestingly, and did not intend to depreciate their habits in the matter of provisions. Horseflesh had been referred to as an objectionable term, but he had used it because he thought introducing a new one would not be liked, or he should have adopted the more musical one of chevaline. Another gentleman said that if they began to eat horses there was no knowing where they would stop; they might come to guinea pigs. Now, guinea pigs were very good food; but he would not stop anywhere, but throw into consumption all that was wholesome as long as there was a deficiency in the food of the people. He had introduced the words "horse oil" into the *menu* in order to show that although the fat of the horse was not available for cooking in exactly the same way as that of other animals, still it could be applied in an equally useful and palatable manner. A large and cheap dinner for the working classes was still rather a difficult matter, on account of the enormous amount of work devolving on the person who got it up. There was even a difficulty at a first-rate hotel; and, therefore, he should require assistance before he undertook it. He should be very happy to receive names for this purpose, and was much obliged to Sir John Lubbock for his kind offer of aid in establishing a shop. The inspection in France was very complete; in the first place a veterinary surgeon examined the horse and gave him a pass to go to the *abattoir*, and when he was killed a *post-mortem* examination was made to see that there was no concealed disease, and eventually each joint sent out was certified and marked. The gentleman who had eaten all the diseased animals did so as a scientific experiment, having undertaken it at the time of the famine in Algeria, in the hope of doing good, and he now published his experience; but no one, he thought, would have supposed that this was anything but an experiment. If a horse were nicely cut up into joints he did not believe anyone would know it from beef. This was the first time he had mentioned the subject of diseased horses, but as people were always asking him about it, he thought it as well to show that even if by chance a diseased horse did get into consumption, no great harm would be done. There was in this respect one advantage in horse-meat, for the parasites which produced tapeworms did not exist in horses, although they had been discovered in beef and mutton; and a worse form of parasite, the trichina, had long been known to exist in pork. He would consider about opening a shop, but he was afraid he must wait for yet further assistance before embarking in the speculation. He had explained the subject thoroughly to a thousand men in a building yard, men above the average intellect, and offered them horse meat for nothing, but only seven came to ask for it. Among the very poor there was not quite so much prejudice, probably because of their greater necessity. It was beyond all question that the supply of meat was quite inadequate to the wants of the population, and therefore any new variety ought to be welcome.

The CHAIRMAN then proposed a vote of thanks to Mr. Bicknell, which was carried unanimously.

At the conclusion of the meeting, soup made from horse, roast joints, and sausages were served in the lower room and partaken of by those present. There was also a joint of donkey.

Mr. Wentworth L. Scott exhibited a specimen of *extractum carnis* made from horse-meat.

Proceedings of Institutions.

DEVONPORT MECHANICS' INSTITUTE.—An interesting lecture on "Ghosts and Apparitions" was delivered recently in the large hall of the above institute, by Joseph Simpson, Esq., of Newport Pagnell, Secretary of the College of Lecturers, and editor of the *Institute and Lecturers' Gazette*. The tendency of the lecture was to disabuse the mind of a belief in ghosts, apparitions, and kindred superstitions. It was listened to throughout with earnest attention by a large audience, whose applause clearly evidenced their appreciation of the lecturer's arguments. This was Mr. Simpson's seventh appearance as a lecturer before the members of the Devonport Mechanics' Institute.

Notes.

MONT CENIS TUNNEL.—During the months of January and February the progress made at the Mont Cenis tunnel was 202·25 metres, of which 130·30 metres was at the Bardonnèche, and 98·95 metres at the Modane end. Of this, the total advancement was 106·20 metres during the month of January, of which the progress at the Bardonnèche end was 54·30 metres, and 51·90 metres at Modane. In February, the total progress was 96·05 metres, of which 49 metres was at Bardonnèche, and 47.05 metres at Modane. The position of the tunnel up to the 1st of March, was as follows:—

	Metres.
South end, Bardonnèche	4·827·80
North end, Modane	3·221·10
Total length of tunnelling	8·048·90
Remaining to be done	4·171·10
Total length of tunnel	12·220·00

The following is the advancement and expenditure for each year since the commencement of this gigantic undertaking to the end of 1867. The expenditure for 1867 has not yet been published:—

Length of tunnel completed.

Date.	Bardonnèche.	Modane.	Total during year.	Total length.	Amount.
	Metres.	Metres.	Metres.	Metres.	Francs.
1857 } 1858 }	284·85	212·75	497·60	497·60	3·369·246
1859	236·35	132·75	369·10	866·70	1,630,753
1860	203·80	139·50	343·30	1,210·00	2,500,000
1861	170·00	193 00	363·00	1,573·00	3,000,000
1862	380·00	243·00	623·00	2,196·00	2,000,000
1863	426·00	376·00	802·00	2,998·00	3,500,000
1864	621·00	467·00	1,088·00	4,086·00	6,552,254
1865	765·30	458·40	1,223·70	5,309·70	5,502,738
1866	812.70	212 29	1,024·99	6,334·69	5,644,982
1867	824·50	687·46	1,511 96	7,846·65	—

The probable cost of the work was estimated at 70,000,000 francs (£2,800,000); of this amount 33,699,973 francs were expended up to the end of 1866.

Correspondence.

RAILWAYS AND ROLLING STOCK.—SIR,—In reading the paper on railways by Mr. Fairlie, published in your *Journal*, I find that he attributes to Mr. James Samuel the invention of the engines and carriages or steam carriages used on the Eastern Counties and elsewhere, commencing about the year 1848. If there be any value in matters of history, the history should at least be accurate,

and embody facts. Mr. Samuel was not the inventor of anything belonging to the plans; he was simply the user, and, as the resident engineer of the line, recommended them to his directors, and I am far from underrating the importance of recognition. But everything connected with plan or design, or mechanical operation, was produced at Fairfield Works, of which I was senior partner and mechanical manager. In the year 1850, I wrote a pamphlet, enlarging upon a previous article in the *Westminster Review*, in which the whole of the circumstances were recorded, and it was reviewed both in the *Times* and *Spectator* at length, and no doubt has ever been thrown on its accuracy from that time to this. I hand you a copy.* You will find therein stated all the principles involved in the disproportion of dead weight to paying weight treated at full length, as applicable to the present time, now as then. You will find, p. 13, Mr. Samuel's first application to the writer for a manumotive machine, which was constructed, and travelled at 18 miles per hour, but the beef-fed human engines struck work. Out of this grew the "Express," with $3\frac{1}{2}$ in. cylinders and 6 in. stroke. But the first practical recogniser of the system was Mr. Charles Hutton Gregory, consulting engineer to the Bristol and Exeter, and now President of the Civil Engineers' Institution, who recommended his directors to order a steam carriage called the "Fairfield," on six wheels, the drivers 4 ft. 6 in., cylinders 8 in. diameter, stroke 12 in., 58 passengers, working gradient of 1 in 87, and two loaded wagons; consumption of coke 8 lbs. per mile. This was on the Great Western gauge. The next steam carriage was ordered by the directors of the Eastern Counties Railway, and called the "Enfield." It was on six wheels, the same as the Fairfield; the driving-wheels were 5 ft. in diameter; passengers 84; but another carriage, 40ft. × 9ft., was attached as the traffic increased. The Enfield weighed, in working trim, 15 tons 7 cwt.; the consumption of coke while running was under 6 lbs. per mile, and the speed 37 miles per hour. The two next engines with connected trains were ordered by Mr. Nixon, the engineer to the Cork and Bandon. The next was the "Cambridge," coupled to the train, but with four separate wheels, as it was found a difficulty to put passenger carriages into the engineering shop when repairs were wanted. Subsequently to this Mr. Hemming, the Secretary to the Londonderry and Enniskillen Railway, ordered another, which was called the "Enniskillen." This engine had 9-inch cylinders, and 15-inch stroke. The tank was beneath the boiler, holding 350 gallons of water. A similar engine, called the "Resurgam," was furnished to the St. Helen's Railway Company, by order of the Secretary, Mr. Arthur Sinclair, and another, called the "Speranza," to an Italian line. Subsequently three "twin engines," called the Gemini, were constructed for the Enniskillen line, adapted to run either singly or coupled together, built by Messrs. Kitson, and so arranged that one driver and stoker could work the pair of engines, fire-box and piston together. An engine and coupled passenger and tender vehicle was also built by Messrs. Kitson, and shown in the Exhibition of 1851. The drawing of this engine is shown in the pamphlet "Road Progress." That in the Exhibition was called the "Ariel's Girdle." There was a peculiarity about the first engine built for actual working,—the "Fairfield." It was broad-gauge, with only one pair of driving wheels in front. I considered it dangerous to use a crank axle, and undesirable, as involving great weight; but with such a width of gauge outside cylinders were preposterous. I therefore used inside cylinders, applying their power to a separate crank shaft, technically called a "dummy," and then transferring the motion to crank pins on the driving-wheels. This was, I believe, the first time that such a plan was ever put in practice, and it was found to answer very well. The Enfield was, after a time, separated from the carriage for convenience in cleaning, and put upon four wheels, and in that condition became the directors' engine for several years, because she could travel as fast as any engine on the line, with much less lumber. Subsequently, one of the directors, having read somewhere that six-wheeled engines were safer than four, insisted upon another pair of wheels being applied, which was done; but I am not aware that the running facilities were improved by the extra dead load and extra friction of the wheel base. In the days of the commencement of this system I knew nothing of Mr. Fairlie. My first acquaintance with him was his wishing to put my light system before Colonel Kennedy, the engineer of the Bombay and Baroda, and he informed me that he had had my engine, the Enniskillen, under his charge on the Coleraine line, and had re-christened it the "Fairy;" and he was full of expressions of delight at her performance as to speed and steadiness, evidently believing, like the sailor with his ship, that she could do everything but talk. How he made such a blunder as now to attribute the whole matter to Mr. Samuel, I do not well comprehend. What Mr. Samuel did was to order from Fairfield Works first a manumotive and then an inspectors' engine, with $3\frac{1}{2}$ cylinders, but how they were to be made did not enter into his imagination, for none of his antecedents prepared him for it. He was extremely delighted with a new toy, and proclaimed its merits far and wide, and worked hard at getting results and statistics. A report on the subject of light engines and dead weights was about this time placed before the directors of the Eastern Counties, and this report made a considerable sensation with Mr. Samuel's name appended to it, but it did not produce an order. The first order was given to the writer by Mr. Charles Hutton Gregory. The designs were all mine, the results of previous years of thought. They were worked out in all their steam-power calculations and details by Edward Reynolds, a pupil, who was first introduced to me by Walter Hancock, the famous locomotist on common roads, as a young man of remarkable faculties, who had had been very much about him in his experiments. I never willingly pass by faculties where I can find them, for the world is not overburthened with them, and so Edward Reynolds became free of Fairfield Works as a pupil, both in the drawing office and workshops, and a very valuable assistant he was, and his subsequent career has confirmed his early promise. My foremen at the time were Archibald Sinclair and Edward Corry, the former passed away, the latter a prosperous and well-respected man in London City. All these things are matters of common knowledge, and, to a certain extent, of literary history. The pamphlet was not confined to the question of engines only. It reviewed and particularised the whole subject of engines, vehicles, trams, and permanent ways; and the *Times* of January 25th, 1850, says of the pamphlet "It also contains a number of suggestions on the general developments of traffic, which, in point of ingenuity and completeness as well as in the faith they exhibit in the extent to which the public would avail themselves of increased facilities, resemble the original Post-office plans of Mr. Rowland Hill." In looking over Mr. Fairlie's paper I find a quantity of very useful statistics about dead load and paying load proportions. But the practical remedies appear to settle themselves into one single point—the substitution for existing engines with two cylinders of an engine with four cylinders, or rather two underframe engines, with a long frame and boiler above, the engines each pivoted to the upper frame by a bogie pin, round which it swivels; the advantage being that each bogie wheel base being only ten feet in length, it will roll round curves of only two chains radius. This is precisely the principle of the timber trucks used on railways, two short trucks being connected by the long timber lying on central saddles. I am not going to criticise Mr. Fairlie's engine, but merely to theorise. I take it for

* We have the copy before us.—*Ed. J. S. A.*

granted that, with a given cylinder power, it will haul the same load as a two-cylinder engine of equal power, with the undoubted advantage of getting rid of flange friction, as compared with a long-based engine on curves, giving out more "duty" and less waste power. But if the bogie be very short in the wheel base, and badly centred, this also may involve frictions of another kind, by dragging, and keeping the axles abnormal to the curves. Thus, a 10 ft. wheel base, involving $\frac{3}{4}$ in. of versed sine on a curve of two chains radius, might involve less friction than a 5 ft. wheel base on the same curve with $\frac{1}{4}$ in. versed sine, because, in the absence of other guidance, length is an important element in steadiness, and the short base might drag askew. But Mr. Fairlie takes it for granted that, in the case of his engines—and, of course, of any other engines viewed as tank engines—by cutting off the tender the whole weight and waste of the tender is saved. Let us analyse this. The datum line from which to construct an engine, whether on six wheels, or four, or eight, is the limit of weight which may be put upon each wheel without damaging either rails or tyres to any serious extent. Beyond this limit we cannot advantageously go. Assume it to be six tons per wheel, that will give a load of 36 tons for a six-wheel engine. Assuming the adhesive load required to balance the steam to be as 5 to 1, that would give seven tons of steam power, say, a pair of 18 in. cylinders. But the engine in this condition is a mere dummy; an idiot, "full of sound and fury, signifying nothing," like Munchausen's horse with his hinder parts cut away, falling into a syncope for want of food and water. He is a trooper without his horse, a soldier without his rations, and he will die a rapid death without his tender or its equivalent. The tender weighs say 20 tons; but if taken away, the fuel and water, and tanks, and coal-bunks must be retained and placed in some form or other on the engine's back, and that will be at least 12 tons out of the 20; this added to thirty-five makes forty-eight, which gives eight tons per wheel, bringing it within the crushing limit; wherefore, it is evident that we must travel back and lighten the whole to the original 36 tons by lightening the structure, and in such case we shall have a less powerful engine, unless we assume that the present 36-ton engines are made superfluously heavy in material to the extent of 12 tons, which may be abstracted and replaced by fuel and water. The water will be 9 tons, and the fuel 30 cwt; and if we are to use tank engines with a small supply of water we can only run short distances, unless we resort to Mr. Ramsbottom's plans of picking up from level troughs along the line, against which there is only the solitary objection of frost. No doubt, other things bring equal, it is an advantage to have a long straight frame with flexible wheel bases, but it is also a very considerable advantage to have only two cylinders and two sets of gearing instead of four, because, in the one case it is simply an increase in the weight of metal, and in the other it is a duplication of workmanship and repairs—far the heaviest items. Other things being equal, a small watch costs as much as a large one as to workmanship. There is also a disadvantage in making the fuel and water constitute a part of the adhesion, because it is a diminishing quantity. If 12 tons be abstracted from 36 it leaves 24, or four tons load per wheel, equal to less than five tons of steam power instead of seven, or else the wheels would slip, unless under very favourable conditions, as to level and dry rails. There is also an advantage in what are called tank engines, that they will run either end foremost without reversing, and so facilitate traffic. But one reason for this is the bad construction and connection of the tender, which renders it dangerous to drive it before the engine, as being liable to get off the line. But there is no difficulty in so arranging the connection of the engine and tender, that they may run either end foremost without risk, and without shaking the driver on the foot-plate, as well as any tank engine. Much is claimed for the double-bogie engine, that it has a straight connection between the two pivots. But it is quite practicable so to couple two six-wheel goods engines that they will do the same thing, transmitting the force either in pushing or pulling on a straight line between the centres of the adjoining frames. Without going into the question of building new stock, there is quite enough to be done in the conversion of existing stock to frictionless movement, very materially to benefit their dividends, when once railway managers shall turn their attention to it. The normal 6lbs. per ton resistance must be multiplied many fold to account for the very small number of tons load drawn, compared with the area of the cylinders. In modern railway calculation cost is determined per mile run by the train, whether full or empty. The passengers are never considered, they are but as dirt in the balance; of no more importance to the total load than the insects which may jump on or off. One reason for this extensive growth of dead weight is to resist endlong collision, a consideration not requisite with omnibuses; but, as in ships, a larger hull carries a larger load in proportion to its displacements, so, should the widths of railway carriages increase, and the length of the train proportionally diminish, the weight and resistance would be lessened, and the paying load increased: and in proportion as frictional resistance is diminished so may new stock be constructed with less dead weight. It must be remembered that in proportion to the resistance of the train its carrying capacity diminishes, and its demand for engine power increases, and hence disproportionately heavy engines—W. BRIDGES ADAMS.

MEETINGS FOR THE ENSUING WEEK.

MON......Social Science Assoc., 8. Mr. J. B. Curgenven, "On the Extension of the Contagious Diseases Act, 1866."
R. United Service Inst., 8½. 1. Mr. James D. Dougall, "On Schultze's Granulated-Wood Gunpowder." 2. Mr. Geo. Read, R.N., "Will Explain a Model of his Helm Indicator."
British Architects, 8.
Actuaries, 7. Mr. H. W. Manly, "On a Comparison of the Values of Policies as found by means of the various Tables of Mortality, and the different methods of Valuation in use among Actuaries."
Medical, 8.
Asiatic, 3.

TUES ...Civil Engineers, 8. Mr. John Wolfe Barry, "The City Terminus Extension of the Charing-cross Railway."
Anthropological, 8.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

WED ...Society of Arts, 8. Mr. Raphael Brandon, "How to make Railways remunerative to the Shareholders and profitable to the State."
Pharmaceutical, 8.
Obstetrical, 8.
R. Society of Literature, 4½.

THUR ...Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Dr. W. Baird, "Contributions towards a Monograph of the species of Annelides belonging to the *Amphinomacea*, with a description of several new species contained in the British Museum." 2. Mr. Jas. Buckman, "The Effects of Selection in the Cultivation of Plants."
Society of Fine Arts, 8. Mr. Alfred Gilbert, "On the Classics of the Pianoforte."
Chemical, 8.
R. Society Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

FRI.......Geologists' Assoc., 8.
Royal Inst., 8. Dr. Frankland, "On the Water Supply for the Metropolis."
Archæological Inst., 4.

SAT ......Royal Inst., 3. Professor Roscoe, "On the Non-Metallic Elements."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 17th March*, 1868.

62. Bill—Registration of Writs (Scotland).
42. (II.) Postal Contracts—Correspondence.
129. Bankruptcy Court—General Return.

132. Police (Counties and Boroughs)—Correspondence.
135. Fisheries (Ireland)—Correspondence.
143. Navy—Statement of Excesses (1866-7).
144. Army—Statement of Excesses (1866-7).
145. Army—Estimate "on Account."
Ecclesiastical Commission—Twentieth Report.

Delivered on 18th March, 1868.

56. Bill—Land Writs Registration (Scotland).
123. Metropolitan Board of Works—Return.
137. Education—Report.
149. Navy—Estimate "on Account."
108. East India (Systems of Government)—Despatch.
Prison Dietaries (Ireland)—Report.
Trades Unions—Report of Examiners.
Public Petitions—Eighth Report.

Delivered on 19th March, 1868.

61. Bill—Renewable Leasehold Conversion (Ireland) Act Extension.
95. (I.) Edinburgh Churches—Supplementary Return.
141. Dublin Metropolitan Police—Abstract Account.
Ship "Mermaid"—Agreement.

Delivered on 20th March, 1868.

47. Bill—Public Schools (amended).
68. ,, Court of Appeal, Chancery (Despatch of Business) Amendment.
69. ,, Ecclesiastical Commissioners Orders in Council.
126. (I.) Committee of Selection—Second Report.
Church Estates Commission—Seventeenth Report.

Patents.

From Commissioners of Patents' Journal, March 20.

GRANTS OF PROVISIONAL PROTECTION.

Bags, &c., measuring and cutting cloth for—489—C. Blyth.
Bathing dresses—654—F. Dumas.
Boilers—786—J. G. Tongue.
Bolts and nuts, screw—808—C. D. Abel.
Bolts, screw—690—E. Baker.
Boots, &c., rivets for—765—C. H. Gould.
Bricks, &c., burning—604—H. Chamberlain, J. Craven, and H. Wedekind.
Building, compositions used in—515—L. Mummenhoff.
Cans—698—R. Zwez.
Card cases—804—H. M. Lee.
Carpeting, felt—746—W. and T. Mitchell.
Carriages—369—J. Offord and S. W. Hale.
Cartridge cases—755—F. T. Baker.
Cartridge cases, filling—692—J. Collins.
Chairs, steel—623—F. Remy.
Chronometer boxes—757—J. Hammersley.
Clocks, &c., mechanical movements adapted for—571—W. E. Newton.
Coals, &c., screening—728—E. Burton and J. Lawrence.
Conveyances, &c., registering number of passengers travelling by public—693—L. C. Detouche.
Conveyances, &c., registering number of passengers travelling by public—717—F. Moss.
Copper and iron, treating—759—W. Hunt.
Cotton seed, &c., decorticating—792—H. Simmonds.
Docks, floating—788—J. Campbell.
Door handles—740—E. Clifton.
Door knobs, &c., fixing—798—J. and J. Thompson.
Drilling machines, &c.—762—J. Westray and J. Forster.
Earth closets, &c.—810—A. F. Baird.
Electric apparatus—773—I. L. Pulvermacher.
Engines and boilers—725—W. Whittle.
Engines for agricultural purposes—742—H. E. Smith.
Engines, hydrostatic—733—B. W. A. Sleigh.
Engines, steam—761—W. E. Gedge.
Files, machine for cutting—729—H. Kennedy.
Fire-arms, breech-loading—710—T. Horsley.
Fire-escapes—696—W. Smith, J. Giddings, and J. Rank.
Fire, extinguishing—782—T. Atkins.
Flour, preparing hard foreign wheat for manufacturing into—778—G. Hauxwell and J. Ryder.
Food, preserving blood for use as—726—J. Dewar.
Fuel, artificial—727—G. Anderson.
Furnaces—775—J. M. Stanley.
Furnaces, blast—780—J. Watson.
Galvanometers—764—J. L. Clark.
Hats—680—J. Dunkerley.
Hats, &c.—724—H. Zox.
Hooks and eyes for picture cords, &c.—749—J. Askew.
Horses, &c., shoeing—526—A. M. Dufilhol.
Hydrocarbons, burning—708—W. E. Newton.
Iron and steel—735—I. W. Nasirow.
Iron, treating cast—794—A. C. Kirk.
Jars, &c., covers for—758—H. A. Dufrené.
Lace, manufacturing—763—J. Hartshorn.
Lamps for burning petroleum, &c.—739—A. Cole and J. Carter.
Land, &c., cultivating—769—A. V. Newton.
Liquids, evaporation of—796—R. Tooth.
Liquids, freezing—816—A. M. Clark.
Liquids, raising and forcing—802—E. Casper.
Lubricators—771—J. Dickson.
Match boxes, &c.—730—S. A. Bell and G. H. Higgins.
Metal plates, coating—814—E. Morewood.
Motive-power—784—J. Parker.
Nails—722—J. Manly, jun.
Nails, machines for making—723—W. Spence.
Ordnance and projectiles, breech-loading—450—A. M. Clark.
Ores, obtaining copper from—731—T. Johnson.
Organs—812—H. Willis.
Paper, waterproof—776—T. Whittaker.
Paper-hangings, mineral—714—W. E. Gedge.
Paving—743—A. M. Clark.
Pens, &c.—665—W. E. Newton.
Pianofortes—774—J. Brinsmead.
Plane irons, sheep shears, &c.—589—R. B. Mitchell.
Printing, engraving rollers for—790—R. Leake and R. Platts.
Propellers, twin-screw—745—J. G. Kincaid.
Pumps, steam—770—A. M. Clark.
Railway carriage wheels, coupling, &c.—673—J. Livesey.
Railway passenger trains, signal apparatus for—721—J. A. Haswell and G. Brown.
Railway signals, &c.—756—J. J. F. Stevens.
Railway wagon axle boxes—712—A. Smith.
Reaping machines, &c.—719—T. Bisset.
Reaping machines, &c.—750—J. Brigham and R. Bickerton.
Rulers, parallel—732—J. W. and C. R. Harrison.
Sewage, utilising—744—W. K. Stuart.
Sewing machines—751—I. Cole and A. Maxfield.
Shoes—224—C. R. Broadbent.
Skirts, skeleton—702—L. B. Schmolle.
Smoke, consuming—670—G. Hart.
Soups, &c., preparing essences for—767—H. Drake.
Spinning, &c., machinery—618—J. Vevers.
Straw, &c., stacking—700—W. Barford and T. Perkins.
Telegraphic apparatus—691—H. B. Wilder.
Tobacco pipes—752—C. R. Rockley.
Walls, &c., constructing—640—T. Lythgoe and H. Thornton.
Water, &c., heating, &c.—272—F. Wirth.
Water-closets—706—W. Rollo.
Window sashes—748—C. Scholefield.
Window, &c., cords—737—S. Jefferies.
Wood, cutting and reducing—734—J. A. Lee
Wood, machines for cutting—282—W. Ellis.
Yarns, winding—720—W. B. Thompson and W. Gall.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Hats, bonnets, &c.—865—C. R. Broadbent.
Hides, &c., machine for beaming—841—P. Lennox.
Looms—886—H. A. Bonneville.
Railways—887—H. A. Bonneville.

PATENTS SEALED.

2656. G. E. Marchisio.
2657. J. Hargreaves.
2662. B. and A. B. Blackburn.
2665. A. Mackenzie and S. Robinson.
2668. A. Aitchison and H. J. Grantham.
2687. W. Winter.
2688. G. Batcheldor.
2690. J. H. Brown.
2692. T. H. Williams.
2701. W. Woodcock.
2715. J. Jameson.
2717. E. T. and C. Horsley.
2719. J. Jameson.
2733. J. and J. A. Huggett.
2753. J. Dewar.
2800. R. Hattersley.
2838. W. R. Lake.
2907. W. B. Adams.
3178. W. Thompson.
3697. J. E. Gowen.
186. J. Carr and C. Lucop.
245. H. M. Ragland.
283. F. N. Clerk.

From Commissioners of Patents' Journal, March 24.

PATENTS SEALED.

2703. A. Rooker.
2706. J. Kirk and J. Kirk, jun.
2713. J., B., and R. Wood.
2714. A. Morrall.
2716. G. Wilkinson.
2731. L. de la Peyrouse.
2736. H. A. Bonneville.
2743. J. Elder.
2763. W. Mitchell.
2796. J. Offord.
2838. H. Wallwork.
2851. G. Twig.
2854. J. Withinshaw and J. E. Baker.
2889. M. A. F. Mennons.
2903. E. Gessner.
2992. J. Mitchell.
3424. J. Hadley.
3632. J. Hadley.
149. J. A. Jones.
161. S. and E. Burrows.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

734. S. B. Boulton.
750. J. Bullough.
753. A. V. Newton.
768. J. H. Kidd & J. C. Mather.
775. A. G. Browning.
776. A. V. Newton.
759. E. Pilling and J. Harper.
771. J. T. Romminger.
808. G. E. Donisthorpe.
778. S. Chatwood.
819. R. W. Morrell.
937. P. J. Jamet.
785. C. Farmer and T. Turner.
799. W. J. Coleman.
818. A. B. Von Rathen.
853. W. Betts.
815. D. Mackenzie.
820. H. Oakes.
822. J. Tall.
823. T. Roberts and L. Luc.
824. G. H. and J. A. Castree.
956. W. Bulstrode.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

710. W. Andrews.
729. A. Haley.
719. J. Victor and J. Polglase.

Journal of the Society of Arts.

FRIDAY, APRIL 3, 1868.

Announcements by the Council.

ARTISANS' REPORTS ON THE PARIS EXHIBITION.

The Reports of the Artisans selected by the Council to visit the Paris Exhibition are now ready, and may be had of the Society's publishers, Messrs. Bell and Daldy, York-street, Covent-garden. One volume; demy 8vo., 732 pages, price 2s. 6d. in boards, or 3s. 6d. in cloth. The volume contains reports, by upwards of eighty artisans, upon the principal industries represented in the Exhibition, as well as special reports on the condition and habits of the French working classes.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'Clock:—

APRIL 8.—*Passion Week.* NO MEETING.

APRIL 15.—"On Liquid Fuel." By BENJAMIN H. PAUL, Esq.

APRIL 22.—"On the Cultivation of Beetroot, and its Manufacture into Sugar." By W. A. GIBBS, Esq.

APRIL 29.—"On Progress in Oyster Culture." By HARRY LOBB, Esq.

CANTOR LECTURES.

The last lecture of Dr. Crace Calvert's course, "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," will be delivered on TUESDAY, the 7th of April, as follows:—

LECTURE IV.—TUESDAY, APRIL 7.

THE CONVERSION OF CHLORIDE OF SODIUM INTO CARBONATE OF SODA.—The decomposition of common salt into hydrochloric acid and *sulphate of soda*, Glauber's salt; the transformation of this compound into *soda ash*, *soda crystals*, and *bicarbonate of soda*, Ballard's process; and the important and recent discovery of the utilisation of soda waste, &c. Illustrations.

The lectures commence each evening at Eight o'clock, and are open to members, each of whom has the privilege of introducing two friends to each lecture.

ALBERT MEDAL.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The Committee met on Wednesday, March 18th. Present—B. Shaw, Esq. (in the chair); Mr. Harry Chester, Captain Grant, Mr. G. F. Wilson, F.R.S., Mr. Edward Wilson, Mr. J. Ludford White, Rev. J. E. Hall, and Mr. E. Hollond.

MR. JAMES REDMOND BARRY, Inspecting Commissioner of Irish Fisheries, attended to give information respecting the sea fisheries of Ireland.

The CHAIRMAN—We have had some evidence from Mr. Blake, as to the desirability of Government granting loans for the purpose of aiding the fisheries on the west coast of Ireland, and there seems no doubt that such a plan would very much benefit the fishermen of Galway, but the question remains how far it would develop the produce, and whether it would do so to such an extent as to make an imperial question of it, or as likely to considerably increase the supply of nourishment to the people.

Mr. BARRY—It would develop the fisheries to a much greater extent than they are at present. I have been connected with the fisheries of Ireland a great many years, and am now the only inspector. My duties now do not extend to the inland, but only to the sea fisheries. I am not very fully acquainted with the provisions of the measure introduced by Mr. Blake, and I don't quite accord with all his views. His measure was introduced before the appointment of the Select Committee of which

he was chairman; and I was under the impression that his views had been materially altered by the evidence adduced before that Committee. I am clearly of opinion that the estuaries of Ireland contain a large quantity of fish, which, under better arrangements might be obtained for the use of the people.

The Chairman—Part of the measure which Mr. Blake proposes is, that the loan system should be restored; that loans out of a fund voted by Parliament should be granted, partly to assist in providing curing-houses, and partly to provide fishing-boats and gear of all kinds. Are you of opinion that such a measure would be likely to prove successful?

Mr. Barry—It would aid, no doubt. The country has been reduced to a state of great pauperism by the unfortunate occurrence about twenty years ago, of what is known as the potato famine. The country has never recovered from that, and that branch of industry has been peculiarly affected. The peasantry upon the coast who used to devote themselves, some exclusively, to fishing, and some partially to fishing and partially to the cultivation of small farms, have in a great measure vanished. They have either died or emigrated, and, as far as my experience goes, the want in Ireland seems now to be rather of men than of appliances. Formerly the great want was of means and of appliances to employ the men. I have myself endeavoured to encourage the formation of one or two small companies—one, in particular, in the south of Ireland, and I have watched their proceedings with great interest. There is in this case no want of means, as the parties who have formed this company are merchants of a very high order, both of means and intellect, in the city of Cork. They have now been three years in operation, and have contrived to get on pretty well; but their greatest want, so far as I can learn, has been want of men. That is in consequence of the great amount of emigration. Even if there were abundance of money supplied I hardly know where, under present circumstances, occupation could be found for it. Still it is to be hoped that the evil would diminish if encouragement were offered to labour. Numerous cases come before the department with which I am connected—the Fishery Commission, where applications are made from persons in extreme distress. I speak of the whole coast of Ireland, which I occasionally visit, but particularly the south. It was in that quarter, where there are a number of small harbours on the coast, where the fisheries most flourished before the famine, and before the exodus; and we have frequent applications still for assistance to procure boats and nets; and if there was any fund from which such assistance could be supplied, it would no doubt greatly increase the number of takers, and the quantity taken will of course depend upon the number of persons employed. I refer to the coast generally; but the east coast is much better supplied in every way. It is a different kind of fishing there; there are more inlets and small harbours, and the fishing is conducted in a more commercial spirit. It is much resorted to by a number of intelligent and experienced fishers, who come from Cornwall, from the Isle of Man, and some from Scotland. The fleet at Howth, a short distance from Dublin, will sometimes number nearly 500 vessels. This state of things has considerably improved the skill and stimulated the industry of the native population in the neighbourhood; and those who used to devote themselves to fishing on that coast—I particularly allude to the herring fishery—have again taken to it. There are three ports, Arklow, Ardglass, and Waterford, or Dunmore, which now supply men for the fleet to a much greater extent than formerly, and they have become very skilful and industrious. The consequence is, that during the last three or four years the capture of herrings has become very considerable, and these places have become remarkable as depôts for them. Then, again, the establishment of railways has been of immense value, as there cannot now be a surplus quantity taken. I can well remember the time when the fishermen used to be desirous of limiting the quantity taken, as a small quantity paid better than a large; but there is now no limit to the demand at a fair and reasonable price.

The Chairman—How is the cargo disposed of when it arrives? I am still speaking of the east coast.

Mr. Barry—The sale is by public auction. The fleet goes out in the evening to fish, and returns by daylight in the morning. There is telegraphic communication with Liverpool. I am now speaking of Howth, which is one of the most important places, and the prices vary, of course, according to the supplies that come in, and according to the demand in Liverpool. There are steamers and vessels ready, which are employed in carrying the fish, which is very slightly salted, so as to keep during the voyage, and taken to Liverpool. Some, of course, goes to Dublin, and a great quantity goes into the interior of the country.

The Chairman—Is there any chance, in your opinion, of imparting that commercial character to the fisheries on the west coast, so as to ensure there being no surplus of take there?

Mr. Barry—The first step would be to afford facility of transit. The want of railways and of other means is a great and serious difficulty on the west coast. No system of loans would get over that difficulty. If vessels were supplied, and if money were given, there would still be a great want so long as there was a lack of means of transit. For instance, some of the best fishing banks on the western coast are at Buffin Island and off the coast of Galway and Mayo, fifty miles from any railway, so that if fish were brought in, there would be no means of conveying it to a market. Curing-houses might be established, but curing has not been found a profitable pursuit.

The Chairman—I understand you to say that on the east coast a considerable number of English and Scotch fishermen are engaged. Can you tell us about what is the proportion of Irish?

Mr. Barry—About one-third are Irish. The vessels that come from England and Scotland are fully manned and fully equipped; and I must say that the example set by these boats, particularly those from Cornwall, has been of infinite service to our country.

The Chairman—What would be your impression as to the railways in connexion with the west coast; that you should first create the railways or first raise the fisheries, so as to encourage the railways to be made?

Mr. Barry—I have very little doubt but that each would stimulate the other, but I should like to see the railways made before I became a member of a fishing company on the west coast. There is no difficulty in this respect on the east coast, and the fishing there is, I think, established so securely that a system of loans is not required.

The Chairman—Then, in fact, your opinion is, that on the east coast such a system is not necessary, and that on the west coast it would be premature?

Mr. Barry—Exactly.

The Chairman—And that at present any mere stimulus to the fisheries, by means of loans, would tend to create local industry, but not a national source of supply?

Mr. Barry—Exactly so.

The Chairman—We understand that there is not one uniform law governing the fisheries of the three kingdoms. Are you of opinion that the regulations should be made uniform?

Mr. Barry—So far as the deep-sea fishing is concerned I do not know of any difference; but there are certain fishings in which the fashion of the day seems to be to alter the old system, and in that respect I think we have managed better in Ireland. For instance, in many places the oyster fishery has been almost completely extinguished, from being overworked, and from want of provident arrangements. I am one of those

who are old-fashioned enough to think that a period of reproduction is quite necessary to that fish—and *that* we have strictly observed in Ireland. We cannot do it with other fish, because the periods of fructification differ. As regards oysters we have closely observed it for many years, and the consequence is that our oyster beds are fairly stocked, and we have supplied large quantities not only to England but also to France. I am sorry to say that there is a course of legislation now in progress which will, I predict, have a very prejudicial effect on our oyster fisheries, on one part of the coast especially, and we shall soon cease to be suppliers, simply because we shall have none to supply. I am alluding to the convention with France. It is now the fashion, since the establishment of the Royal Commission, and since the report of that commission has been promulgated, to believe that no close time for oysters is required; and, acting on that principle, it is to be extended to the coast of Ireland. Our best oyster fishings are upon the east coast, in the Irish Channel, and every season numbers of vessels go from Arklow—one of the most important parts—to take the oysters from those beds. The close time has been strictly observed, and the consequence has been that we have not yet observed any extraordinary diminution in the supply, as has been the case with the natural beds of England. The close season has been observed very strictly under the statute law of the 25th George III. The statute provides that oysters shall not be taken in any month in which there is not an "r" in the name—viz., from May to August inclusive.

The Chairman—Allow me to read to you an extract from the report of the English Commissioners:—"Every spawning oyster may be calculated to produce about 800,000 young. Reduce that estimate to one-eightieth of what it is, and it is obvious that no oyster bed is in the smallest danger of exhaustion from overworking alone if only 1 per cent. of the breeding oysters are left. For suppose that of every 500 oysters only 100 breed during the season, and the spat of only one of them is shed, that one will, by the supposition, yield 10,000 young oysters, or twenty times as many as the original stock. If the conditions for the development of the spat are favourable, it is produced on so enormous a scale that any check exerted by human influence is altogether insignificant; while, on the other hand, if these conditions are unfavourable, man is, in nine cases out of ten, powerless to affect them." Of course you do not agree with that, but would you kindly tell the Committee how you meet that reasoning?

Mr. Barry—I am utterly incapable of entering into these minute calculations, and I think they are all nonsense. I only know the positive fact, that when beds have been dredged without observing close time, which has sometimes happened, they have become barren. A work has recently been published on the subject of fisheries, entitled "The Harvest of the Sea," by Mr. Bertram, which I have read with very great pleasure. I have made a short extract on the subject of close time, which I should like to read to the Committee.

Mr. Chester—This statement in the Commissioners' report is at best but a theoretical calculation; and against that we have the undoubted fact that oysters have become exceedingly scarce, and that many beds have ceased to produce them.

Mr. Barry—The extract is as follows:—"Without wishing to dogmatise on any point of 'oyster life,' I think I can bring before my readers in a brief way a few interesting facts in the natural history of the edible oyster. As is well known, there is a period every year during which the oyster is not fished; and the reason why our English oyster beds have not been ruined or exhausted by over-fishing, arises, among other causes, from this fact of there being a definite close time assigned to the breeding of the mollusc. It would be well if the larger varieties of sea produce were equally protected, for it is sickening to observe the countless numbers of unseasonable fish that are from time to time brought to Billingsgate and other markets and greedily purchased. The fact that oysters are supplied only during certain months of the year, and that the public have a general corresponding notion that they are totally unfit for wholesome eating during May, June, July, and August (those four wretched months that have not the letter 'r' in their names), has been greatly in their favour. Had there been no period of rest it is almost quite certain that oysters would long ago—I allude to the days when there was no system of cultivation—have become extinct, so great is the demand for this dainty mollusc. Oysters begin to sicken about the end of April, so that it is well that their grand rest commences in May. The shedding of the spawn continues during the whole of the hot months, not but that during that period there may be found supplies of healthy oysters, but as a general rule it is better that there should be a total cessation of the trade during the summer season, because were the beds disturbed by a search for the healthy oysters the spawn would be scattered and destroyed." So far as my humble opinion goes, I quite adopt those views. I think the Irish fisheries would receive a useful stimulus if there were in Dublin an exhibition of fishing appliances, &c., such as have been held in France, Holland, and other places, and it would direct public attention to the matter. We sent persons from our department to the exhibition at Boulogne and Paris, who brought back very valuable information.

Mr. Chester—We were told by Mr. Blake that since the time of the potatoe famine there had been a great reluctance on the part of the population in Ireland to eat fish without potatoes?

Mr. Barry—Unhappily, that unwillingness did prevail during the period of the famine, and an enormous quantity of fish was either wasted or used for manure, but I do not think that state of things continues. I think since the people have been accustomed to the use of other food, they have become aware of the value of fish to eat with it, and have used fish whenever they could get it. I can hardly say that curing houses are established in Ireland, except at Dublin, where there is one belonging to the Irish Fishing Company. They cure herrings there; there is no brand used there. It has been pressed upon us very strongly, that either there should be no brand in Scotland, or that there should be one in Ireland also. It has been much urged by the company that there should be a brand everywhere or nowhere. I have been in Scotland, and have made a good deal of inquiry, and I am satisfied the system works well there; and, therefore, I should much rather see it extended to Ireland than abolished in Scotland.

The Chairman—We have had some little difference of opinion as to the extent to which the Irish fishermen would be likely to interfere with those of other countries coming to fish. On the one side, it has been said that they are very violent and ready to interfere with all foreign fishermen, and on the other hand, it is replied that the object was merely to prevent what they considered an injurious system of fishing, that of trawling.

Mr. Barry—I am perfectly convinced that there has been no anti-national feeling. There can be no greater slander than to charge Irish fishermen with a disposition to interrupt strangers who come to fish on their coasts. I make that statement as to the whole extent of coast on the highest authority. We have annual reports from the inspecting commanders of coast guards, and those reports invariably contain the assurance that there is perfect tranquillity and quiet. On the other hand, there certainly have been, especially in one locality, strong prejudices against that mode of fishing, and there have been some little riotous proceedings in Galway, but they were very trifling and are greatly subsiding. In fact, it was one particular community which entertained those prejudices most strongly, and that community has so much diminished that scarcely a shadow of them remains. I am certain that if fishing by means of trawls were set up on a large scale by commercial companies, the people

would not only tolerate, but encourage it. I do not know as to the remains of these poor people, who were of a very primitive type, but I know that some trawlers have been established by persons of means, and some of these people at Clodda have worked for them, and have taken shares in the boats. I am sure they would not object to fish under the companies.

The Chairman—What do you say as to the stormy character of the sea on the west coast? We have had some evidence that it would prevent fishing ever being carried on there on a large scale. Mr. Blake informed us that fishing could only be carried on there occasionally when the weather permitted, and that no man could subsist by it alone, but would require a little bit of land which he could cultivate when he was unable to fish.

Mr. Barry—That is quite right to a certain extent. It is a very stormy coast, and it is not supplied with all the facilities for shelter that would be desirable.

The Chairman—Would not that prevent the formation of companies; because they would be unable to make anything like a reasonable contract with a railway company to carry the fish, the take being so irregular?

Mr. Barry—No doubt the seasons generally are very boisterous, and that is one of the unfavourable features which cannot be concealed. But upon that west coast there are some very favourable spots for fishing.

The Chairman—Do you know whether the weather is worse there than at the Hebrides?

Mr. Barry—I do not know the Hebrides, but I should think the Irish coast is not so bad as I understand the Hebrides to be. There are a good many small islets off the west coast which afford some shelter. Clew Bay is a very fine harbour, and there is also shelter under Clare Island. That is a place particularly favourable, inasmuch as railway communication has now been opened between Westport and, I may say, the whole world. That is on the west coast, in the county of Mayo, and it communicates with the Great Western of Ireland. If I were asked what was the most important point as a nucleus for the formation of any fishing company on a large scale, I should say Clew Bay, as it possesses such facilities for transporting the fish. I could not give anything like an average as to the number of days a-week on which it would be possible to fish. There are a great many fine days in the summer sometimes, which is the principal time for fishing on the west coast. The bad weather is mostly in the winter. The winter fishing is also important, but about sixty years ago that was carried on to a considerable extent off Buffin Island, principally for ling.

Mr. Chester—Supposing Mr. Blake's idea were carried out, and there were a parliamentary fund established, to be granted in loans, subject to inspection, and suppose the board charged with the administration were to say they would not make any grants to individuals directly, but there must be local co-operation, and the formation of companies, which should raise a certain portion of capital first, which should be used in loans, do you think it would be possible to obtain such local co-operation?

Mr. Barry—I am sorry to say that there is a great deal of sluggishness upon this subject. It is an exceedingly precarious pursuit, and I believe that those who have entered into the companies which have been formed have done so more from feelings of patriotism and benevolence than from an expectation that there would be any great gain. I know that to be the fact in one case, and I believe it to be the same in the other. I refer to companies in Cork and Dublin, the promoters of the latter being principally members of the Society of Friends, who did so from a spirit of benevolence. For some time they lost largely, and are only now beginning to retrieve their position.

The Chairman—If there were a larger and more seaworthy class of boats provided, would it be possible for them to keep the sea more regularly?

Mr. Barry—They have a very fine class of boats; they are built in Dublin, and the tonnage may be from 50 to 70 tons. This is on the east coast. There is a very small and bad class of boats on the west coast; if they were assimilated more to those on the east coast no doubt they could fish more regularly, and be able to stand out more. They are all open boats, and very badly provided. I am now concerned only with the sea fisheries. I was at first connected with the inland fisheries also, but I differed altogether from the new system of legislation adopted, and it was judged expedient to relieve me and the board with which I am connected from all interference with it. I do not hesitate to say that an increased quantity of food has not followed from what I must designate the class legislation in reference to that department of the fisheries.

Cantor Lectures.

The third lecture of Dr. Crace Calvert's course, "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," was delivered on Friday evening, the 27th of March.

Seventeenth Ordinary Meeting.

Wednesday, April 1st, 1868; Thomas Webster, Esq., Q.C., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Barry, J. J. Redmond, Ireland.
Cleghorn, J. The Mount, York.
Fraser, Alexander Colvin, Colchester.
Mitchell, Albert, Elmstead, near Chiselhurst.

The following candidates were balloted for, and duly elected members of the Society:—

Bradford, Rev. William, 120, Cambridge-road, N.E.
Weston, Thomas, 115, Lower Thames-street, E.C.

The Paper read was—

HOW TO MAKE RAILWAYS REMUNERATIVE TO THE SHAREHOLDERS, BENEFICIAL TO THE PUBLIC AND PROFITABLE TO THE STATE.

By Raphael Brandon, Esq., Architect.

In the year 1854, it first occurred to me that the facilities offered to the public for travelling were very inadequate to the powers that the railways were capable of affording, and year by year since then I have made calculations in order to see if an universal system of cheap fares could not be established with advantage to the public and the road makers. The great question was to ascertain the minimum fares that could be made to pay; and although lower fares than those proposed in this paper might possibly prove more remunerative, yet the calculations are sufficient, I think, to show the feasibility of the scheme, and I have been fortified in my conclusions by the fact that each year's return has given more favourable results than its predecessor.

On the 21st of May, 1864, I forwarded to the Right Hon. W. E. Gladstone, M.P., then Chancellor of the Exchequer, a brief statement of the scheme which is sketched in the following paper. Since that time the attention of the Government has been imperatively called to the condition of the railways of the kingdom, and in March, 1865, a Royal Commission issued, the object of which it explains as follows:—

"To inquire into the charges now and heretofore made by the several railway companies of Great Britain and Ireland, for the conveyance on their lines of passengers, parcels, goods, minerals, animals, agricultural products, and other merchandise, and into the equality or difference

of such charges under similar circumstances, whether as between different companies, or by the same company in different cases; and where such inequality or difference exists, you are to inquire whether there are special circumstances which render necessary such inequality or difference; and you are also to inquire into the actual costs of such conveyance, and to compare such costs and charges respectively, if and so far as you shall think fit, with the costs and charges relatively to the accommodation given and service performed on the railways in any one or more foreign countries; and to report your opinion whether, with due regard to the progressive extension of the railway system, it would be practicable, by means of any changes in the laws relating to railways, or otherwise, to effect a more convenient interchange of traffic between the several systems of railways, and more economical arrangements for the working of railways, so as to make any considerable reduction in the said costs of conveyance, and in the charges to the public on account thereof; and more effectually to provide for securing the safe, expeditious, punctual, and cheap transit of passengers and merchandise upon the said railways with as near an approach as may be to uniformity of charge and equality of treatment for all persons under similar circumstances."

The object of the following paper is to point out the steps needed to make the railways what they should be, as the great arteries of circulation for the commerce and industry of the country. The system, under its present variously conducted and divided plans of management and mismanagement, has attained to a degree of development which renders its maintenance a national necessity; and recent events show that it is now in danger of collapsing, at least in parts. The scheme which I am about to lay before you is designed to show how it may be effectually maintained with largely increased convenience to the public and profit to the nation.

The formation and maintenance of practicable roads to facilitate internal communication is one of the principal requirements of commercial enterprise in any country, and all governments have devoted great attention to this important subject. The first great roads in England were made by the Romans, and carefully maintained during their occupation in perfect order throughout the land, according to their universal plan in a newly-acquired territory. Their primary object was, of course, to have ready means of communication for military operations between their camps and stations; but in a civilised and settled country, where commerce and industry are every day developing themselves, the necessity of good means of intercourse between the various centres of manufacture and the ports is equally important, and cannot be over-estimated.

The great highways of a country, being for the general use of the nation, should neither be left to the caprice of the different localities which they traverse, nor to the tender mercies of the private companies who may have formed different parts of them as commercial speculations. The king's highways, as our old roads used to be called, were under national authority, and powers existed to compel those localities where they were not well maintained to repair them effectually. The General Post-office has frequently repaired a road used by the Royal mails, and afterwards recovered the expense incurred thereon from the locality by a compulsory presentment.

Within less than half a century our system of intercommunication has undergone a complete change, and the great iron roads have taken the place of the king's highways. It is not too much to say that thousands travel where ten or twenty, at the utmost, travelled in the old coaching days; this is, of course, a great gain; but what I propose to consider in this paper is, whether the convenience of the public is provided for to anything like the extent that existing circumstances would permit, and also whether the interests of the shareholders would not be greatly benefited by making the convenience of the public their first consideration.

In order to arrive at these conclusions, it will be necessary to consider (1st) how these iron roads have been formed; (2nd), the powers granted to the various companies that have made them; (3rd), the reasons for those powers being granted; (4th), the present state of the roads, and the return made for the enormous sums which have been expended on the lines already completed; (5th), the benefit to the public; and (6th), the powers reserved by the Government.

I shall then be enabled to show, (1st), how the public convenience may be enormously increased; (2nd), the position of the shareholders improved; and (3rd), a large additional yearly profit produced which might be employed for the further development of the railway system, and in the reduction of taxation.

In making the following calculations, the returns provided in compliance with an order of the House of Lords have been taken as the basis, and it is therefore to be understood that the responsibility for the correctness of the figures rests upon the different railway companies.

1. According to the present system, the various railways are the private property of different companies, who made them as commercial speculations, and over whom the Government and the public exercise but very limited powers. These companies are naturally but little disposed to offer such facilities as may be much required by the public, but which do not promise a speedy return in the shape of profits (though this is a very short-sighted policy, for the greater inducements that are offered to travellers, the greater undoubtedly will ultimately be the return); and hence, while certain localities are most conveniently situated as regards railway communication, others are totally neglected, greatly to their detriment and to the injury of the railway companies themselves, who thereby lose many travellers.

Had the system been laid out on a comprehensive national plan, we might have had, ere now, a scheme in operation extending railway communication into every part of the land, without having expended as much money as has been already invested in the existing lines, much of which has been wasted upon establishing and maintaining rival lines, from which the public have reaped but doubtful and short-lived benefit, and which the shareholders have had bitter cause to repent. Railways should be carried into every part of the country, causing the population to spread over the land and thereby establishing new centres of commerce and industry.

It was quite natural that the principal towns should first have been considered in making railway communication, and, in connecting these one with the other, new and important towns have sprung up. But after the communications had been made between the large towns, it was a mistake to make rival or competing lines between the same places, and had the whole of the railways been under one management, on a comprehensive system, this would never have been dreamt of. The sums of money expended on these rival lines should have been employed in opening up the country, and this would have increased the value of land in all directions. Such a course would have proved more remunerative than investing money in a scramble to obtain a share of traffic which might have been accommodated by means of a judicious expenditure upon existing lines.

2. The special powers granted to railway companies were, first, the right to become corporate bodies; secondly, the power to purchase such lands as were needed for the purposes of making, maintaining and working their lines; and, thirdly, to charge tolls, not above certain amounts, for the use of these lines. From these tolls they were to obtain the return for the capital expended, and they had full powers to work the lines by placing thereon engines and carriages, or, if they so pleased, to lease the lines to others to work for them.

3. Let us now see upon what plea these powers were granted to private companies who came forward, in the first instance, simply as road-makers. It is the duty of

Government to see that the plant of the general industry and commerce of the country is fitly arranged and efficiently maintained, and the sense of this duty led, on the commencement of railways, to an examination of each scheme by a parliamentary committee before powers were granted to the company to make the line. This examination, however, was too often a mere form, but the public utility was always the principal item reported proved in the preamble of a railway bill, and as the projectors of a line were unable to obtain the land on which it was to be laid without the compulsory powers granted by Parliament, their prime object was to prove that the line was of great convenience, if not of absolute necessity, to the public. Parliament, moreover, at first, evinced anxiety to secure to the public every conceivable advantage; for instance, private individuals were to have the power to run their own engines and carriages at moderate tolls; maximum rates for all tolls were fixed, and especial attention was paid to the convenience of the public in the question of the mails. Further, the Government, applying to the railway system a principle of the patent laws, secured to itself the power of purchasing the railways after a certain term of years. The securing of this right is a recognition of the duty of the Government to maintain the efficiency of the great highways. This duty was even more directly exhibited about thirty years ago, with respect to Ireland, for the Government then issued a commission to survey and examine into the wants of that part of the kingdom, with a view to the establishment of a complete system of railway communication. The commissioners brought in a report recommending the formation of a number of trunk lines, but eventually the whole field was left to private speculation, and now the state of these various enterprises is such that it has become a matter of most pressing necessity that the Government should step in, purely in the interests of the public, and take the charge of the Irish railways, so as to secure the maintenance of proper communication.

4. Up to the year 1865 the returns made for railway investments had not been at all such as might have been expected from capital so laid out; and since the end of that year the profits have become less with a large number of railways; and the low prices at which all railway shares are now quoted, show that investments in such undertakings are not regarded with favour; in fact a glance at the share lists will justify the conclusion that the railways of the kingdom might all be purchased at a very large discount off their total aggregate outlay.

On referring to the returns of the railways up to the end of 1865, I find that the total amount expended on these undertakings throughout the United Kingdom was £443,572,250, exclusive of the capital returns for the lines not then open. Of this amount:—

£3,333,145	or 0·75 +	per cent. paid from	10 to 11 per cent.
8,563,394	,, 1·9 +	,, ,,	7½ ,, 10 ,,
179,445,242	,, 40·5 —	,, ,,	5 ,, 7½ ,,
220,014,037	,, 49·6 +	,, below	5 ,,
411,355,818			
32,216,432	7·25 +	,,	paid nothing.
443,572,250	100		

Thus it results that of every £100 invested in railway schemes 15s. pays 10 per cent., £1 18s. returns under that amount and above 7½ per cent., £40 10s. pays from 5 to 7 per cent., while £49 12s. gives a return of less than 5 per cent., and £7 5s. is wholly unproductive. It is almost needless to observe that none but the first-named proportion give a return at all commensurate with what should be looked for from money adventured in such enterprises, not to allude to the fact that even the highest amount of dividend quoted falls below the expectations held out to those who invested their capital at the commencement.

5. It is obvious that this enormous outlay has not proved beneficial to the shareholders, who found the money for the formation of the lines; let us now see if the public in general have gained such advantages as may be considered sufficient to convert the loss that has been sustained into a national gain. There is no doubt that we can travel with a speed and a security, and we may even add with a cheapness formerly unknown; but it is equally clear that what has been accomplished falls far short of what might be done were the system of railway travelling carried out in harmony; as witness how in numbers of cases the companies who cannot agree to work together for the public good, make innocent passengers the victims of their quarrels by refusing to run trains so as to carry them on when they reach a joint station, and so compel them to spend a few hours in the contemplation of chilly fires and stale pastry at such junction. Witness also the studied inconveniences placed in the way of third-class passengers, by running the trains at such times as to compel them either to continue their journey in a higher class, or to spend a night in a strange town; and witness the marvellous discomfort of some of the second-class carriages, cunningly devised to drive travellers into the first-class, but quite as frequently resulting in sending them into the third.

These are only a few of the evils the public have to bear in consequence of the mistaken notion of divided interests in the proprietorships of the railways, and the false idea that the interests of the shareholders and of the public are antagonistic. The object of this paper, however, is not so much to expose and dispel these errors as to show that the public have not yet obtained the full benefits to be derived from railway travelling, as well as that the shareholders might reap advantages in proportion to those conferred on the public, by the adoption of a better system.

6. These desiderata, it appears to me, can only be accomplished by the Government uniting all the railways under one general management, to form either a separate branch of the public service, or to be administered by an independent commission or directory. According to the returns for the year 1865 we had at the end of that year a total length of lines amounting to 13,289 miles, returning a net amount above their working expenses of £18,602,582. The total capital returns of the railways up to that date showed that £443,572,250, exclusive of the capital returns for the lines not then open, had been expended in making and working these lines. This being the aggregate amount of railway capital, including ordinary and preference stock, debenture stock and debenture loans, the returns of that year were sufficient to pay a dividend of 4⅗ per cent. on the total outlay of the kingdom. This aggregate return would be much increased if the railways were all united in interest, and managed, as they ought to be, so that each should facilitate the operations of the rest.

The development of additional traffic by thus consulting the interests of the public would, in itself, add largely to the revenue, and there would be no expense incurred by the ruinous competitions which at times stimulate an unhealthy traffic, to stagnate as soon as the existing cause is removed, and which proves of no permanent benefit either to the shareholders or the public.

There would be further important savings in the payments made to the numerous boards of directors, and to the clearing houses, which would be no longer required if all the lines were amalgamated; legal and parliamentary expenses would also be saved. It may be mentioned here that these latter expenses in connection with railway companies during the six years 1861-66 amounted to more than £17,000 a month.

The Government in this country has maintained the postal establishment, and no one has ever questioned

the fitness of their doing so. The forwarding and delivery of letters was not long left in private hands, and were it so, the country in general would in truth be badly served. The Post-office has also commenced what may be termed a parcels delivery, by means of the book and sample post, a great convenience to the public and a source of profit to the nation; the transmission of money through the post, which has also been undertaken by the office, more than pays its expenses, and is a real boon to such of the public as do not keep banking accounts. The question has lately been started of the Government taking up the telegraph lines, which it will no doubt do sooner or later. All these schemes are but partial recognitions of the one great principle, that in matters so vitally interwoven with the well-being of the community as the forwarding of intelligence, and even of parcels, it is advantageous that the Government should not leave the carrying trade of the country to the mercy of private speculators, but should maintain a well-organised and comprehensive system for the general convenience of the public who pay for it.

The present position of the original shareholders being, as I have shown by the foregoing statement of facts, most unsatisfactory, taken in the aggregate, I propose now to point out how, according to a new system of fares, they may retrieve some part of their losses. If the returns I estimate can be realised (and I believe they will be considerably exceeded) there will be a surplus in hand of about £20,443,382 per annum over the present passenger receipts. A portion of this surplus should of course be reserved as a fund for the future extension of the railway system, say £2,000,000; this would be sufficient to open about one hundred miles of new railway annually, and as there must some day be a stop to the formation of new lines, it is probable that after twenty years no more would be needed, or at least there would be no need to take this into account, because by that time the receipts would have increased sufficiently to defray the costs of such additions.

My proposal is, that Government should avail itself of the power it possesses, and unite the whole of the railways under one general management, as before stated, available for the whole population; a passenger being enabled to travel one journey of any distance in one given direction at a sum little more than nominal. As an illustration of the working and the results of such a scheme, I must take a supposititious case, of course, as it is quite impossible to foresee to what extent such a facility of travelling would increase the numbers of travellers, and it must be borne in mind that it need not be the actual number of individuals who would travel that might be increased (though their number would no doubt be considerable), but that the present travellers would avail themselves of the facilities offered them very much more frequently than at present; and in order to make such estimate, I suppose that the numbers at present travelling would be increased sixfold if they could travel one journey of any distance in one direction for the sum of threepence, which is the minimum sum I have based my calculations upon. Existing fares under the proposed minimum prices may remain as at present; they are comparatively few, and would not affect the calculations.

From the general summary, I find that during the year ending 1865, passenger trains to the number of 3,448,509 ran over 71,206,818 miles, carried 251,959,862 passengers, and produced £14,724,802; this gives an average of nearly 21 miles and 73 passengers for each train, that is about 3½ passengers for each mile, the average fare paid by each passenger being 1s. 2d.*

Six times the number of passengers could be carried for a very small (if any) additional expense, and if an universal fare of threepence was charged for any distance for each person, at a very moderate computation six times the present number would travel, and would produce £18,896,989, being £4,172,187 in excess of the present receipts.

The above calculation is made supposing that each person pays only a threepenny fare; but as it will be necessary to divide the passengers into different classes, a much larger receipt may be reckoned upon; for this purpose I would divide the traffic first in half, supposing that half the passengers would travel by single fares (that is to say, would pay for each journey at the time), and these I would subdivide into three classes as follows—at one shilling for first-class, sixpence for second-class, threepence for third-class:

Thus 2)251,959,862 total No. of passengers for 1865

125,979,931, half of ditto
6 times for contemplated increase

7)755,879,586

			s.
$\frac{1}{7}$ 1st class	107,982,798	at 1s.,	107,982,798
$\frac{2}{7}$ 2nd class	215,965,596	at 6d.,	107,982,798
$\frac{4}{7}$ 3rd class	431,931,192	at 3d.,	107,982,798
			20)323,948,394
			£ 16,197,419

The other half I consider would take yearly tickets, which would be issued for first and second-class passengers at £25 and £15 each respectively, giving the holders the privilege of travelling any distance in any direction, in carriages provided expressly for their use; this would give half the number of passengers multiplied by six as before, 755,879,586, divided by 365, to ascertain how many travel per day, say 2,070,903, divided again by 2, supposing that each person takes two journeys a day, which gives 1,035,451; of this number I calculate that 350,000 would take first-class, and 685,451 second-class tickets.

The one, at £25 per ticket, would give	8,750,000
The other, at £15 per ticket, would give	10,281,765
	19,031,765

We have from this the following results:—	
The single tickets producing..........	£16,197,419
The yearly ,, ,, ...	19,031,765
Contemplated receipts.................	35,229,184
Present ,, ...	14,785,802
Increase per annum	£20,443,382

Tickets might be issued for the three classes of single fares—worth 1s., 6d., and 3d.—in a similar manner to the other Government stamps, and a double fare charged to any passengers not provided with a ticket, just as an unstamped letter is charged double for the trouble of collecting the money; and by the adoption of such tickets all accounts would necessarily be much simplified, and the consequent saving in clerks' salaries would more than defray any additional cost there might be in carrying the increased number of passengers.

In cases where local season or yearly tickets are now issued at prices below the £25 and £15 for first and

* The average fares paid on some of the principal lines are as follows:—

	s.	d.	
Great Eastern	1	2	+
Great Northern	2	1¼	—
Great Western	1	10¼	—
Lancashire and Yorkshire	0	9½	+
London and South Western	1	9½	+
London, Brighton and South Coast	1	1	—
London, Chatham and Dover	0	9	+
Midland	1	5	+
North Eastern	1	4	+
North Western	1	11	+
South Eastern	1	0½	+

second class, it will of course be well to retain them; but as they will only confer the privilege of travelling on one line within certain limits their number is not likely to be great. The proposed new yearly tickets might, to suit the public convenience, be issued half-yearly, or even quarterly, at a small increased rate; and it must be remembered that the sale of these tickets would produce a large sum of money at the commencement of the year, and supposing £10,000,000 to be paid in January for such tickets, and the remainder at intervals of three months, the interest for one year, say £500,000, would be an item of some magnitude, while the amount in hand would be an important acquisition for working expenses, &c.

Another item which would increase the returns is that of excess luggage, &c., which produces about one million and a quarter annually. I propose that all luggage placed in the van should be paid for, and from this source, with the increased number of passengers, I estimate an annual revenue of about four millions.

With respect to goods traffic, I have not thought fit to enter into any calculations. Doubtless it would increase, but I do not think it at all likely to increase in the same proportion as the passenger traffic. A bale of goods, an ox or a sheep will perform but one or two railway journeys, but a passenger will travel day after day. An increased goods traffic, moreover, though producing increased profits, necessitates some considerable increase of expenses in the employment of porters, storage-room, and other charges; while the passengers simply require to be carried by the trains from station to station.

For the Government to take up the railways no money would be needed; each shareholder would receive in return for his shares Government railway stock, bearing interest at 4⅗ per cent. guaranteed by the State. The amount of these bonds to be given in exchange for the shares should be fixed by a competent tribunal, who should base their calculations on the average price of the shares for the past seven years, so as to arrive at a correct market value; the new stock would be proportionally equal in value to any other Government stock, and the railway proprietors would receive in return for their fluctuating shares securities whose value would vary no more than that of other Government stocks; there are many railways in which the shares have become utterly valueless, yet no doubt the holders of these worthless shares would think themselves hardly dealt with if they had to give them up for nothing. It would be as well in such cases, where there appeared an ultimate probability that these shares might produce a return, to issue to such holders, deferred bonds, to bear interest in the event of the profits from the railways exceeding a certain amount.

As the present returns of the railways, up to the end of 1865, show that a profit of 4⅗ per cent. can be obtained on the aggregate capital employed, the Government would be in a position to guarantee that rate of interest, dividing the stock of the different railways in such proportions as would fairly represent their several values.

The holders of deferred bonds should be entitled to interest when the profit, after allowing a sufficient sum for the further development of the system, enabled the State to pay them 1, 2, 3, or even 5 per cent. It might also be arranged that the ordinary railway stock should receive 5 per cent. after the profits of the system permitted it. But after paying this, which might be fixed as the maximum rate of interest, the surplus profits should be applied to the further improvement of the system, in the matters of comfort, and extension of the facilities of communication. Any further surplus would, of course, like the profits of the General Post-office, be placed in the national purse, and be applied to the reduction of taxation.

There will, no doubt, be many readers of this paper who will at once say that the idea of carrying a passenger from London to Edinburgh for threepence is preposterous, but we must remember that it was not until Sir Rowland Hill had shown its feasibility that any one thought it reasonable to take a letter from London to Edinburgh for the same charge as from London to Richmond. It may be said that the analogy does not exist, that the half ounce of a letter is nothing, but that a passenger is really heavy and makes some difference in the cost of running a train. In reply, I say that the delivery of a letter is the most expensive part of its cost to the Post-office, whereas a passenger takes himself away; that the average of trains run, could each carry six times as many passengers as are now conveyed by them, and though the expense might be slightly increased, the increase could be but extremely small, while the receipts, as I show, would be enormously augmented. Any increase of expense would also be further much more than met by doing away with a large number of ticket clerks and others, who would not be required under the new system. The foregoing calculations have been based upon the returns of 1865. Those for 1866 show more favourably for the correctness of my views, and I have no doubt those of 1867 will yet more fully justify my calculations, and the soundness of my plan and arguments.

Without uniting, under one management, all the railways in the kingdom, no considerable saving can be made, and the system cannot be developed as it ought to be, and no board representing different, and, in many cases, conflicting interests, can ever be made to work for the public benefit. The interests are national, and the management, to be effective, must be national also. At the present moment the Government can safely guarantee 4⅗ per cent. to the proprietors of railway stock, and this guarantee would at once raise the value, and, consequently, leave a large profit to the Government, therefore all railway proprietors would be benefited by the Government taking up their lines. The public would speedily reap the advantages of a complete and harmonious system of management, with regular and continuous trains running in all directions, and a general diminution of expense; trade would be benefited enormously by the increased facilities of traffic, while the effect upon the money market of at once converting £453,000,000 of sunk capital into readily convertible securities, would be a stimulus of enormous value to the country.

I now lay my scheme before the public, appealing confidently for its favourable consideration, on account of the benefits which all classes would receive from its adoption; in the first place, to railway proprietors, to whom its adoption would at once secure a certain return for their investments, which are, in most cases, now of very doubtful value. To those in authority I appeal, on the grounds of the public duty and high importance of developing to the utmost extent the resources of the country, as well as upon the certainty of increasing the revenue, both directly and indirectly; and to the public in general I appeal, on the above-mentioned grounds, and especially upon those of the enormously increased convenience they would obtain.

DISCUSSION.

Mr. Moxon said he thought there was a little discrepancy in the paper, which he should like to have explained. He thought, first of all, a uniform rate of 3d. was advocated, whatever might be the distance, and then afterwards fares of 1s., 6d., and 3d. were spoken of, which made the average higher than 3d.

Mr. Hawes said the paper they had just heard was rather a startling one, but the main element in it was an advocacy of Government interference. The Government were to take the whole management of the railways; and it was assumed that, whereas the average fare per passenger was now about 1s. to 1s. 4d., under that system it would be reduced to 1s., 6d., and 3d., at which there would be a profit, the average being about

10d. The calculations in the paper seemed to him to be quite untrustworthy. The numbers of persons who travelled annually were all mixed up together, including both long and short journeys; whereas, out of the total number, a very great proportion—one-third, if not more—were those who travelled short distances only, and who did not pay anything like a fare of 10d. for their journey. To all those this system would not be beneficial. Then it was assumed that six times as many persons would travel, and that that increased number could be carried at very little or no greater expense than the present number, which was equivalent to saying that they could carry 9 cwt. from London to Edinburgh at the same cost as $1\frac{1}{2}$ cwt. Then an analogy was drawn between railway travelling and the Post-office, and it was said that Sir Rowland Hill was the first person to discover that the great cost of carrying a letter was not in the mere transit, but in the distribution. But if passengers were carried at the same rate as letters it would come to this:—Letters were carried at 1d. per half ounce, which was equal to nearly £300 per ton; whereas, 3d. per passenger would be so small a tonnage rate as would hardly pay for the porters to carry the passengers' luggage from the booking office to the train, to say nothing of the cost of locomotion. The expense of carrying the passengers was not confined to the locomotive power; there was station accommodation to be provided for the whole length of the line, and other matters, which were altogether ignored. It was said that in carrying a letter from London to Edinburgh the main portion of the expense was caused by the receipt and delivery, and that the same thing applied to passengers; but this was not so; the two things were totally dissimilar. The letter was put into a bag, and not touched until the end of the journey, but the passengers' safety and comfort had to be provided for, and this formed a large element in the expense. If any accident occurred the letters were not damaged, but the amount of compensation which was awarded by juries in the case of a passenger killed or injured was tremendous. They were told that railways did not pay, and therefore the Government should interfere. That involved the great principle that Government management was cheaper than that of private individuals or companies, which he ventured to deny. He did not consider the Post Office was a fair illustration; but even if it were, he had not the smallest doubt but that if a company were established to conduct it with the same able management as was displayed in the case of the London and North Western Railway, the service would be performed at much less cost. He had such faith in the results of private enterprise, and they had such examples before them in the army and navy, the dockyards, and every branch of the civil service, of the cost and bad management of the Government departments, that he thought any one must be very bold who would venture to recommend that a great branch of the industry of the country should be put into Government hands. Government would never keep up with the requirements of the times. It always waited until it was driven on by the wants of the people, while private enterprise took the opposite course and anticipated and almost created those wants. He thought, moreover, it would be very undesirable to put into the hands of Government such an amount of political power as the appointment of two or three hundred thousand persons all over the country. This would be mischievous in a political sense; and he saw no reason to believe that better appointments would be made than at present, when able men were being continually drawn out from the ranks of the workmen to fill the offices of traffic and locomotive superintendents. Many of those who were now taking a distinguished part in the management of some of the great lines had been originally in the workshops, but under Government management, wherever there was a good berth, it was given to some one who had not been brought up in the department, and who, consequently, was often incompetent. He did not think the proposed change would be beneficial in any point of view. Directors had to study the interests of the public as well as their own, and were constantly considering, particularly on very special occasions, what was the lowest rate at which they could carry passengers, so as to stimulate traffic. Let them make fares as low as they liked, but in the winter months people would not travel beyond a certain extent. Travelling was not only a question of expense, but of time. People did not travel for the sake of riding in a railway carriage, but either for business or pleasure. He denied that it was the duty of the Government to take into their hands the great enterprises of the nation. By so doing they would place Englishmen in the position of the continental nations, looking to the Government to protect them from every danger and provide them with every necessary. They had taken the Post-office, and if they were to take the telegraphs and the railways, he did not know where they were to stop. Why should not they take up the cotton trade, the coal trade, or the iron trade, until the result would be that Englishmen would look to the Government for everything, instead of resting on their own energies? The only one instance in which the government was tolerably successfully was the Post-office, and he should dispute much that was said about that. It was allowed that there had been an average return of $4\frac{3}{8}$ per cent. on our railways, and taking into consideration all the circumstances, that was not so very bad. The competing lines spoken of were not lines running side by side, but were merely competing so far as the termini were concerned, but opened up entirely different districts between them, thus proving of great advantage to the country. If the interest was only $4\frac{3}{8}$ per cent., yet if capitalists chose to invest their money at that rate, it was their own choice, and they had certainly been of immense service to the country. The security, pleasure, and expedition of travelling were much beyond anything they ever were before, and these capitalists ought not to be deprived of their chance of future profit, though their property might be depressed. He believed the immediate future return of railways would be good, and in the distant future immense; and, therefore, for the Government to come in now, when private persons had taken all the risk, and pay the taxes of the nation out of the profits, would be most unjust, and, he believed, impolitic. He believed both the country at large and individuals would suffer, and the whole spirit and enterprise of the nation would be impaired if such a course were adopted.

Mr. Moxon said he had not had an opportunity of reading the figures quoted in the paper, but he believed the views of the author were based on one or two serious errors. In the first place, with regard to the 3d. fare: on the Derby-day and similar occasions, all the town would want to go to the Derby, and he did not see how the railways could accommodate the numbers. In his opinion Parliament had never done its duty towards railways. In the Manchester and Liverpool Bill there was a provision that not more than ten per cent. should ever be paid, but if ever there was an exception to a general rule it should have been in that case, where a few gentlemen joined together to try a great experiment. He (Mr. Moxon) had, on that occasion, suggested that there was a great opportunity for Parliament, and that they should employ their engineering staff, and at once lay out all the lines in the country, and let them to the lowest bidder, giving them facilities for obtaining the land with a Government title, so that the lines might be made at the smallest possible cost. The Manchester and Liverpool Company, with the aid of their legal assistants, found out a plan of evading the provision as to the rate of dividend by giving bonus-shares reckoned as fully paid-up, and paying dividends on the full nominal amount, and this ought not to be allowed. Sir Robert Peel, after the establishment of railways, thought the best thing for the public was to encourage as much competition as possible,

which he (Mr. Moxon) believed was a great mistake; and from the opening of the Trent Valley extension line he dated a great deal of the mischief which had taken place up to the present time. Speaking of the general system of railway management, he considered the great fault had been an attempt to get very rich very quickly, and the consequence had been rash speculation, with its inevitable results. After condemning the system of proxies, which threw too much power into directors' hands, he said that in many cases the prices paid for land would have frightened any one who was laying out his own money, in one instance £170,000 having been paid for a very small corner of a nobleman's park. The whole system of making what were pronounced by engineers and lawyers to be good lines at any cost, had been altogether injurious, and the consequence was that when one or two companies got into difficulties it seriously affected others which were managed wisely and well. In 1845 there was some difficulty on the part of railways in raising money, and bonds were very low in the market, when suddenly it was said that a large number had been withdrawn, being taken up by the Bank of England. He much regretted that they had never been able to get any accurate returns from the Bank, but he believed that about four millions of bonds were taken at that time by the Bank, the effect of which could not but be very serious. He believed the Bank had been obliged to hold the greater portion ever since, because the railway companies had been unable to redeem them; and when it was said, in 1866, that the Bank came forward and renewed a large number of the bonds of one company, he believed the truth was that they could not do anything else. Nothing would, in his opinion, cure the prevalent evils unless the proxy system were either abolished, or an alteration introduced into it, so that a week or ten days should elapse before the voting took place by means of proxies. By a fortunate accident, two years ago, all the proxies sent out for a meeting of the Great Eastern Company were rendered valueless from some informality in the stamps, and the consequence was that the board had to retire. He considered the use of proxies very bad, both as regarded the public and in the interests of the shareholders. What was now most required was a thoroughly honest and clear system of accounts, under which expenditure fairly chargeable to revenue could no longer be charged to capital.

Mr. S. Sidney was afraid they were rather losing sight of the main object which they should keep in view. The reform of the railway system was most important to all, whether shareholders or the public, but they must consider, not only what was desirable, but what was possible. There was not the least doubt that by bringing business habits and principles to bear upon railway matters great improvements might be effected, but they had now brought before them in a new shape the old project for Government interference. It was said that if Government had only begun and laid out a comprehensive system of railways, and prevented competition, very wonderful results would have followed; but at the time of the Liverpool and Manchester line being opened, Government had no engineering staff for the purpose, and the only Government engineer, the late Mr. Walker, gave his opinion directly in opposition to that scheme. Government had been consulted in one or two instances in railway matters, and in every case it had made a grand mistake. The Brighton schemes were referred to Government, the very worst plan was selected, and they saw what was the condition of the Brighton Company now. Again, when Government issued a railway commission, a most able report was prepared, which converted many persons, who thought that if its recommendations were carried out it would be greatly to the benefit of the nation; and it was said amongst other things that competition in the case of the Trent Valley line had done a great deal of harm; but would any one say now that they had not derived great advantage from the lines condemned by that commission? For instance, the Great Northern was condemned, but it had been of immense benefit in opening up new districts for manufacturing enterprise. He spoke only in the interest of the public. Railway shareholders must take care of themselves. What had been the result where the recommendations of the commission had been carried out? A late duke had received a handsome testimonial for assisting to drive away the railway from the valley of the Thames, and it was a question for some time whether a line should go through Oxford; now there were four, greatly to its advantage, whilst Northampton, which had opposed all railway facilities, now suffered bitterly for want of the accommodation. He knew of only one instance in which a railway had been abandoned, and that was a little line to Newmarket for the accommodation of persons going to the races. With so many good results, why should they turn round to the opposite system, and put the lines into the hands of the Government? It was only lately he saw a statement by a very intelligent French writer, that whilst staying at Perth he saw more trains passing than through any principal town in France. Some of the lines might not pay very good dividends, but they were an enormous convenience to the public. Look at the underground line; that would never have been completed under Government management, but when it was at length constructed by private enterprise its convenience could not be over-estimated. These things had been accomplished with money which would otherwise have gone to South America, Spain, or elsewhere. Englishmen would gamble in something. For many years past they had gambled in railways; they should rejoice to think that their so doing had benefited the nation at large. The paper was certainly of rather a startling nature, and seemed of somewhat the same character as a scheme for supplying trousers by Government at 6d. a pair. No doubt good and cheap garments would be supplied if the taxpayers made up the deficiency. Then, again, it would be a disadvantage for Government to have in its hands the appointment of all the officials, to say nothing of the political power thus conferred. When a man once had a berth under Government, unless he were either an absolute idiot or a defaulter in money matters, he expected to remain there for life, and promotion would not be, as now, by merit solely, but by seniority; and this would pervade the whole system, so that if a porter or station-master neglected his duty, the only redress would be an appeal to Parliament. We should be reduced to the condition of Prussia, where, it had been observed it was a great deal safer to kill a cook than to thrash a station-master. In England we had not the same system of producing first-class public officers as on the Continent, where the cleverest young men were constantly picked out from school and college and put into the public service. Here, he was happy to say, a great many stupid people went into the service of Government, and clever people devoted their talents to private enterprise. Our present railway system was unequalled in the world, and supply had kept pace with the demand; but this was never the case in Government management. The difficulty now was to extend what they had, not to make new lines. When they saw Government managing any commercial undertaking properly, it would be quite soon enough to ask them to undertake the railways. The Post-office was the worst example that could be adduced, for all the most important and difficult part was managed by private enterprise; the railways did the difficult part of the work by contract; and he quite agreed with Mr. Hawes, that if the Post-office were put into the hands of a Company the work would be done better and more cheaply. Every argument in favour of handing over the railways to the Government would tell just as strongly in favour of entrusting them with the clothing of the people, or giving them any other department of industry. While there were railway

directors they were amenable to their constituents and to public opinion, but when once any deficiency or shortcoming was made a Government matter, it must, of course, be defended by Government in Parliament, whether right or wrong. It was the interest of the public to be carried cheaply, but it was not the business of Government to do it.

Mr. N. F. Davin said there were two principal propositions before them in the paper, the first of which had been dealt with almost exhaustively, but the second had only been touched upon cursorily. The first was that Government should take the management of railways, and in opposition to that, the benefits arising from competition had been adduced, but it was impossible to have in such a matter as railways free competition. He did not think those who had enquiries to make at the Post-office found the officials so difficult to deal with as had been supposed by one speaker. Government officials were, as a rule, qualified men, and it was not likely that if Government undertook the management of the railways, they would not avail themselves of the services of the best men they could find. The most interesting question, however, was this—Was it possible to introduce—whether by Government or in any other way—an uniform fare for long or short journies, and that fare as low as 3d.? This was a most startling proposal certainly, but in endeavouring to follow the figures given in the paper, he thought Mr. Brandon seemed to make out a good case at any rate for consideration. Mr. Hawes' objection was certainly a very cogent one, that a large proportion of the travellers were for short distances, but considering that new things were constantly coming before them, which at first sight were quite as startling, but which soon passed into accomplishsd facts, he thought the feeling of every scientific man in such a question should be one of thoughtful consideration.

Mr. Botly had not altered the opinions which he had before expressed on the subject of the Government taking over the railways, but he might say in reference to one point mentioned by Mr. Moxon, that he was present at the last meeting of the Bank of England when it was announced that a much larger amount of railway bonds had been paid off than had been expected, and even more than was necessary, and the whole of the Bank proprietors present were perfectly satisfied with the information given them on this point.

Mr. Humphreys thought some of the strictures of Mr. Hawes were hardly justified under the circumstances; for instance, he had spoken of the expense of carrying passengers as including comfortable accommodation, porters, and so on, and also the cost of occasionally killing a traveller, but all these matters had been included in the calculation, if the figures given by the different railway companies were correct. The cost of stations, of course, formed part of the original outlay of £443,000,000 mentioned. Another point was that a great number of the passengers paid less than the proposed minimum, but deducting even fifty millions on that account—[Mr. Hawes—That would not be nearly enough.]—if even half were deducted, it would still leave a surplus according to the calculations made. Then Mr. Hawes said they could not send people running about long distances however cheap the fares were, but that was just the argument of Mr. Brandon, because there would not be so many expensive journies to make, and the returns would not be swallowed up. Allusion had also been made to the faults of Government management, but could anything be worse than the management of the London, Chatham, and Dover, and some other lines he could name? As to the idea that if Government took over the railways they would immediately put them in charge of an army of incapables, he thought no government would act so foolishly when they had before them such tried and trusted persons as the gentlemen who managed the London and North-Western Railway. In one sense there was scarcely such a thing as a competing line in the kingdom; certain lines were in competition to certain points (of which Exeter was an instance) and the result was that to those places only you could travel at very low fares, but at intermediate distances there was no competition. That showed the weakness of the present system, and there could be no doubt that a very large saving indeed would be effected if the whole could be brought under one management. The Chatham and Dover, South Eastern, and Brighton lines were now about to amalgamate in a certain sense, and although all the separate expenses of direction would continue, they reckoned on saving £100,000 a year by the arrangement. As to the political power that would be given to Government, it was no doubt a point for consideration; but he thought they were approaching a time when the political power of a Government would be less than it had been. He thought the great object was to bring the whole system of railways under one management, and if this could be done without placing them in the hands of Government, he should much prefer it, but he did not see how this was possible. The other point was the system of universal fares, and that, he believed, on full and mature consideration, gentlemen would find more feasible than they at first supposed.

Mr. Brandon said he had unintentionally led some of his friends into error. He was not specially in favour of placing the railways under Government management entirely, but of uniting them all under *one* management; whether as a branch of the Civil Service or under a company, the great object was, that all should be under one management, and without that there never would be proper arrangements. He was no advocate for Government taking up the lines, but he did not see how any other power could effect the requisite amalgamation. They had reserved the right of purchasing all the lines after a certain time, and their powers could then be delegated to any body they thought fit to entrust with them. Even at present, no line could be opened for traffic until it had been inspected by a Government official. He had not referred to the carriage of letters as an analogous case, but as an illustration. It was quite true that there was no means of testing the supposition that six times the number of journeys would be made. He only knew that, for his own part, he should travel six times as much; and he now found that whenever he went a long distance he had no difficulty in procuring a first-class carriage for his own use. He was sorry to find that the discussion had not turned so much upon the real practical points of the system which he proposed as upon the question of Government as against private management.

The Chairman, in proposing a vote of thanks to Mr. Brandon, said he must concur in the opinion that the views put forward in the paper were somewhat startling, but he could not but think that some of the more important points had been lost sight of in the discussion. The question of Government taking up the railways had been discussed more than once in that room, and the general feeling of every meeting had been against it, for the simple reason, that, although they might have the best officers, they never would have the same amount of progress as under private enterprise. He remembered that on the many occasions when Mr. Brunel was examined on the subject, he always said that there was a continual progress in railway matters, which never could be the case except under a system of private enterprise. Mr. Brandon had referred to the present scramble for traffic amongst the different lines. The object of the working union between the South-Eastern, Chatham and Dover, and Brighton Companies was to avoid this, and to save expense and consult the public convenience by harmonious arrangements. Instead of having three trains starting at about nine o'clock from different termini, they would have one at nine, one at ten, and one at eleven o'clock; and it was calculated that the number of trains could be reduced by one-half, and yet the public would be better served. As to the reduction of fares, he did not think they had

yet any adequate idea of the extent to which it could be carried with the object of increasing traffic, and this view was certainly supported by the analogy of the Post-office. He hoped excursion trains would be done away with, as he believed they were a fruitful source of disaster, and that instead, ordinary trains would be run at very low fares for long distances. Another matter deserving of consideration was the system adopted by the railways of endeavouring to compel passengers to travel in the more expensive class of carriages. There was a story of a nobleman who said he travelled in the third-class because there was not a fourth; that might be a matter of individual taste, but he believed the third-class passengers were the most profitable, and it was certainly upon them that the Metropolitan Railway chiefly depended. They had gone through three phases of railway construction. In the first they were made by private individuals, then the public came in, and then they had what were called contractors' lines. He did not think the general public would ever again embark largely in railway enterprise, but they would come, be believed, to this, that the land through which a railway passed must bear a large proportion of the expense of construction in consideration of the improved value given to it. The right principle would be that the land for a certain distance each side should be taxed for the construction of the railway, for an enormous addition was made to the value of it, to which the owners were in no way entitled, or else this improved value should be taken into account in assessing the amount of compensation. The enormous prices that had been demanded for little bits of land would not be given again, for that was at a time when in many quarters there was a great prejudice against railways, and when towns did all they could to keep railways away from them. In all new matters they had to live and learn, and to go on improving, and whether they looked at the railway or the postal system, they might congratulate themselves on the progress that had been made. He believed that future progress would be made rather by unions of different companies for harmonious working than by Government undertaking the management, although in such a state of things a more complete Government inspection and control in the interest of the public might be necessary, in order to keep the companies up to their duty. Still it was true that for many years to come their own interests would probably be sufficient for that purpose. He was an advocate for private responsibility, not for having Boards numbering a dozen or twenty, but three, five, or seven, and making the individuals responsible. He believed the system of private management and responsibility would be found to be at the root of all successful enterprise. He was sure they would accord to Mr. Brandon a vote of thanks for his interesting paper.

The vote of thanks was then passed and acknowledged.

PARIS CENTRAL SCHOOL OF ARTS AND MANUFACTURES.

The Minister of Agriculture, Commerce, and Public Works has just issued the programme of the conditions of admission to this important school, which is open to foreigners as well as natives of France, and on the same conditions. Diplomas of "Engineer of Arts and Manufactures" are granted annually by the minister to those pupils who are recommended by the Council of the School as having passed through all the examinations in a satisfactory manner, and Certificates of Capacity are granted to those who have exhibited sufficient knowledge in the most important departments of instruction. All the pupils are out-of-door scholars, and no uniform, nor any other distinctive mark, is worn by them. The course of study occupies three years, and the fees, including the costs of experiment, are 800 francs (£32) per annum, half the amount being paid on entering, and the remainder, in two equal instalments, in the months of February and May. The only other conditions are—the deposit of a sum of 35 francs to defray any losses or injuries done by the pupils' negligence, and the purchase of the necessary books and instruments, which may be had at the school, at rates fixed by the director.

In the case of pupils, natives of France, whose families are not in a condition to defray the costs of the school, subventions are granted by the State, under certain conditions, but this, of course, does not apply to foreigners.

All pupils must pass an examination before admission, and these examinations take place twice in the year, namely, in July and October. The programme for admission consists of compositions and oral examination in the following subjects:—French language; arithmetic; elementary geometry; algebra, as far as the general theory of equations exclusively; rectilinear trigonometry; analytical geometry; descriptive geometry; physics; that part of the usual course of the lycées which precedes heat; chemistry; rudiments of metallurgy; natural history; freehand, linear drawing, and tinting. In addition to these, the pupil is examined also in the general subjects, as in other superior schools. Full particulars are to be obtained by application to the secretary of the school. The pupils must have attained the age of seventeen on the first day of the year of application, and must produce testimonials of good conduct, and a certificate of vaccination.

Fine Arts.

Art Exhibition at Pau.—The fifth exhibition of the Society of the Friends of Art, of Pau, is now open, and will remain so until the 27th of April. Considering the remoteness of this fashionable resort in the Pyrenees, the number of works exhibited is very large, namely:—361 pictures and drawings, and 21 pieces of sculpture, the latter including a charming statuette, entitled "Concordia," and a bust of Richard Cobden, by a well-known sculptor, M. Mégret. Twenty-two works have already been purchased by amateurs, but the selections of the Society itself are not yet made; the Museum of Pau and the English Club there are also expected to be purchasers. Altogether this exhibition promises excellent results.

Manufactures.

Pellet Gunpowder.—The March *Army Circular* contains an appendix in the form of a list of changes in artillery *matériel*, small arms, and other military stores, with instructions relating thereto. These lists of changes will in future be issued monthly with the *Army Circulars*, instead of quarterly as heretofore. The present list contains an order that pellet gunpowder is to be provisionally adopted for all gun charges of 50 lbs. and upwards. The difference between this and ordinary granulated powder is due to the fact that the composition, after having been converted into "meal" in the breaking-down machine, is pressed at once into cylindrical pellets instead of being made into "press cake" and then broken into grains in the granulating machine. The pellets are formed by the meal being placed in a number of holes in a metal plate, into which closely-fitting punches (having projections that form a cavity in the end of each pellet) are forced by hydraulic pressure, adjusted to give the density required. This is the method by which pellets for fuzes and blank ammunition for Snider rifles have long been made in the royal laboratories. When the pellets are dry they are drummed for about half an hour with black lead to glaze them. The following are the particulars of the powder provisionally approved:—Range of density of the pellet, 1·65 to 1·7; diameter of pellet, 0·75 in.; depth, 0·485 in. to 0·495 in.;

diameter of cavity, or indentation in end of pellet, 0·2 in. at top, 0·15 in. at bottom; depth of ditto, 0·25 in.; range in weight of the pellets, 18 gr. to 95 gr., *i.e.*, about 78 to the pound. Pellet powder has been introduced in consequence of its exercising a materially less destructive effect on the guns than the present L. G. R. powder, than which it exerts a smaller maximum pressure. The repeated failures of 13-inch guns, only two of several of these pieces now remaining serviceable, was doubtless due to to the destructive quality of this L. G. R. powder when used in very large charges; and, accordingly, the select committee, after instituting experiments with pellet powder, and comparing them with the results obtained in Russia and in America, recommended the introduction of this powder for the guns of the future, in which the charge would exceed 50 lbs. There are no guns larger than the 9-inch of 12 tons actually in the service as yet, though experiments have been made with a 10-inch rifled gun at Shoeburyness, and some 12-inch guns have been constructed during the last year; so that the introduction of the powder will be simultaneous with that of these heavier guns. We may therefore hope that no more large and costly guns will find their way to the list of those which have already yielded to the destructive action of our large grain rifled powder, which is far more powerful than that used by any other nation. Further experiments with pellet and prismatic powder are still in progress, and are likely to extend over a considerable period.

Commerce.

Supply of Grain and Flour for France.—The Minister of Commerce and Agriculture has just presented a report to the Emperor, stating what measures have been taken to facilitate the importation of grain into the country. In the first place, the surcharge on grain and flour imported in foreign vessels was suppressed by decree in November last, and the effect of this measure is shown by the returns of the port of Marseilles; it appears that during the two months preceding the suppression of the surcharge, there were less than 30,000 quarters of grain brought into port by foreign ships, whereas, during the two succeeding months the quantity reached 35,000 quarters. At the instance of the Government, the French railway companies at the same time sent all the trucks and locomotives they could spare into Germany to bring wheat from Hungary into France; the necessity for this has now ceased, and the German railway companies are able to carry all that is presented without assistance. By these means there have been brought into France, by sea and land, between the last harvest and the end of February, about 572,000 tons weight of wheat and flour. The next object to be achieved is the distribution of the supply over the country, in order to produce an equality of price in the various markets, the quotations varying at present from 26 to 30 francs per hectolitre in the east, to 34 and 38 francs in the central and western departments of France. With this view, a diminution has been made in the charges made by the railways for carriage; in the first place, the price was reduced to seven centimes a ton per kilometre, rather more than a penny per mile, on all the lines, except the Western, in whose case the rate was ten centimes, according to a provision to that effect on the price of wheat reaching 20 francs at certain markets. By an arrangement with the railway companies, a further diminution has been made in the tariff of charges, amounting in the case of long distances to about 50 per cent. on the rate just quoted. The present charges are, 6, 5, 4, and 3½ centimes per ton per kilometre for the respective distances of 200, 400, and 800, or more than 800 kilometres. The reduced rates are to be maintained for four months at least. The diminution applies to the carriage of grain, wheaten and rye-flour, rice and buckwheat.

Colonies.

British Guiana.—The papers received by the late mail from this colony contain reports of the opening of a new building erected in Georgetown, in connection with the Royal Agricultural and Commercial Society, for the purpose of a local museum. The opportunity was taken to hold an exhibition of indigenous and foreign products of the greatest possible diversity, and it appears to have been a complete success. The following particulars are taken from a local journal, and we think it will be admitted that such efforts are in the highest degree creditable to colonial communities, and especially to such as have to encounter the difficulties of production with an insufficient supply of labour. The Committee of Correspondence, by whom these exhibitions are organised, are, we understand, anxious to direct the attention of those interested in colonial progress to the claims of the newly-established institution to their support in the way of contributions of any suitable specimens:—"The great event of the fortnight has been the local exhibition, which was opened on Thursday, the 13th February, and at the same time the inauguration of the local museum. Shortly after one o'clock his Excellency the Governor arrived, and the proceedings were opened by the Lord Bishop reading prayers suitable to the occasion, and the Honourable E. G. Barr then presented an address to his Excellency, from which the ollowing is an extract—'As an educational establishment I recommend the museum to the favourable support of the Legislature, as it will no doubt prove to be the storehouse from which the youth of the colony will draw much valuable information, which may in the end incite many to increased efforts towards the development of the vast resources of this great country.' To this his Excellency made a suitable reply. Mr. Oliver, as president of the Royal Agricultural and Commercial Society, then read an address, of which the following are some of the most interesting portions—'It may not be out of place here to draw a comparison between the export of sugar—the main staple of the colony—in the year 1854, when the first local exhibition was held, and the export in the year 1866, twelve years afterwards. In the year 1854 there were exported 56,580 hogsheads of sugar, and in the year 1866, 91,580 hogsheads. This great and progressive increase, which bids fair in the present year to raise the crop to nearly 100,000 hogsheads, has been produced by importing labourers from distant lands, viz., India and China, who find a profitable field for their labour, and many of whom, in returning to their native country, carry with them the results of their diligence in the wealth they have earned. . . . In the year 1854 the average yield of sugar per acre did not exceed one ton, while at the present time the yield does not fall far short of two tons per acre. It would require no prophetic powers to tell how, in the proper employment of labour, the result would be a doubling of the present production. But while the means of more effective culture have been taken advantage of, the processes of manufacture have, equally if not in a greater ratio, been improved. The common processes of manufacture now exist on comparatively few estates. Improved processes, especially in the use of bisulphite of lime, have become almost universal. Few of the estates of great importance are not possessed of vacuum-pan machinery, thus enabling the proprietors to send into the market an article which meets at once the requirements of the consumer without undergoing the process of the home sugar refiner. And to the energy and enterprise of our landholders this result must be attributed. Who here present would not wish them further and unbounded success? Another point may be mentioned, and it is one which has contributed, although none of us could have predicted it, to the present prosperity of the colony. Alluding again to the period of

the first exhibition in 1854, the colony was then, as it is to a great extent now, supplied with breadstuffs from the United States of North America, and in return the ships carried away our life blood, our metallic currency. But times are changed. We receive our breadstuffs, and in exchange we give our chief staples—sugar and molasses, taken in large quantities, and to us on more favourable terms than can be procured in our mother country. And thus it happens, as would hardly have been believed a few years ago, that we can compete in a free country with the employers of slave labour. Nevertheless, it cannot but be remembered with anxiety that our exports are so few. Shall we continue to depend on one or two staples? We must look before us. Cannot we produce within ourselves one of the principal articles of import —viz., rice? In answer, we would simply ask anyone to view a sample of rice and straw grown in this colony and exhibited by Mr. Lorimer, of Plantation Wales. If such can be produced, why not grow a sufficiency for our own consumption, nay, even for exportation? It is incumbent on our proprietors to see to this. We need also a fresh impulse in the production of such articles as coffee, tobacco, cocoa, and farinas, and it is to be hoped that these may soon form an important addition to our limited exports. And now to revert to a subject of much importance, viz., the facilities which our museum will afford in an educational point of view. On the importance of the study of natural history as a subject of education, it is hardly necessary here to enlarge. It must be well known to most persons present, the high value attached to it by the leading Educationists in England. With these views before us, coinciding as they do with all our best aspirations, can we doubt for a moment that those in this colony who legislate for the well-being of all classes will not fail to render whatever aid is necessary in promoting a scheme so valuable in the training and educating of the rising generation.' In his reply, his Excellency said:—'I entirely concur in the sentiments expressed in the Address with regard to the Exhibition, and I earnestly hope that it may lead to the further development of our trade, and to an increased supply of the staple articles of food of the masses of our population. The Exhibition is so interesting in all its sections and so highly creditable to the exhibitors that I shrink from calling attention to particular objects, but there is one section so important that I cannot refrain from deviating from my original intention. I refer to the live stock section, and chiefly with the view of pointing out the great importance to the colony of raising a much larger supply of stock. It is owing, in a great measure, to the high price of animal food that the cost of living in British Guiana is so excessive. It has been my duty on frequent occasions to direct attention to the great increase of the trade of the colony, owing to the judicious employment of capital, and to more scientific cultivation of the land. The demand for our staple product which has recently sprung up not only in the United States of America, but in the new dominion of Canada, is calculated to produce most important results. It is most gratifying to me to observe that, under a system of free trade, British Guiana is able to compete in the markets of the world with the products of countries where slavery still prevails; and it is most satisfactory to reflect that capitalists need no longer feel that constant apprehension of Imperial legislation which cramped their energies prior to the abolition of slavery and of protection, and which, however inevitable it was, necessarily produced most calamitous results to individuals.' The idea of having a Fine Arts Department was a happy one, as proved by its success, the call for contributions having been answered to an extent which one could not have anticipated. There are paintings and engravings of various descriptions, some of them exceedingly well executed, and there are also articles of vertu; some fine specimens of statuary, carved ivory work, bronzes, old china and valuable books. Indian curiosities and many other objects attract attention, and there is one part of the gallery devoted to specimens of embroidery, work in wool, worsted, wax, and beads, the greater portion of which are contributed by pupils of the Ursuline Convent School, and speak well for both pupils and instructors. On each side of the entrance are large cases of stuffed birds and animals of various kinds, including the tiger, the tiger-cat, wild-hog, and many others. In the centre of the hall is a large case containing silver and plated articles, jewellery, jugs, masonic emblems, swords, and pistols, &c. There are fine specimens of native gold, and quartz glittering with particles of gold, which have been obtained from the diggings at Cuyuni. Near this case are two tables made of colony wood, inlaid, the workmanship of which would do credit to a first-class tradesman in England. There is some coolie jewellery, which is really attractive, and merits praise as being made in the colony. Of the products of the colony, the list is almost interminable, including starches, gums, barks for medicinal purposes and for dyeing, various other articles available in medicine, oils for external or internal use, such as cocoanut, and laurel oil, cotton fibres, cassareep, pepper, chocolate, cocoa, fruits, preserves, &c. The sugar department attracted much attention, and the jurors had great difficulty in coming to a decision when examining the specimens for the purpose of awarding prizes. It is here open to us to protest, on behalf of the planters of the colony (says the colonial paper from which these particulars are taken), against the unjust legislation of the mother country, which prevents their making first-class sugar for exportation, and excludes them from a fair competition with the refiner in the home markets. Be this as it may, we may sum up our notice of the articles exhibited by saying that any stranger looking at the oils, gums, starches, barks, and other colonial products cannot fail to be impressed with a powerful sense of the vast resources of the colony."

Obituary.

John Herapath was born on the 30th May, 1790, at Bristol. His schooling was of a very limited character, and his knowledge seems to have been acquired almost entirely by private and persevering study. At the age of nineteen his great parts and attainments had already attracted the notice of some of those friendly men who love to encourage youthful ardour, and in the year 1809 he was introduced by Mr. William Perry, at his house at Winterbourne, to Mr. Davies Gilbert, a man of fortune, addicted to the study of mathematics and physics, in which he attained some distinction, and a member of Parliament. He received the young student kindly, and his encouragement became a new stimulus to exertion. From this time Herapath pursued his studies with unabated energy, and must have engaged in original researches, for he says that in July, 1811, he was calculating lunar equations, with a view of completing the theory of the moon's motion. In 1815 he married. Soon after this marriage he gave up business and became a teacher of mathematics. Mathematical physics claimed his chief attention, and more particularly the explanation of the phenomena of heat, light, gravity, and cohesion. What was avowedly the great aim of his ambition was the investigation of the laws of the planetary systems, and of cosmical science. His hope was to complete the task of our great countryman Newton, and to enable us to rival the "Mécanique Céleste" of Laplace. In 1818 we trace a contribution of his in the "Annals of Philosophy," Vol. xi., p. 209, on the "Law of Continuity." In 1819, in Vol. xiii., p. 364, there is a paper on "New Demonstrations of the Binomial Theorem." In 1820 he offered a paper to the Royal Society, which, however, was not accepted, and the

matter produced much controversy. At the end of that year Herapath came to the neighbourhood of London, at Cranford, where he again opened a school for mathematics, and for preparing young men for the navy. For several years his public labours alternated between his communications to the "Annals of Philosophy" and "Philosophical Journal," and the controversy with the Royal Society. In 1821 he wrote a paper on the "Theory of Evaporation," published in the "Annals of Philosophy" for April and May. The list of his scientific papers is particularly varied, but much of the material was incorporated in his work known as "Mathematical Physics," and published in 1846. Among his friends was Lord Brougham, who solicited Herapath to correct his mathematical works, and induced him to write for the Useful Knowledge Society, in 1827, a treatise on the "Differential and Integral Calculus." As a journalist his name is known in connection with the "Railway Magazine," called also the "Annals of Science," which contained valuable contributions to physics and mathematics, and their application to the science of the new art of railways. In the latter part of his life he abandoned mathematical teaching, and in 1832 he left Cranford for the metropolis, residing long at Kensington. In the last two years a failure of memory and strength warned him of the end, and, after a short illness, he died on the 24th Feb., 1868, at the age of nearly 78 years. He was elected a member of the Society of Arts in 1865.

Notes.

Exhibition of Poultry in Paris.—An exhibition of poultry, singing, and other birds, is announced to take place at the gardens of the Société d'Acclimatation in the Bois de Boulogne this month (April), to open on the 19th and close on the 26th. Two former exhibitions of the kind took place at the same gardens in 1862 and 1863 with marked success. It is said that there will be at the same time a show of fancy dogs.

The Works of the late Léon Foucault. — The Emperor has decided that the publication and completion of the works of the late celebrated natural philosopher shall be carried on at the cost of the Civil List; a sum equal to £400 per annum is set apart for the purpose, and especially for the completion of the experiments, and the construction of apparatus projected by M. Foucault.

Correspondence.

Mr. Fairlie's Paper on Railways.—Sir,—As one of the oldest members of the Society, perhaps you will allow me to make a few remarks upon one of the most able and practical papers upon the subject which this session has as yet produced, and to express my great regret that I was unable to attend, to have expressed my entire and cordial concurrence in the vote of thanks proposed by the noble Marquis in the chair. It is seldom you meet with men of talent who have the moral courage to express their feelings regardless of the position of the parties against whom they inveigh, be they engineers, directors, managers, or secretaries of railways. Mr. Fairlie has done this, and has given a mass of figures and facts, in the general result of which I most cordially agree. He was corroborated by the silence of those who were present, although there were some of the most influential men, who could have enlightened the meeting by a confirmation or otherwise of the statement of facts put forward by Mr. Fairlie; and I am sure that that gentleman had reason to express "his great disappointment at the way in which the paper had been discussed, as not one of the main points brought forward had been in any way touched." There can be no question but that the present extravagant system of locomotive power is not only expensive but destructive, and this would be avoided by the adoption of tank engines, the first of which competed with the "Rocket" at the trials upon the Liverpool and Manchester Railway in 1829, and in 1837-38, four others were constructed by myself, as contractors' engines, for the Eastern Counties Railway, when I introduced the outside cylinders, complained of at the time for the alleged unsteady motion thereby increased in the travelling of the engine. These points were discussed at that period by Mr. Edward Woods and myself. I have no hesitation in agreeing with Mr. Fairlie that the dividends from railways would be enormously increased by a reduction of the wear and tear, both of the permanent way and of the locomotive power, together with the better construction of the rolling stock. With regard to the Eastern Counties Railway, of which I was the projector, promoter, and constructor for a period of nearly ten years, the balance-sheets, as issued to the shareholders, show an enormous amount for repair of permanent way, which could be reduced by proper management at least £50,000 per annum. In conclusion, although I do not quite agree with Mr. Fairlie in some of the details, I am certain he has hit the right nail on the head.—I am &c., John Braithwaite, C.E.

14, Abingdon-street, Westminster, March 25, 1868.

Mr. Fairlie's Paper on Railways.—Sir,—With reference to Mr. Fairlie's very suggestive paper, although not myself an engineer, I may yet be allowed to remark—1. Granting the possibility that the present enormous weight of our railway engines and carriages may be necessary to give a profound security where the velocity travelled is 30, 40, or 50 miles an hour, the same weight cannot be necessary on our metropolitan lines, where the rate of travelling is only 10 to 15 miles an hour. 2. Could the enormous size and weight of the boilers on our metropolitan railways not be reduced if there were stationary boilers to supply the locomotives with hot instead of cold water as required? 3. Our forefathers believed only in the security of enormously ponderous coaches. We now only believe in the light broughams. Does the fallacy which once existed regarding coaches not still dominate over us regarding railway carriages and engines? Being a holder of stock in a metropolitan railway, I am interested in Mr. Fairlie's economical suggestions.—I am, &c., Geo. Wyld, M.D.

MEETINGS FOR THE ENSUING WEEK.

Mon......Royal Inst., 2. General Monthly Meeting.
Society of Engineers, 7½. Mr. Sydney A. Reade, "The Sewerage Works at Redhill."
Entomological, 7.
Victoria Inst., 8.

Tues ...Civil Engineers, 8. 1. Discussion, "The City Terminus Extension of the Charing-cross Railway." 2. Mr. Wilfrid Airy, "On the Experimental Determination of the Strains on the Ties of a Bow-string Girder."
Pathological, 8.
Ethnological, 8. 1. Dr. A. Campbell, "On the Tribes around Darjeeling." 2. Dr. Edw. Mergon, "An Account of some Cases of Arrest of Development." 3. Mr. Francis W. White, "Notes on the Native Inhabitants of Formosa."
Society of Arts, 8. Cantor Lecture. Dr. F. Crace Calvert, "On Chloride of Sodium."
Syro-Egyptian, 7½. Mr. Black, "On the proper Identification of the Melita of St. Paul."

Wed ...Geological, 8. 1. Mr. W. H. Flower, "On the Affinities and probable Habits of the extinct Australian Marsupial, *Thylacoleo carnifex*, Owen." 2. Mr. E. Hull, "On the Thickness of the Carboniferous Rocks of the Pendle Hills." 3. Mr. E. Hull, "On the relative Ages of the leading Physical Features of the Carboniferous Districts of Lancashire and Yorkshire." 4. Mr. D. Hatch, "On a Saliferous Deposit in St. Domingo." Communicated by Sir R. I. Murchison, Bart.
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
Archæological Assoc., 8½.

Sat ......R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 21st March*, 1868.

142. West India Islands, &c., Relief—Account.
Cholera (Constantinople)—Despatch.
China (Treaty of Tien-tsin)—Memorials.
Public Petitions—Ninth Report.

Delivered on 23rd March, 1868.

55. Bill—Indian Railway Companies.
58. ,, Ecclesiastical Buildings and Glebes (Scotland).
63. ,, Election Petitions and Corrupt Practices at Elections (amended).
67. ,, Tancred's Charity.
72. ,, Compulsory Church Rates Abolition (amended on re-commitment).
150. Education—Return.
152. Westminster Hall—Correspondence.
157. Victoria—Further Correspondence.

Delivered on 24th March, 1868.

57. Bill—Titles to Land Consolidation (Scotland).
60. ,, Canongate Annuity Tax.
71. ,, Representation of the People (Ireland).
73. ,, Inclosure.
101. Court of Session (Scotland)—Returns.
114. Parishes—Return.
156. Poor Law Rating—Letter.

Session 1867.

575. Colonial Governors and Bishops—Returns.

Delivered on 25th March, 1868.

65. Bill—Reformatory Schools (Ireland).
66. ,, Railways (Guards and Passengers Communication).
64. Military Reserve Funds—Account.
146. Provincial Colleges (Ireland)—Letter from T. Wyse, Esq.
153. Meat Supply—Return.
Schools Inquiry—Report of Commissioners, Vols. 2; 3; 4, Part I.; 5, Part II.; and 6.

Patents.

From Commissioners of Patents' Journal, March 27.

Grants of Provisional Protection.

Bedsteads, &c., metallic—899—W. Hulse and E. Williams.
Blinds, Venetian—797—R. M. Chevalier.
Boilers—842—W. Hawthorn.
Boilers, heating the feed-water for—819—J. Slater.
Boilers, supplying with water—848—W. A. Lyttle.
Boot and shoe soles—760—W. R. Lake.
Boots and shoes, machinery for finishing—879—P. F. Gubault.
Bottles, feeding—783—T. Atkins.
Boxes, &c., closing and securing—878—W. A. Lyttle.
Candles, composite—785—J. Houston.
Carriages—875—F. Mulliner.
Cartridges—888—H. A. Bonneville.
Cigar tubes and pipes combined—809—L. Blumfeld.
Cinder sifters—854—A. and E. Geary.
Combing machinery—793—C. E. Brooman.
Cotton, &c., combing—895—P. J. Livsey.
Cotton, &c., preparing, &c.—833—S. Brooks.
Dyeing, &c., brown colouring matters for—821—C. D. Abel.
Engines—825—J. G. Douglas.
Engines—882—A. Baumann.
Engines—883—T. S. L. Beech.
Engines and boilers—831—H. E. Smith.
Engines, carding—871—W. Bellhouse, jun., and R. Ashworth.
Engines, speed regulator, &c., for—1—W. R. Lake.
Engines, traction—890—D. Greig.
Engines, &c.—862—W. McNaught.
Fibrous materials, preparing rovings from waste—850—T. Barnes.
Fire guards, &c.—791—H. Symons.
Flour, &c., crushing and sifting—881—E. V. de Forville.
Fuel—901—W. E. Gedge.
Game, new, played with balls, cues, &c.—3313—J. H. Brown.
Gas—747—G. Davies.
Gas—820—W. B. Kinsey.
Gas, &c.—891—W. E. Newton.
Girders or rails, &c.—837—B. Browne.
Glove boxes, &c., fastenings for—709—F. Neiber.
Gloves with pockets—811—W. Pidding.
Harness, &c.—876—J. Clay.
Horse rakes—897—R. Sims.
Horses, &c., clipping—866—S. H. Salom and T. Field.
Iron and steel bars, finishing, &c.—823—J. Jones.
Iron and steel, puddling—884—H. F. Griffiths and A. Beard, jun.
Iron and steel, &c., rolling—840—M. T. Shaw and T. H. Head.
Iron castings—846—W. Thompson.
Kitchen ranges, &c.—801—F. J. Baynes.
Knives, &c., cleaning and polishing—822—S. Desborough.
Lace—858—S. Bates and W. Redgate.
Lamps, indicator, for cabs, &c.—873—J. P. Knight.
Liquors, fermented—861—M. Rowand.
Liquors, measuring spirituous—754—A. V. Newton.
Looms—180—H. A. Bonneville.
Looms—787—H. Hargreaves.
Looms—827—A. Bourdon.
Lubricators—828—A. V. Newton.
Magnesia, sulphate of—836—F. Winser and I. Swindells.
Manure—855—B. Britten.
Millstones, dressing—829—J. Wallis.
Millstones, dressing—880—J. Norman.
Motive-power—847—H. Fletcher.
Nails and spikes—877—J. Carter.
Nuts, machinery for making metallic—803—P. Koch.
Paper bags—834—E. and J. Broadbent.
Paper, &c., utilisation of the waste products in making—835—F. Winser and I. Swindells.
Pistons—868—W. G. Beattie.
Railway rolling stock, &c., applying springs to—872—J. B. Handyside.
Railway signals, &c.—852—J. Hodgeson.
Railway wheels, &c., tyres for—805—J. Jeavons.
Rubber, &c., making articles from hard—815—W. H. Halsey.
Sewers and drains—482—J. Towle.
Shafts, axles, &c.—860—G. F. Lyndon.
Ships' compasses, &c.—843—F. A. Paget.
Size, &c., machinery for preparing—777—J. Eastwood.
Slate, &c., ornamenting—896—J. S. Gee.
Smoke, consuming—718—J. Barker.
Spindles and shafts, foot-steps for—795—W. Berry.
Steel, &c.—830—C. Attwood.
Stereoscopes—799—W. H. Warner and R. C. Murray.
Telegraph cables, &c.—838—T. Walker.
Telegraphic apparatus—892—W. E. Newton.
Traps, stench—817—P. F. Halbard.
Trusses—885—W. and W. Arthur.
Tubes, speaking—869—S. Holness.
Tunnelling machinery—813—P. W. Barlow.
Vehicle wheels, &c.—894—J. H. Johnson.
Vessels, ballasting—853—W. E. Newton.
Vises, &c.—851—A. P. Stephens.
Water, raising—824—R. Meldrum.
Water, raising—839—S. Naylor.
Weapons, side—863—C. S. Möller.
Window frames, &c., pulleys for—845—F. Ryland.
Worsted, &c., spinning—864—H. Kershaw.
Yarn, preparing and conditioning—806—W. Hartley.

Inventions with Complete Specifications Filed.

Cartridges—930—C. E. and J. Green.
Fuel—970—V. A. Deaubeuf.
Machines for overcoming resistance—944—H. F. Shaw.

Patents Sealed.

2744. M. Hamer.	2807. A. Bradburn & S. T. Marsh.
2751. W. James and W. Hill.	2848. T. Blackhurst.
2752. J. Donald.	2904. W. E. Newton.
2765. R. Fletcher.	2924. H. Sharp and F. W. Webb.
2778. H. Haschke.	278. G. Kellogg.
2787. G. Townsend.	442. W. R. Lake.
2794. J. Gutmann.	443. W. R. Lake.

From Commissioners of Patents' Journal, March 31.

Patents Sealed.

2759. J. G. Jones.	2877. J. H. Johnson.
2760. G. Allibon and A. Manbré.	2901. F. D. Frost.
2766. T. E. Clarke.	2910. E. Shaw.
2767. W. and S. Smith.	2942. A. F. Jaloureau and C. L. Lardy.
2768. R. H. Taunton.	3019. F. M. Smith.
2769. F. Parkes.	3042. E. B. Wilson.
2773. J. H. Nelson and T. Briggs.	3091. T. B. Cutts and F. W. Brooksbank.
2776. F. J. Jeffery.	3107. W. E. Newton.
2777. C. Mace.	3138. C. L. Hett.
2780. W. Spence.	3469. P. G. L. G. Designolle and J. Casthelaz.
2789. A. T. Becks.	3501. H. Bessemer.
2801. J. Anderson.	98. J. G. Tongue.
2810. J. Piddington.	109. J. G. Tongue.
2820. H. Trotter.	150. W. Betts.
2821. T. Ollis.	376. J. Dewar.
2834. R. Reid and E. H. Craigie.	
2839. J. James and T. Jones.	
2845. W. Warren.	
2870. R. F. Baré and J. Thomson.	

Patents on which the Stamp Duty of £50 has been Paid.

828. W. Simons and A. Brown.	898. W. Savory.
884. W. Irlam.	900. A. A. Croll.
996. W., E., and J. Gray.	945. J. R. Wigham.
844. H. C. Hurry.	863. J. Bruckshaw and W. S. Underhill.
850. J. Dodd.	864. F. Le Roy.
1001. A. Homfray.	882. J. Wright.
1043. J. Walker.	923. R. A. Brooman.
1314. R. and H. Harrild.	876. F. A. Mocquard.
856. J. Todd.	

Patents on which the Stamp Duty of £100 has been Paid.

759. T. Davison and R. Paterson.	788. W. D. Napier.
778. W. Sorrell.	795. R. Ridley and J. Rothery.

Journal of the Society of Arts.

FRIDAY, APRIL 10, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock :—

April 15.—"On Liquid Fuel." By Benjamin H. Paul, Esq.

April 22.—"On the Cultivation of Beetroot, and its Manufacture into Sugar." By W. A. Gibbs, Esq.

April 29.—"On Progress in Oyster Culture." By Harry Lobb, Esq.

Albert Medal.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows :—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, March 18th. Present — B. Shaw, Esq. (in the chair); Mr. Harry Chester, Captain Grant, Mr. G. F. Wilson, F.R.S., Mr. Edward Wilson, Mr. J. Ludford White, Rev. J. E. Hall, and Mr. E. Hollond.

At the conclusion of Mr. Barry's evidence, published last week,

Mr. Frank Buckland attended to give information on the subject of fish and means of increasing the supply.

Mr. Buckland—I am very glad that the Society of Arts has instituted this inquiry, because it gives a stimulus to public opinion in the right direction. I have taken as much pains as possible to obtain information for the Committee, and, with your permission, I will make my statement in my own way. I shall be glad to give you evidence upon river fisheries, pond and lake fisheries, sea fisheries, and upon crustacea. I have made a list of fish that may be eaten, classifying them into migratory fish—river fish—pond and lake fish—and what are commonly called "shellfish." As regards migratory fish, I have on my list salmon, sewen, sea trout, bull trout, whitebait, eels, shad, sturgeon, smelt, lamperns, lamprey, and others; fifteen varieties. River fish—Jack, barbel, bream, burbolt, chub, grayling, perch, river trout, gudgeon, roach, dace; eleven varieties. Pond and lake fish—Lake trout, powen, char, carp, tench, bream; six varieties. Sea fish—Turbot, cod, haddock, soles, whiting, pollock, coalfish, halibut, brill, dabs, mullet, mackarel, plaice, wrass, skate, bream, herrings, pilchards, gurnet, gurnard, dorey, ray, weaver, sprats, dogfish, anchovy, garfish, conger, sand lance, catfish, ling, flounder, hake, and bass; thirty-three, making 65 kind of economic fish. Then we have among the crustacea—crabs, lobsters, prawns, shrimps, mussels, whelks, cockles, oysters, escallops, and crayfish. These are only the families, but there are many sub-families; for instance, among the dogfish there are half-a-dozen kinds, so that you have enormous scope for your operations in dealing with 65 kinds of economic fish besides the crustacea. I begin with the salmon, which has been already cultivated to some extent, and may well be deemed the most important. In order to show you, and through you the public, what has been done for the preservation of the salmon fisheries, which had been much neglected until the subject was taken up by Parliament in 1861, I will show you how England has been divided into salmon districts, or what may properly be termed "fish parishes." There are 34 districts and 34 boards of conservators, who have machinery at their command to protect the interests of the salmon; and be it observed that these gentlemen have no pecuniary interest whatever in the matter, but act entirely *pro bono publico.* The districts are as follows:—The Coquet, the Tyne (which is now being highly cultivated by the Duke of Northumberland), the Tees, and the Trent; then crossing to the north western coast there is the Kent, the Lume, and the Ribble, which last is a most valuable river. Then we come to another exceedingly valuable district, the Dee, out of which nearly £15,000 worth of salmon was taken last year. Then come the Clwyd and Elwy, the Conway, the Sciont (a new and promising district), the Dovey, the Teify (which is worth £3,000 a year, and might easily be made worth £9,000); then there come the Cleddy; the Towey Lougher, &c. (beautiful little rivers), the Severn, the Wye, the Usk, all emptying themselves into the estuary of the Severn, and forming a most valuable property. Then we come to a new district, the Avon, not yet cultivated, but just beginning to be so. Then we come to the Taw and Torridge, the Camel, Tamar, Fowey, then another Avon; then the Dart, the Exe (which is just beginning to be cultivated),

the Axe, the Frome, and then the Stour. Then there are no more districts until we come to the Canterbury Stour, the latest formed district and one of the most promising. You see, therefore, that these districts extend nearly all round England. We want to make two new districts if we can, that of Itchin and Test, and the Avon and Rother. A district is created by the country gentlemen in the neighbourhood, acting under the provisions of the Act, and the Secretary of State signs the authority and gives effect to the matter. There are now 1987 miles of salmon river more or less under protection, and the number of square miles which these rivers drain is 16,661. Under this system of cultivation I am glad to say that the produce of England is increasing as regards the quantity of salmon brought to market. My friend, Mr. Ashworth, some time since gave me a comparative statement as to the produce of England, Ireland, and Scotland. He says, that Scotland was supposed to contribute nearly £500,000, Ireland, £300,000, and England about £10,000 a year; that was in 1863. The Salmon Acts have since been passed, and England and Wales are now beginning to perceive the beneficial result.

The Chairman—What does the protection amount to?

Mr. Buckland—To a surveillance of the salmon when spawning, and to the prevention of poaching, &c. Licenses are issued, so that if I have a right to fish in a certain river, I have to pay a certain sum, which goes to a general fund, which is used for the protection of the fish at spawning time, and this is the most important point. The Government has assented to the principle that those who make a profit by the salmon should pay something towards the production of the parent salmon, and this really is the object of having a district. The amount of salmon which is brought to the London market is much greater than it used to be. I have had great difficulty in obtaining information on this point, because people are very reluctant to show their books; but there is one very public-spirited salesman at Billingsgate, Mr. Ridpath, of the firm of Forbes, Stewart, and Co., who has kindly analysed his books for me, and the result is as follows:—In 1864 the the number of boxes of salmon received from English and Welsh rivers was 752; in 1865, 868; in 1866 the number jumped up to 1,563; and in 1867 they were 2,406. I consider that to be very satisfactory; and if the law is thoroughly carried out, I see no reason why, some day, the 2 should not be turned into a 4. There are, however, certain things which I desire to call your attention to; and if you really wish to benefit the public, there are three points to which you should direct your efforts. The first point is pollution. I have been rendered quite miserable by looking at the upper waters of some of our most valuable rivers, such as the Tyne, the Wear, and the Tees. At the head waters of these rivers there are large lead mines, and the existence of something in the washings of lead in the rivers is incompatible with the life of salmon. I am nearly certain of what is the actual cause of death, but it is not necessary to state it now. The South Tyne is nearly destroyed as a salmon river by the lead mines, but in the north Tyne, which is free from these lead mines, there is an enormous quantity of salmon. What is required is, to get the mine-owners simply to make catch-pits, in which the water may rest a certain time before it is discharged into the river. That is all I ask, and it would not occasion much expense. That has been done in two or three cases, not to a sufficient extent, but enough to show that the principle is a good one, and would be successful if carried out. In July last I saw numbers of salmon and sewen dead from lead water. The poor things went up the river, and, as soon as the "hush" came down they were killed. That river might be made to produce a great deal of money if you could only persuade the mine owners at the top to keep their dirty water out of the river. There are other pollutions also to which I desire to call attention. For instance, chloride of lime from paper mills will kill the fish, and I say it is cruel to the fish, as well as destructive to human food, to turn into a river chloride of lime, as this might be got rid of in other ways. Of course, as an individual I am the friend of the salmon, but as a public officer, I am quite ready to admit that manufacturers have rights which ought to be considered, but I contend that we may consider both manufacturers and fish. The second point is that of weirs. A salmon is a sea fish proper, which goes to the top of a river to deposit its eggs, and the more salmon that go up the better for the proprietor. The salmon wish to go up, but in many cases they cannot do so, because a wall has been built across the river for the purpose of driving a mill wheel. The water is transferred into the mill leat, and turns the mill, which may be a corn mill, a cotton mill, a paper mill, &c. The fish cannot possibly pass these weirs, except in the time of floods, and thus large districts of spawning ground are blocked up by them. My friend, Mr. Ashworth, has written a pamphlet, in which he ably proves that an immense deal of injury is done by these weirs, *quoad* salmon, and, so far, I quite agree with him. Nevertheless, Mr. Ashworth says that by these weirs salmon are excluded from an area of 7,991 square miles, and he particularly instances the tributaries of the Wye and the Severn, and I know that this is the fact from my own observation on the Ribble. I think this is a question of bread *v.* fish, most of the weirs being applied to corn mills, but I cannot see why we should not have both bread and salmon. If the millers will only be kind enough to allow the fish the use of the water at night and on Sundays, when the mill is not at work, then all ends would be answered. My friend here, Mr. Garnet, has an important weir on the Ribble, and he has made a pass on it for the fish to go up the river.

Mr. Garnet—I think I ought to say that I have had this fish-pass for the last thirty years. The width is 17ft., and there is a rise of 3ft. in a run of 63, or one in twenty-one.

Mr. Buckland—The third point is canals. I am a great advocate for fresh water, and I don't think rivers should be entirely robbed of their water in order to supply canals. I hear there is a project to make a canal at the head of the river Dee, which will take away a great quantity of the water; and there is another project to take water from the head of the Severn.

Mr. Chester—That would require an Act of Parliament?

Mr. Buckland—Yes; but I am afraid it will be passed. It is a very simple matter; the fish cannot swim without water.

Mr. Chester—Are water-mills increasing in number or are they giving place to steam?

Mr. Buckland—Mr. Ashworth wishes to show that steam power would be more profitable than water power on a salmon river. For instance—if a man makes £100 a year out of his mill, it would be better to knock down the weir and substitute steam, and get £150 out of the the river in salmon.

Mr. Chester—That would depend on the part of the river he was in; the fish might all be stopped below?

Mr. Buckland—Yes, that is true; but if all would agree to it, it would be better. If water-power were replaced by steam on the Dee, it would be of immense importance. At Chester there is a weir which entirely prevents the fish from ascending the river. The upper proprietors say it is no use their protecting the fish, when they are not allowed to reach them on their return from the sea, and thus many fish are prevented from ascending, whereas if a pass were made in the weir, so that the fish might pass, and the upper proprietors were allowed to catch a certain proportion with their rods, which was all they wanted, they would willingly co-operate in cultivating and protecting the fish.

Captain Grant—What about the greaves and putchers?

Mr. Buckland—There is a tax on every one of these. First of all they must prove their legality to the satis-

faction of the board, for if they cannot do so they are at once abolished. If, however, they are proved to have a charter from William the Conqueror, or anything of that sort, then a tolerably heavy licence is put upon them, which is fixed by the Act. This money does not go into the pockets of any private person, but into the hands of the Board of Conservators, who pay out of it the water bailiffs who protect the salmon; and each salmon thus protected in spawning time brings back a large amount of money. I calculate that, upon the very lowest estimate, each salmon nest is worth £5. When I hear of one river yielding 20,000 salmon, and people calling it good, I laugh at it as a naturalist, because I can get that number, as I did last winter, out of two salmon. If we breed salmon artificially we can get a basketful of eggs from each fish, and what is 20,000? Nothing at all. Only attend to these three points I have named, breed the fish in the river, and they will all come back again to a certainty.

Mr. Chester—Your three points are—not to let the rivers be robbed of their necessary water; not to allow them to be polluted; and, thirdly, not to allow of obstacles which prevent the salmon going up to the breeding grounds. We cannot do away with the mills altogether, but you suggest that the weirs should be open at night and on Sundays. Have you any further suggestion to make in that direction, such as the erection of fish ladders?

Mr. Buckland—What we really want is compulsory power to make the millowners let the fish pass, in some way or other, to the satisfaction of the board.

Captain Grant—At all times, and do away with the Queen's gap?

Mr. Buckland—That must depend upon circumstances.

Mr. Chester—Have you any suggestions to make as to equalising the rights of proprietors at different parts of the river, so that all the fish should not be taken in the lower part of the river?

Mr. Buckland—If the weirs were opened a certain quantity would go up.

Captain Grant—Look at the Wye, where I rented two miles. Last season I do not suppose there were thirty fish taken with the fly above Hereford, while the millers took 500 at one haul. Unless the river is made as free for the fish to ascend as the high road is for cattle, the upper proprietors who subscribe for the preservation of the fish might as well throw their money into the river. The lower proprietors get all the fish, and even if all the putchers and greaves, or whatever else they are called, were removed, they would still retain a great advantage over the upper ones upon the principle of first come first served. The system of stake nets and fixed nets is prohibited; but the way the millers manage is to have three nets, one behind the other, so that hardly a fish can escape. I say the fishing is not equally distributed. The upper proprietors preserve the fish, and the lower ones get all the benefit. I, for one, have withdrawn my subscription in consequence.

Mr. Buckland—They cannot use the nets in flood time.

Captain Grant—And that is the only chance which the upper proprietors have. I say do away with that monstrous absurdity, the Queen's gap.

The Chairman—What is the Queen's gap?

Captain Grant—It is a small gap of so many hours a week for the fish to pass up. In some places they have no other chance of going up, and thus the lower proprietors have the benefit of the fish the whole of the week with the exception of this Queen's gap of 42 hours.

Mr. Garnett—I have no business to speak, but if Mr. Buckland will pardon me interrupting him, having had an experience of fishing for more than 40 years, I can say a word or two as to the increase of the fish. I have been some years a member of the Board of Conservators of the Ribble, and that board took a lease of the fisheries from the proprietors. In 1859, we took a number of sea trout and 90 salmon. In 1866, the water bailiff tells me they took in one week 3,133. That is a satisfactory proof of the increase, although I should say that both years were extraordinary; 1859 for drought, and 1866 for a succession of floods, which caused a large increase in the quantity of fish caught in all the rivers of England. The Hodder, a tributary of the Ribble, swarms with sea trout; and there is not a weir in the whole length, and yet the fish, from some peculiarity, never ascend to the upper reaches until the month of September, of which Col. Towneley complains very bitterly. He says:—"Here have I turned down 800,000 young salmon and I never see them back again." After September, however, they ascend the river freely and spawn very extensively there. The nominal weekly close time is 42 hours, but it is not so in reality. There are about forty days from the first of May, when the fish begin generally to ascend the Ribble, to the 31st of August, when the fishing ceases, reckoning 42 hours per week; but on the average of seasons, owing to droughts or freshes during two-thirds of that time, the water is not in a condition for the fish to go up. Consequently, there are only about 12 or 14 days in which to supply the upper proprietors for a length of 100 miles; the lower proprietors taking all the remainder. I remember incidentally suggesting to Sir George Cornewall Lewis at the time the Bill of 1861 was before the House, that either there should be no fishing allowed at night, or that three days a week should be set apart for the fish to ascend the river. Sir George Cornewall Lewis said—"You might just as well propose to shoot partridges only three days a week." I said—"The cases are not at all analogous; if the partridges had all to migrate before they could be killed, if they all returned like salmon by the same track, and if 90 per cent. were taken on the road by those who neither fed them nor bred them, I think a change in the law would soon be called for." That is just the case with salmon. They migrate chiefly at night, and at that time no fishing should be allowed.

Mr. Buckland—I now pass on to the other river fish. I advise you to pay attention to them, and to cultivate if you can coarse river fish throughout England. Rivers that will not carry salmon may carry coarse fish, and they only need to be protected in the months of May and June. There is no doubt of people eating these fish, roach, dace, and everything else. You see there is a demand for jack and other fish which are brought over from Holland. The common river trout ought to be cultivated by artificial means. With regard to pond and lake fish, I do entreat you to pay attention to the char of the Cumberland and Westmoreland lakes. It is now used for "potted char" in the height of the spawning season, and we all know that if you kill a fish when about to reproduce, there will be no progeny. The powen and pollen of the Irish lakes are exceedingly valuable; and so are tench and carp. These latter may be cultivated by placing hurdles in the water in the last week of May or the first week of June, on which the carp will deposit their eggs, and they will then multiply exceedingly. The carp ponds should be thoroughly netted every year, and the fish should be sorted and sent to market as they arrive at a proper condition. You may receive it as a maxim that if you have too many fish in a pond they will decrease in size. I now come to the question of new kinds of fish. I know of only three. This [producing a dried specimen] is the Perca Lucio, a ravenous fish, something between a jack and a perch. It is very good eating, but a very voracious fish. They live in ponds, and, as Mr. Wilson knows, are very abundant in the markets of Berlin.

Mr. Wilson—It is some years since I tasted one, but I think it eats more like perch than jack. They are very good eating.

Mr. Buckland—They will do very well in places where you have command of them, but for goodness sake do not

let them get into the rivers. The next is the *Silurus glanis;* the nearest fish of ours to it is the burbolt. It will do in ponds; it lives in the mud, and eats the fry of roach and dace. I took some down to Aldermaston, but they disappeared, and I do not know what became of them. Lastly I may call attention to a fish described in a book by Mr. H. W. Herbert, entitled "Fish and Fishing in the United States," called the Otsego bass, but it is in reality a char. The white fish of Canada is nearly allied to the gwinniad of North Wales. The Otsego bass is not a bass at all. The Acclimatization Society has tried to get some over, but as yet has failed. My friend, Mr. H. Lee, has offered a reward of £20 for the introduction of the "gourami," from the Mauritius. I am anxious to impress upon you, however, the importance of cultivating the fish that we have got to the fullest extent, rather than divert attention to the introduction of new species. I would follow this up by pointing out the desirability of cultivating the Norfolk broads, where there are a great number of acres of water, which, if judiciously managed, might be made to produce a large amount of food for the people. Before passing to the subject of sea-fish, I may mention that the amount of money paid for licenses for nets, rods, &c., which money all goes to the preservation of fish, is £4,807. The license for a draught net is £5, and there are 486 of these in England. There are 1,807 rods. The total number of men employed, according to the returns we have, is 3,970; but many districts do not send an accurate return, and the total number is probably between 4,000 and 5,000. The total amount of fines inflicted has been £641. It ought to have been three times as much. These figures will show the importance of our salmon fisheries. During the last five years a good deal has been done in the distribution of salmon by artificial means. I have sent to different places a great number of salmon and trout in the egg state. We have a hatching apparatus at the Horticultural Gardens, and I have distributed a good many on the part of the Acclimatisation Society, and on my own part, during the last three years. Fish culture has been taken up by her Majesty, who has stocked the Obelisk Pond in Windsor Park with Great Lake trout; and this is the third year of the experiment. The Duke of Marlborough has done the same at Blenheim, and Lord Bath has done the same at Longleat-park. Mr. Burr, also, and many other persons, have applied to me for eggs; but we want a central Piscicultural Society, the same as there is at Huningue, to distribute the fish.

Cantor Lectures.

The fourth lecture of Dr. Crace Calvert's course "On Chloride of Sodium, or Common Salt, the Products obtained from it, and their Applications to Arts and Manufactures," was delivered on Tuesday evening, the 7th of April. These lectures will be published in the *Journal* during the Vacation.

Proceedings of Institutions.

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TECHNICAL EDUCATION—Mr. WHITWORTH'S BENEFACTION.

The following minute in reference to this munificent gift has been passed by the Lords of the Committee of Council on Education:—

Science and Art Department, South Kensington.

At Whitehall, the 27th day of March, 1868, by the Right Hon. the Lords of the Committee of Her Majesty's Most Honourable Privy Council on Education.

My Lords consider Mr. Whitworth's letter to the First Lord of the Treasury, dated the 18th of March, 1868. In this letter Mr. Whitworth offers to found 30 scholarships of the annual value of £100 each, to be applied for the further instruction of young men, natives of the United Kingdom, selected by open competition for their intelligence and proficiency in the theory and practice of mechanics and its cognate sciences, with a view to the promotion of engineering and mechanical industry in this country; and he expresses hopes that means may be found for bringing science and industry into closer relation with each other than at present obtains here:

It is unnecessary now to repeat the thanks which the First Lord of Her Majesty's Treasury and the Lord President of the Council have already conveyed to Mr. Whitworth for his generous offer, which they are convinced the country will fully appreciate.

Mr. Whitworth proposes that these Scholarships should be tenable on conditions to be defined by a deed of trust regulating the administration of the endowment fund during his life, and that thereafter the management of this fund, subject to the conditions specified therein, should rest in the Lord President of the Council or other Minister of Public Instruction for the time being.

It is the wish of my Lords to see provision made in several large centres of manufacturing industry in the United Kingdom for affording to all classes of Her Majesty's subjects ample opportunities for acquiring instruction in the sciences which are applicable to productive industry. My Lords are of opinion that by the union of local and private efforts, supplemented as far as is proper by State assistance, this provision will be best made.

This will be rendered easy if the munificent example set by Mr. Whitworth shall be extensively followed by others.

My Lords will be happy to receive any further suggestions from Mr. Whitworth should he desire to make them, and to be informed if the department can render him any assistance in carrying out his liberal intentions.

The following is a report of the debate in the House of Lords on this subject, which took place on Friday the 3rd inst.

Earl Granville asked whether Mr. Whitworth had made an offer to her Majesty's Government to endow scholarships for the promotion of education in mechanical science. It appeared from a minute of the Privy Council, which had been published since he gave notice of the question, that Mr. Whitworth had offered to found thirty scholarships of £100 a-year each for the encouragement of students of mechanical science. That was, in his opinion, one of the most munificent acts ever performed, and looking to the results which might be expected to flow from it, he could not help thinking it one of the most magnificent and useful gifts ever

offered to the nation. It was evident that, in the opinion of this eminent engineer, science and practical education are not sufficiently connected in England, and that it was desirable workmen should receive a higher education than they did at present. That appeared to indicate the course which the Government should adopt, and he trusted that the Government would not shrink from a moderate expenditure to forward the object which Mr. Whitworth had in view. The course which the Government had adopted for the encouragement of the study of art might here be applied to the encouragement of science. He should be glad to know whether the Government had determined how they could best assist Mr. Whitworth in carrying out his great project?

The Duke of Marlborough passed a high eulogium on Mr. Whitworth, whose high-minded and liberal conduct indicated the right course for the manufacturing interest to pursue in promoting the spread of technical education, and extending the means of affording practical education in matters of science. It was more desirable that this encouragement should proceed from those who were directly connected with the manufacturing interest than that it should be carried out through State intervention. But it was not to be lost sight of that technical education so far differed from general primary education that it had a special and important bearing on the manufacturing prosperity of the country; and whatever assistance was required to be given for the promotion of this object, it would not be sound policy for the Government to initiate extensive measures on the subject. Those who ought to originate such measures were persons interested in the manufactures of the country. Mr. Whitworth's gift was a step in the right direction, and showed not only the value he attached to correct instruction in science connected with the industry of the manufacturing districts, but also his sense of the fact that provision should be made, in the first instance, by those whose own prosperity was dependent upon the progress of those districts. With regard to the action of the Department of Education in respect of this munificent gift, and the minute which has been made public, that minute of council had stated precisely the position of the Government in the matter. They had no knowledge at present how Mr. Whitworth wished the gift to be administered, or the exact manner of its practical application. A communication had been made to Mr. Whitworth requesting him to furnish the department with information upon the subject, and in that communication they had expressed their willingness to aid him in carrying out his views so far as was practicable. They were awaiting his reply. In all probability Mr. Whitworth would wish to retain the management of this fund in his own hands during his lifetime; but he would, no doubt, be desirous that the Government should assist him with some mode of examination by which the comparative merits of the candidates for the scholarships should be tested. As soon as the Government were in possession of the precise terms of Mr. Whitworth's wishes, they would give them their best consideration, with the desire of aiding him as far as they possibly could. As to the question whether the Government should assist the general progress of technical education, the suggestions of the noble earl were well worthy of attention. At a very small expense, and without going the length advocated in some cases and by some of the deputations which have waited upon the Government on the subject, very considerable assistance and great encouragement might be given to the progress of technical education generally, by following the principle that local efforts should be made in the first instance, and that such efforts should be supplemented by the Government giving some small assistance to professors or to colleges which might be brought into existence for this special purpose. It would be premature to say more at the present time. The whole of the question was under the consideration of a select committee of the other house at the present moment, and they would no doubt have this as well as other portions of it brought under their notice. He would only add that as the minute of council had been referred to by the noble earl he should lay it upon the table.

Lord Taunton said this noble gift came at a most opportune time, when public attention was so generally directed to the application of science to manufacturing and industrial processes. One of the advantages of the late Exhibition in Paris was that English manufacturers and her most intelligent workmen had returned to this country deeply impressed with the feeling that they could not afford to throw away any advantages which they could command in the competition to which they were now subjected. Many important branches of manufacture were beginning to feel the pressure of that competition greater than they had ever before known, and it was singularly appropriate that this movement in the direction of technical education should have originated with so distinguished a mechanician as Mr. Whitworth. He had no doubt his example would be followed not only by individuals, but by commercial associations, and that with the aid of the Government great progress in that direction might be made in future years.

The Duke of Somerset said he had known Mr. Whitworth pretty intimately for the last twenty years, and had visited his establishment at Manchester. It was most interesting to see the pains and care and the scientific application by which Mr. Whitworth had risen to his present eminent position. That gentleman in his own career showed how necessary it was to combine science with practical knowledge. We had plenty of good workmen, and scientific, but the difficulty was to find a good foreman, who, with the skill of the workman, united a superior scientific education, and was thus able to direct intelligently and effectively the labour of those under him. No doubt in many of the branches of technical education it was difficult for the Government to take any part, but they had already taken a very important step in that direction in the instruction in shipbuilding given at South Kensington, and he had no doubt that the system might be extended to other branches of industry.

PRODUCTION OF SULPHUR IN ITALY.

The total average annual production of sulphur in Sicily is estimated at 1,600,000 quintals (157,143 tons) and is divided amongst the various provinces in the following manner:—

	Quintals.
Province of Caltanisetta	810,000
,, Girgenti	610,000
,, Palermo	60,000
,, Catania	120,000
,, Trapani	1,000

There are 615 sulphur mines, of which 237 were abandoned in 1864. The sulphur is carried to the surface on the backs of men, and the water is raised by pumps worked by animals, with the exception of 14 mines, where steam is employed for this purpose. The total engine-power amounts to about 100 horses. The number of *calcaroni*, or furnaces, for separating the sulphur from the impurities as extracted from the mines, are 4,367 in number.

The proportion of sulphur extracted from a cubic meter of mineral varies as follows:—

	Kilos.
Caltanisetta	180
Catania	165
Girgenti	132
Palermo	120
Trapani	100

Thus the average is 155 kilos per meter cube of mineral throughout the island.

As the average price per quintal is 11 frs., the whole production may be estimated at 17,600,000 frs. (£704,000) per annum.

The total number of workmen in the sulphur mines of Sicily amounts to 21,510, and their average wages from 4·80 frs. to 1·55 frs. It is estimated that a miner produces 440 quintals (864 cwt.) of sulphur per annum; that is, extracts 284 cubic meters of mineral. Seven millions of francs (£280,000) is yearly expended for labour.

The production of sulphur in Sicily, which in 1830 was but 30,000 quintals, has now increased six-fold, on account of the great demand for it for industrial purposes. The following table shows the exports from the island from 1851 to 1866:—

Year.	Exports. tons.	Duty paid. francs.
1851	94,985	—
1852	98,037	949,000
1853	110,997	1,072,000
1854	141,343	1,376,000
1855	112,384	1,087,000
1856	148,052	1,435,000
1857	139,747	1,339,000
1858	134,442	1,288,000
1859	175,968	1,684,000
1860	143,783	1,370,000
1861	156,645	1,566,000
1862	155,330	1,553,000
1863	169,956	1,699,000
1864	155,678	1,557,000
1865	159,657	1,596,000
1866	184,173	1,842,000

The sulphur is transported by carts, or on the backs of mules to the following ports:—Catania, Licata, Girgenti, Palermo, Terranuova, and Trapani.

The following are the exports to the various countries:—

Countries.	1861.	1862.	1863.	1864.	1865.	1866.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
England ...	49,334	54,168	36,931	52,689	47,361	66,166
France	60,134	37,705	48,515	42,563	36,237	38,437
Other Countries	43,539	58,102	76,321	55,909	71,021	72,825
In the Island	3,538	5,363	8,191	5,117	5,038	6,745
Total ...	156,645	155,330	169,956	155,678	159,657	184,173

The following shows the quantity and value of the exports and imports of both raw and refined sulphur from 1862 to 1865:—

Unrefined Sulphur.

	Imports.		Exports.	
Year.	Quantity. quintals.	Amount. frs.	Quantity. quintals.	Amount. frs.
1862	11,442	240,000	1,433,236	30,098,000
1863	6,714	141,000	1,470,350	30,877,000
1864	7,515	157,000	1,398,413	29,366,000
1865	1,088	22,000	1,382,324	29,028,000
Average	6,689	14,000	1,421,080	29,842,000

Refined Sulphur.

	Imports.		Exports.	
Year.	Quantity. quintals.	Amount. frs.	Quantity. quintals.	Amount. frs.
1862	1,382	46,000	22,257	728,000
1863	1,044	34,000	57,275	1,890,000
1864	1,780	58,000	35,524	1,172,000
1865	1,745	57,000	70,841	2,337,000
Average	1,488	49,000	46,474	1,532,000

Of the 35 sulphur mines in the district of Ancona, 23 are situated in the province of Forlì, and 12 in those of Pesaro and Urbino. Of these only 17 are worked at the present time, and the remaining 18 are suspended or abandoned.

In 11 of the mines worked at the present time the mineral is raised by shafts by means of horses or steam-power; in four the sulphur is extracted by means of a gallery with tramway. The quantity of mineral raised in 1865 was 675,872 quintals (66,380 tons). The most productive mine is that of Perticara di Talamella, which yields annually 208,000 quintals (20,429 tons) of mineral. The mines next in importance are those of Formignano, at Cesena, and of Marazzana, at Sant' Agata di Feltria, which each furnish about 90,000 quintals (8,840 tons) annually.

The number of furnaces for separating the sulphur from the mineral is 60, and the quantity of sulphur produced is 86,817 quintals (8,527 tons), of the value of 1,071,874 frs. (£42,871). The total number of workmen employed in these mines amounts to 1,425.

The wages of the miners vary from 4 frs. to 1·30 fr. per day, and of those employed at the furnaces, &c., vary from 2·50 fr. to 0·50 fr. During the year 1865, 57,900 frs. (£2,316) was expended in labour.

The refining of the sulphur is carried on in some cases near the mines, as at Perticara, Formignano, Zolfinelli (Romagna), or at separate establishments to which the sulphur is brought, as at Rimini, Cesana (Romagna), Catania, and Porto Empedoca (Sicily).

The total quantity of sulphur distilled in 1864 was 89,800 quintals, from which were obtained 82,250 quintals of refined and sublimed sulphur, in the proportion of 92 per cent. on the unrefined sulphur.

At each of the eight establishments for refining sulphur there are employed on an average six workmen. These establishments also produce annually 700 quintals of sulphuric acid, at 23 frs. per quintal, and 500 quintals of sulphate of iron, which sells for 25 frs. per quintal.

The value of the sulphur refined in Sicily amounts to 46,000 frs. (£1,840), and of that in the Romagna to 1,300,000 (£64,000). A great amount is exported to the Levant, Trieste, Lombardy, Tuscany, and Rome. Considering the great consumption at the present time for the vineyards, the price has fallen since 1862 (when it sold for 20·70 frs. the quintal) to 13·50 frs. the quintal.

Fine Arts.

Jury for the Paris Salon.—The ballot for the election of jurors has produced the following list, the names in which are placed in the order of election:—Painting—Daubigny, Baudry, Bida, Pils, J. Breton, Gleyre, Cabanel, Cabat, Robert Fleury, Fromentin, Français, and Gerôme; supplementary—Brion, Comte, Isabey, Meissonier, Ph. Rousseau, Millet, and Courbet. Sculpture—Barrye, Soitoux, Perrault, Guillaume, Dumont, Cabet, Marcelin, and Carpeaux; supplementary—P. Dubois, Jouffroy, A. Millet, and Otteri. Architecture—Duboix, Vaudoyer, and Labrousse; supplementary—Baltard. Engraving and Die-Singing—Mouilleron, Gaucherel, Henriquel-Dupont, Jacquemart, Flameng, Bœtzel, and C. Nanteuil; supplementary—Lalanne and Pisan. The list includes all, or nearly all, of the professors of the Ecole des Beaux Arts, several members of the Institute, and not one unknown name, so that, although a few eminent names may be missed, the popular mode of election must be regarded as having worked admirably. It must be mentioned, too, that some artists whose names stand low in the list, or are absent from it, reside at a distance from Paris, or for other reasons have declined or would not be expected to act; amongst these may be mentioned Hamon and Hébert, both in Italy.

Fine Art Exhibition at Havre.—An exhibition of works of art is appointed to take place this year in connection with the international maritime and commercial exhibition, and to open on the same day, namely, the 1st of June. The Count de Nieuwerkerke, Superintendent of Fine Arts, has accepted the honorary presidency of the artistic exhibition. It was originally proposed that this exhibition should be opened later in the season, in order to receive works from Paris, after the closing of the annual exhibition there in the middle of June, but it has been determined instead to reserve space for works from the Paris *Salon*.

Annual Exhibition of Fine arts at Turin.—The Society of Fine Arts (*Belli Arti*) of Turin, will open their annual exhibition of the works of living artists on Saturday, the 18th of April.

Sale of Works of Art at Rome.—According to the *Giornale di Roma* the value of the pictures and sculptures, both ancient and modern, exported from the Pontifical States during 1867, amounted to not less than 21,623,310 francs (£864,932 8s.).

Picture from English History, by Baron Wappers.—Baron Wappers, president of the Brussels Academy of the Fine Arts, has recently painted a large work, of which the subject is taken from English history, the "Disembarkation of the first English Families in America, about 1620." It is unfortunate that this work having been painted for M. Aldama, a rich amateur in the Havannah, where it has already been sent, is lost to Europe, at any rate for a time, for the composition and colouring are spoken of very highly by French critics who have seen the picture. The composition includes twenty-two figures, and the style is semi-allegorical, conceived and executed in a masterly manner. Two young girls are singing a canticle of thanks for their prosperous voyage; another plants in the new world the seeds she has brought from the old; the head of the family fills the centre of the canvas, and his young wife with a baby in her arms leans confidently on his shoulder; a boy scans the novel scene with an eye of mere curiosity; and a labourer stands near with implements of husbandry. In the distance two girls offer up prayers for the future, while two male figures, representing civil and religious liberty, give free expression to their enthusiasm; other figures and the ship in the extreme distance fill up the picture. The colouring of the work is described as magnificent. The subject has a great interest for England, and it is to be hoped that we may be made acquainted with the composition and chiaroscuro of the work by means of photography or engraving, although we must remain strangers to its beautiful harmony of colour, which is said to be very remarkable. It is to be hoped that Baron Wappers will soon present us with some other examples of this high school of art, at present so rare.

Manufactures.

Exhibition at Turin.—It is now definitely settled that an exhibition of national industry will be held at Turin during the forthcoming festivities on the occasion of the marriage of the Prince Humbert with the Princess Margherita. This exhibition will be held in the building formerly occupied by the Minister of Finance, in the Piazza Castello. The committee of the *Lega Pacifica* (a league for the encouragement of national industry) are doing their best to insure the perfect success of this show of national industry. Forty of the principal manufacturers at Turin have promised their support to the undertaking. The applications for space from intending exhibitors will remain open until all is filled. The expenses of carriage, &c., are to be borne by the exhibitors.

Oxygen for Industrial Purposes. — The Paris Society for the Encouragement of Industry offered, some time since, a prize for the economical production of oxygen on a large scale, and several attempts have been made, in consequence, to supply this gas for various industrial purposes. The process adopted by M. Tessié du Motay and Maréchal, of Metz, and which was illustrated in the laboratory, by the water side, at the Paris Exhibition, consists in the employment of six cylindrical retorts, enclosed in a furnace, three of these retorts being filled with manganate of soda, and the other three with permanganate of the same alkali; a fan drives a current of hot air, deprived of its carbonic acid by being made to pass through lime-water, into the first three retorts, in order to convert the manganate which they contain into permanganate; superheated steam is forced into the other three retorts, which carries off the oxygen and converts the permanganate into manganate. The operation is afterwards reversed, the hot air being driven into the second and the steam into the first set of three retorts. The condensed steam passes from the retorts into a receiver, and the oxygenis collected in a gasometer. An arrangement of the following kind has been applied to a number of gas-lights in front of the Hôtel de Ville, and has attracted much attention and some controversy. The oxygen is introduced into the lamp at a short distance from the common gas burner, and a small cylinder of magnesia being introduced into the flame, the effect is remarkably brilliant. —Another process has been employed by M. Gondolo, formerly pupil of M. Payen. This is based, in the first place, on a discovery of M. Boussingault, in 1855, and consists:—1. In changing oxide of barium into binoxide, by passing a current of air over the former when heated to a dull red. 2. In heating the binoxide to a bright red, and thus causing it to give up the oxygen derived from the air. By these two processes a large quantity of oxygen may be produced. The difficulties in the way of its industrial application were, the regulation of the fire, the semi-vitrification of the barytes, and the breaking of the porcelain tubes employed. M. Gondolo has modified the process by using cast-iron tubes enamelled with a special mixture, by mixing the barytes with an alkali or with earthy matter, and by the improvement and simplification of the apparatus; and he is now able, we are told, with the aid of a common labourer and very little fire, to produce many cubic mètres of oxygen in a quarter of an hour. One of these apparatus has been in use for several months, and one hundred and twenty operations, carried out without an interval, left the barytes unaltered. The process is said to be very economical, which is the grand point in view. The azote produced by the decomposition of the air is received in a special vessel for use, while the oxygen is collected in a gasometer for illuminative or other purposes. M. Gondolo is now engaged on experiments with the latter gas, in connection with the fusion of metals, the modification of the Bessemer processes, and the rapid transformation of certain chemical substances for dyeing and other purposes.

Co-operative Bakery in Paris.—Two thousand five hundred Paris ouvriers have formed a society for the establishment of a co-operative bakery, with a capital of £2,000, to be raised, as required, to four times that sum. Those who desire to join the society have only to pay one franc on application, and a quarter of that sum afterwards, until the subscription amounts to twenty francs. The society has purchased one of the mechanical bread-makers on the Lebeaudy system, exhibited at the late Paris Exhibition. The bread is to be delivered at the houses of the members, but only in proportion to the number of persons forming the family, the members of the society forfeiting all their rights if they sell any. Should this first society succeed there is little doubt that others will be formed immediately.

Commerce.

Railways in Sardinia.—According to the new contract between the Italian government and Sardinian Railway Company, the following lines are to be opened

to the public not later than the end of December, 1869:—Cagliari to Inglesias, Cagliaro to Oristano, and Sassari to Porto Torres. The other lines, namely, from Oristano to Terranova, and from Sassari to Ozieri, have not been overlooked, but no period has yet been fixed for their completion.

Line of Steamers between Antwerp and Bayonne.—The *Union Bayonnaise*, the first of a new line of steamers, a vessel of 500 tons burthen, has just arrived, in less than four days, at Antwerp from Bayonne, thus inaugurating a rather important new commercial line.

Treaty of Commerce with France.—It is said in Paris, that a member of the Corps Legislatif, M. Pouyer Quertier, intends to put a question to the government concerning the protests that have been received respecting the treaty of commerce between France and England. It is added that as the signatures of seventy deputies have been attached to M. Pouyer Quertier's application, it is probable that the interpellation will be allowed, in which case the discussion, which is likely to be very animated, will take place soon after Easter.

Coffee Cultivation in Southern India.—The *Neilgherry Excelsior*, quoted in the *Produce Markets Review*, says:—"There is a rather large coffee plantation at Coonoor, the property of a Mahomedan gentleman. It is overgrown with weeds and ferns; but the owner nevertheless calculates on a crop of 1,500 maunds, equal to fifteen tons. Supposing that he sells the produce at 600 rs. a ton, he will realise some 9,000 rs. Should he prefer shipping to England, the out-turn will of course be greater. The berry is said to be of a peculiarly good quality; but what we wish particularly to draw attention to is the cheap way in which the native goes to work compared with the European. The estate in question, we have said, is overgrown with weeds and ferns. 'Never mind,' says the owner, the crop will pay me.' And so it will. He has four men on pay, whose duty it is to see that the weeds and ferns do not encroach too much on the coffee plants. For the rest he trusts to nature and the good will of 'Allah.' At the picking season he employed sixteen additional labourers. He begins early, and the berries are taken off the trees as they ripen. 'There is no use employing too many hands,' he says; 'by the time the berries are taken off this batch, and the men are done with that yonder, all the green berries here will be ripe for their return.' And so he goes on composedly, without making any hurry or fuss about it. The four permanent labourers cost him 336 rs. a year; for three years, 1,008 rs. The sixteen additional for the picking, at 6 annas a day, say for three months, 540 rs. making a grand total of 1,548 rs., against 9,000 rs.? A European on the other hand would say: 'I must employ coolies to dig up the weeds, and away go 50 rs. a day. Then, 'the plants want manure and water.' Another 30 rs. or 40 rs. a day is spent in supplying manure and bringing down water. And thus the profit is often frittered away. It appears, however, that there are 326 coffee estates in Southern India, Mysore excluded, and, consequently, coffee cultivation must be a good speculation, or so many estates would not have been opened and managed; of these, the Neilgherries have 73 estates, the Wynaad 190, and Teppacadoo 2. The Wynaad, notwithstanding its notoriety for fever, has two and a half estates to every one on the Neilgherries, or more. When such risk of health is incurred, coffee cultivation must be a good speculation."

Exemption from River Dues on Cereals, &c., in France.—An Imperial decree has just appeared, suspending all river and canal dues and navigation charges appertaining to the State on vessels laden with grain, flour, rice, potatoes, or dried vegetables, from the 28th of March to the end of September; the exemption applies to the vessels and boats of all countries, without exception. The exemption is extended to vessels which have quitted port with their cargoes previous to the 30th September, no matter on what date they may reach their destination.

Production of Petroleum in Italy.—In the neighbourhood of Chieti, in the Abruzzi, there are three deposits of petroleum. At one of these deposits, situated below the Colle d'Oro, at a short distance from Tocco Casauria, petroleum is obtained by sinking wells about 190 feet in the soil; it is also obtained from natural springs, but in small quantities. At another deposit in the same district, a bituminous shale, mixed with water and earth, is accumulated in reservoirs, and distilled at Porto Recanati. The third deposit is that of Lettomanoppello, where excavations have been made for the purpose of obtaining bituminous asphalte, from which petroleum has been distilled, but the results have not been sufficient to encourage the pushing on with the excavation. The first of these deposits furnished in 1865 1,800 quintals of petroleum, of the value of 36,000 frs., and 500 quintals of thick bituminous shale, amounting in value to 7,000 frs. At the first of the two wells 80 persons are employed (50 men and 30 women), and at the other only eight workmen. The wages of the men are 1 fr. 50 c. per day, and the total expenditure for labour was 14,160 frs. Various petroleum wells have existed since the beginning of the century in the provinces of Parma, Piacenza, and particularly in the neighbourhood of Fornovo, Medesano, and Gropperello. The petroleum wells in the province of Emelia in 1862 were 28 in number, but only 19 are worked at the present time. They produce about 26½ kilos. daily, or 9,628 kilos per annum. This shows that the production of petroleum up to the present time is inconsiderable, but it must be remembered that the extraction of the petroleum is carried on in the most primitive manner, much without the aid of machinery of any kind. The Government, with the intention of developing this industry, last year granted three concessions for working the petroleum mines in the provinces of Pavia and Piacenza. Two of these concessions were granted to the American firm of Mayo and Botta, in the districts of Fornovo, Taro, and Medesano; and the third concession is the property of a Genoese company, "L'Esploratrice," in the valley of Riglio, in the commune of Groppello. The former firm are employing American machinery, and the Genoese company are carrying on their works on a large scale, and have already sunk four artesian wells by mechanical appliances. The refining of the bitumen of Tocco, Casauria, and of Lettomanoppello is carried on at Porto Recanati (Macerata). In 1865 the quantity of petroleum obtained from 500 quintals of bitumen was as follows:—

	Quintals.	Francs.
Light petroleum	250	18,750
Heavy	120	7,200
Asphalte	100	1,500
Total	470	27,450

The yearly wages of the two refiners and three labourers employed in this establishment, amount to about 2,000 francs. Another refinery is being established on a large scale at Grottammare (near Ascoli). The following are the exports and imports of petroleum in Italy from 1863 to 1865:—

	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Quintals.	Francs.	Quintals.	Francs.
1863	123,258	3,327,000	2,280	61,000
1864	32,449	876,000	3,763	101,000
1865	36,030	972,000	1,473	38,000
Average	63,912	1,725,000	2,505	67,000

Colonies.

State of Victoria.—A private circular from Melbourne says:—"Trade has improved, but only to a very

small extent, and this has caused the more surprise, as the great industries of the colony are at present more than usually prosperous. For some time serious fears were entertained of a very deficient harvest, and in several districts there has been a failure of crops, but this is compensated by unusually good returns in other districts, so that, on the whole, it is believed the harvest will come up to the average. In consequence of the excellent season for pasture, there will be a very large clip of wool, and the surplus of fat stock is so great that the price of butchers' meat is comparatively nominal; measures are consequently in progress, by means of companies and individual enterprise, to boil down both sheep and cattle for tallow, and to preserve the meat for export to England. The third great interest of the colony—the gold mining—has experienced a revival, in consequence of fresh discoveries at Ballarat and elsewhere; and from the greater command of water afforded by the new reservoirs made and in course of construction, it is probable that the production of gold may in a short time be permanently increased. During 1867 only four pastoral stations were sold, and at this moment runs are more than ever unsaleable. As regards Melbourne, however, the chief cause of the present dulness is its loss of the intercolonial trade. A variety of causes are assigned for this, some asserting that it arises from the cessation of the imports of breadstuffs, others that the change is owing to the direct trade which has naturally sprung up between the neighbouring colonies and Europe, whilst the free-traders allege that it is caused by protective duties. Whatever may be the cause, the fact is certain that a great check has been given to the intercolonial trade. Immigration is comparatively at a standstill, and there seems no present prospect of its renewal. On the whole, it may be safely affirmed that while the condition of the colony is sound, there is a very considerable pressure for money, and necessarily a spirit of economy. During the present year this is likely to continue, and consignors should be very cautious, and on no account increase their shipments, unless there is a revival of emigration to the colony."

Pearls in West Australia.—A Perth paper says:—"Great success has attended the pearl fishery on the north-west coast, and this has induced the fitting out of several small vessels for enlarging it. At present it can scarcely be called a fishery, as at best all that is done is to prowl along the coast and gather as many as can be seen at low water; even by these rude means between 40 and 50 tons have been taken this season, most of which is on its way to England. It is evident a vessel fitted with proper diving apparatus would make a good thing of this fishery, as it is said very large shells are to be seen lying in deep water; a vessel so fitted was expected at Nicol Bay a short time since. The shells are known to exist all along the coast."

Notes.

How Light Sovereigns are Disposed of.—Those who have now and then to pay in sovereigns at the Bank of England know how often one or two or more light sovereigns are rejected—that is to say, not returned, but clipped, fourpence being charged for the unpleasant process. The popular impression is that these cut sovereigns go back to the Mint to be remelted and recoined. But there are a vast number of trades in England which require standard gold for all sorts of purposes, and these regularly go to the Bank to buy these cut sovereigns. The reason is obvious; few trades use so much gold at once as to require an ingot of gold, which weighs from 250 to 300 ounces, and if they did, they have seldom the means necessary to melt it. But they can buy the cut sovereigns by the ounce or the pound; and though as coins they may have been light, yet as metal they are known to be pure. In this manner, between the gilding and porcelain trades, an immense amount of gold is annually absorbed. The porcelain trade alone takes nearly £50,000 worth of gold a-year, and between gilding and porcelain the annual consumption of England and France is estimated at not less than 40,000 ounces, which is lost to currency for ever.

Electric Telegraph.—Mr. Latimer Clark gives the following particulars of some of the recent performances of the Atlantic Telegraph. At the anniversary banquet given to Mr. Cyrus Field, messages were sent from London and answers received in the following periods:—From the President at Washington, two hours ten minutes; from Mr. Seward at Washington, two hours 25 minutes; from several persons in and near New York, average one hour 45 minutes; from the Governor of Cuba, who apologised for the delay caused by his residing at a distance from Havannah, two hours twenty-four minutes; from the Governor of Newfoundland, at St. John's, 38 minutes; and from Heart's Content, Newfoundland, six minutes. But even these performances are thrown into the shade by an ordinary message sent from London to San Francisco on the 1st February. The wires in America were joined up for experiment from Heart's Content to California, and the message was sent from Valentia at 21 minutes past 7 in the morning; the acknowledgment of its receipt was received back in Valentia at 23 minutes past 7, the whole operation having only occupied two minutes; the distance travelled was about 14,000 miles, and the message arrived, according to San Francisco time, at 20 minutes past 11 on the evening of January 31, or the day preceding that on which it left England.

Archæological Discoveries in Italy.—A highly interesting discovery has been made at Rome in the finding of eight new fragments of the plan of ancient Rome, engraved on marble, by the order of Caracalla. Two of the fragments are of considerable size, and one of them clearly represents the *porticus Liviæ*. There seems no question that these fragments formed part of the plan encrusted in the walls of the staircase of the capitolian museum, and, taken in connection with the recent important discoveries made on and around Mount Palatine, they possess great interest. In the district of Volterra, in Tuscany, near the sea, and at the foot of the hill on which stands Castagneto, the feudal seat of the family of Gherardesca, the remains of an ancient house have been discovered; the impluvium and the pavements of four chambers, executed in mosaic in the Pompeian style, have been laid bare. The mosaic is said to be very well preserved, and to be remarkable both for design and colour. The excavations are being continued.

Paris Numismatic and Archæological Society.—This society has inaugurated its fourth year of existence by the opening of more spacious rooms for its conferences, collections, and library, at No. 58, Rue de l'Université. In addition to some interesting publications, this comparatively new society has established weekly conferences; and it is divided into sections for the study of inscriptions, historic geography, and the history of ceramic art. It was commenced by the Vicomte de Ponton d'Amécourt and eleven other gentlemen, and now numbers 120 members and 220 correspondents.

Insect Menagerie.—It is proposed to establish an exhibition of living insects in the new public garden which is being formed at Montsouris, in the outskirts of Paris, and M. Hamet, professor of agriculture at the Luxembourg, is directed to draw up a report on the subject for the municipal council. Without taking into account the parasitic creatures that could not conveniently be exhibited alive, there are more than 20,000 species and varieties in the insect world.

MEETINGS FOR THE ENSUING WEEK.

Mon......Medical, 8.
Tues ...Medical and Chirurgical, 8½.
Photographic, 8.
Anthropological, 8.

Wed ...Society of Arts, 8. Mr. B. H. Paul, "On Liquid Fuel."
R. Society of Literature, 8½.

Thur ...Linnæan, 8. 1. Rev. Geo. Henslow, "On the Variations of the Phyllotaxis in the Jerusalem Artichoke, *Helianthus tuberosus*." 2. Rev. Geo. Henslow, "Note on *Genista tinctoria*, as apparently affording facilities for intercrossing distinct Flowers."
Society of Fine Arts, 8. Mr. Hyde Clarke, "On Ephesus."
Zoological, 8½.
Chemical, 8.
Numismatic, 7.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 26th March*, 1868.

44. Bill—Weights and Measures (Metric System).
70. „ Petit Juries (Ireland).
74. „ Perth and Brechin Provisional Orders Confirmation.
75. „ Petty Sessions and Lock-up Houses.
76. „ Revenue Officers Disabilities Removal.
86. „ Army—Statement of the Savings and Deficiencies.
148. East India (Currency)—Report.
Public Petitions—Tenth Report.

Session 1867.

408. Pilotage—Abstract of Returns.

Delivered on 27th March, 1868.

50. Bill—Divorce and Matrimonial Causes Court.
166. Navy—Additional Papers.

Delivered on 28th March, 1868.

77. Bill—Local Government Supplemental (1868).
169. Union with Ireland—Fifth Article of the Act.
Colonial Possessions—Reports (Part I. West Indies).
Public Petitions—Eleventh Report.

Session 1867.

431. (c.) Poor Rates and Pauperism—Return (C).

Delivered on 30th March, 1868.

164. Bullion—Return.
166. Navy—Additional Papers (corrected copy).
Crete—Reports of Consul General Longworth.

Session 1867.

431. (A ix.) Poor Rates and Pauperism—Return (A).

Delivered on 31st March, 1868.

119. (I.) Trade and Navigation Accounts (29th February, 1868).
182. Civil Services—Estimate "on account."

Delivered on 1st April, 1868.

22. Madras Sanitary Commission—Report.
52. Parliamentary Papers—Return.
147. East India (Ladakh)—Correspondence.
154. Fines and Penalties (Ireland)—Abstract of Accounts.
162. Duchy of Lancaster—Account.
Public Petitions—Twelfth Report.

Delivered on 2nd April, 1868.

64. Bill—Elementary Education.
79. „ Marriages (Frampton Mansel).
80. „ Prisons (Compensation to Officers).
98. Civil Services; Revenue Departments; and Post Office Packet Service—Estimates.
155. Matthew Lynagh—Report of Commissioners.
159. Court of Session, &c. (Scotland)—Return.
161. Roman Catholic Laity (Ireland)—Declaration.

Delivered on 3rd April, 1868.

81. Bill—United Parishes (Scotland).
82. „ Electric Telegraphs.
158. Slave Trade—Return.
160. Salmon Fisheries (England and Wales)—Seventh Annual Report.
173. Millwall Iron Works Company—Correspondence.
178. East India (Employment of Natives)—Return.
180. Foreign Cattle—Petitions, &c.
182. Civil Services—Estimate "on account" (corrected copy).
188. Extra Receipts—Treasury Minute.
191. Coronation, &c., Oaths—Return.

Patents.

From Commissioners of Patents' Journal, April 3.

Grants of Provisional Protection.

Animals, cleaning—772—D. Price and C. Rowe.
Bale ties—972—W. R. Lake.
Barometers, &c.—981—A. Barclay.
Boilers—918—W. R. Lake.
Boots for hunting, &c.—953—J. H. Cooper.
Bottles, &c., ornamenting—789—S. Brown.
Brakes—859—A. Taylor.
Bricks and tiles—937—W. Richardson.
Bricks, lime, &c.—943—H. Chamberlain, J. Craven, & H. Wedekind.
Cartridges—952—J. Abraham and T. R. Bayliss.
Cinders, separating and crushing—929—B. Parks.
Corkscrews—956—G. Twigg and H. Bateman.
Cotton, &c., carding, &c., the fibres of—807—H. B. Barlow.
Cotton, &c., combing—935—G. Davies.
Cruet and egg frames—736—F. Cadby.
Dampers, &c., apparatus for closing—934—E. Rowland and J. Dalton.
Engines, locomotive—913—J. M. Ure.
Engines, locomotive—982—C. de Bergue.
Engines, locomotive, facilitating the ascent of gradients by—903—P. M. Villamil.
Engines, steam—949—R. Meldrum.
Fabrics, treating—919—G. Martin.
Feet, coverings for the—908—J. M. Poisnel.
Fire-arms, breech-loading—800—W. W. Greener.
Fire-arms, breech-loading, and cartridges—980—A. W. Ramscar and F. W. Wilson.
Fire ranges, close—955—J. H. C. Bade.
Floors, covering for—920—A. V. Newton.
Furnaces—917—E. Butterworth.
Gas burners—976—J. Brönner.
Grain kilns, heating air for—950—A. Brownlie.
Hair stuffing, substitute for—905—W. R. Lake.
Hats, manufacturing—826—J. Vero.
Human frame, applying remedial agents to the—942—L. Encausse.
India-rubber, &c., treating—939—W. Hooper.
Indicators for showing the number of passengers carried in public conveyances, &c.—902—Sir J. Macneill.
Iron, spent oxide of, treating and obtaining products from—923—B. E. R. Newlands.
Lace, machinery for manufacturing—974—C. E. Brooman.
Lamp shades, &c., holders for—986—H. Treverton and E. H. Fowler.
Lamps—893—J. Murray and R. Warden.
Lamps, moderator—857—J. H. Maw.
Lawn mowers—962—W. S. Boulton.
Levers, compound—945—R. Side.
Life-boats—954—C. Gunner.
Lubricators—900—C. Womersley.
Medicine, measuring and administering—911—W. E. Newton.
Millstones, &c., apparatus for manufacturing—958—G. Davies.
Millstones, &c., cutting and dressing—921—R. A. Wright.
Mines, supports for the roofs of—932—J. Edwards.
Mines, &c., extracting foul air from—898—R. Smith.
Optical illusions, producing—925—J. B. Linnett.
Perambulators, &c., breaks for—928—P. Hill.
Pistons, &c., packing for—957—S. Duer.
Portfolios—716—H. P. Reynoldson.
Propulsion, auxiliary—844—J. Bourne.
Safes—926—G. Wailes.
Sandals or overshoes—964—W. G. C. Hudson.
Silk, &c., doubling, &c.—940—J. L. Geiger.
Spinning and twisting machinery—933—W. Redman.
Steel, &c., producing—909—W. E. Newton.
Straps, belts, &c.—906—J. M. Poisnel.
Sugar, &c., from beetroot—978—G. F. Guy.
Valves—912—J. F. Spencer.
Watches—959—E. D. Johnson.
Water-closets, &c.—966—J. G. Jennings.
Weaving, figure, apparatus for—915—C. F. C. Cretin-Borne.
Windmills—938—F. Warner and H. Chopping.
Windows, &c., ventilating—931—W. R. Lake.
Wood-shaping machinery—907—J. and J. Thompson.
Wool, &c., opening and cleaning—947—C. Mather.

Invention with Complete Specification Filed.

Ordnance, mechanism for taking up the recoil of heavy—1083—C. S. Tyson.

From Commissioners of Patents' Journal, April 7.

Patents Sealed.

2630. T. C. Clarkson.
2805. W. Low and J. Treadwell.
2808. W. R. Lake.
2813. J. Smith.
2822. J. H. Brown.
2826. J. B. Hulme.
2835. A. Danilecki.
2840. W. Potts.
2841. J. Speight.
2852. A. M. Clark.
2933. S. S. Maurice.
3071. J. Watkins.
3246. R. Heathfield.
3271. K. J. Winslow.
3352. E. H. Bentall.
3651. M. J. Rice.

Patents on which the Stamp Duty of £50 has been Paid.

1700. M. Ashby.
924. G. Burt.
958. G. T. Bousfield.
971. F. R. Ensor.
986. P. Hugon.
955. W. E. Newton.
1007. G. Davies.
962. J. G. N. Alleyne.
1058. C. F. Cotterill.
973. R. Maynard.

Patents on which the Stamp Duty of £100 has been Paid.

877. F. Ransome.
819. W. and F. W. Crighton.
832. A. V. Newton.
825. J. G. N. Alleyne.

Journal of the Society of Arts.

FRIDAY, APRIL 17, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock :—

April 22.—"On the Cultivation of Beetroot, and its Manufacture into Sugar." By W. A. Gibbs, Esq.

April 29.—"On Progress in Oyster Culture." By Harry Lobb, Esq.

Albert Medal.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows :—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, March 25th. Present — B. Shaw, Esq. (in the chair); Mr. Harry Chester, Mr. E. Hollond, Captain Grant, Mr. G. F. Wilson, F.R.S., Mr. J. T. Ware, Mr. Neville Lubbock, and Mr. E. C. Tufnell.

Mr. Frank Buckland attended and gave information with respect to the supply of oysters, lobsters, &c.

Mr. Chester—Before you begin, I wish to ask a question with regard to the extension of the inland fishery districts. I understand that a district is formed when the country gentlemen in the neighbourhood wish for it, but is there any arrangement under which the Secretary of State, or one of the inspectors of fisheries, can put the thing in train, so as to show the country gentlemen the value of having a district, and get them to act?

Mr. Buckland—That is not exactly the business of an inspector; but both Mr. Walpole and myself take much the same view of the matter as you do. I shall be very glad to see the River Eden and its tributaries made into a district. I am going to give a lecture at Southampton, and hope to get the Hitchen and Test made into a district; and we also are making arrangements to the same end with regard to the Arun and Rother. I will now proceed with my evidence on sea fisheries. The first point to which I would call attention is the cultivation of oysters; and in the first place I would enumerate the localities where, as far as I know, oysters exist—proceeding downwards from the N.E. side of England. At Berwick-on-Tweed there are no oysters, only mussels; next we come to Holy Island, I believe, which is a very promising place for oysters; it is the property of Lord Tankerville. At the mouth of the Alne and Coquet there are no oysters; too much sand. A great bed of sand, in fact, appears to extend from here to Norfolk; and where there is sand there are no oysters. At the mouth of the Tyne there are no oysters, but abundance of mussels; the same with the Tees and the Wear. At the mouth of the Trent there are no oysters; I believe there are mussels. Just off the north coast of Norfolk there are a few oysters, not enough to be of great commercial value; but the mussel cultivation in the Wash and the Humber, is very important. The head-quarters of the oysters are off the coast of Essex. There are very few in the Orwell at present, but it seems likely to be a good place for them. Then we come to the Colne, where there are magnificent oysters, now very scarce; and at Blackwater they are very good. This district and hereabouts is the great breeding ground of all the so-called "natives." Then we come to the mouths of the Crouch and the Roach, where the oysters are very good. My friend Mr. Fred. Wiseman, who is here, will give you some information as to this locality. The peculiarity of the Roach oysters is that they are green-bearded; the bodies are of the usual colour, but the beards are green. Mr. Wiseman will tell you that these are the oysters which for years have been sent to Ostend, whence they are sent to Paris, Berlin, &c., and are sold as *Huitres d'Ostende*, and as they are much prized by Englishmen abroad, Mr. Wiseman is anxious to introduce them into the London market. Then we come to the mouth of the Thames; about Shoeburyness it is too sandy for oysters, but there are some very fine ones called Hern oysters, opposite Sheppey. Then we come to Whitstable, which produces the best oysters we have, worth now £8 per bushel. Next we come to Herne Bay, where there is an oyster company, with which I am connected. Then there is a long blank until we come to Selsey Bill, where there are a few oysters, but it is not a place of much importance in our list. A district of very great promise for oyster cultivation is that about Portsmouth and Chichester, where

there are a great many creeks, and not far off is the celebrated Hayling Island Oyster Fishery. There are several fisheries in the Isle of Wight, one at Medina, and another at a place called Branding Harbour, the property of Captain Kulbach, where it is proposed to form a company. All along the Solent and off Spithead the oysters have a handsome shell, but they are not very fat. Opposite the Hampshire Stour there are very few. Next we come to Poole. At this place there is a natural bank of shells, but at present no oysters. A lady has been trying to cultivate them there under the French system, but as yet with only partial success. There evidently have been oysters there, and I see no reason why they should not come again. There are none, I believe, in the Axe; in the Exe there are a few of what is called "Exe Bright" oysters, but I am afraid the bottom is rather too sandy. Sand is the great enemy to oysters; for a sand storm may come and bury the whole bed, and kill any oyster placed near it. There are a few oysters at Plymouth, but no great number. At Falmouth there are pretty fair oysters, but, unfortunately, some of them are green, not only in the beard, but in the body. Then we come round to the Severn, where there are no oysters, and never will be; there is too much sand. At Swansea we find rough, sea oysters, but the young ones are pretty fair in quality. There are not many in Carmarthen Bay, owing to the sand. Milford is a very first-class place indeed for oysters, and they are as fine there as ever I have seen them. From there all up the Welsh coast there are no oysters until we come to Beaumaris, from which place Liverpool market is largely supplied. The beds there are not natural, the oysters having been laid there. Further to the north, I believe, the coast is all too sandy. The localities, therefore, where oysters can be cultivated on the coast of England, are considerably limited.

The Chairman—Is there any real objection to the green oysters?

Mr. Buckland—The green-bearded ones from the Roach are very good, but the Falmouth ones will not do at all. I do not know whether they are eaten in the neighbourhood. I believe that not all these Falmouth oysters are green. I now come to the Irish oyster fisheries, of which I have a list made out by the late Mr. Ffennell, which shows a very different state of things to what we have seen in England, for all the bays and inlets on the west coast are very favourable for oysters. The beds are at Lough Foyle, Blacksod Bay, Achil Sound, and Clew Bay; Kilkerran Bay, Burterbuc Bay, and Rosmuck; Galway Bay, Waterford, Burterbill, Wexford, Wicklow, Carlingford, Cork Harbour, Belfast Lough, Red Bank Burrin, Shannon, Kenmare Bay, Lough Swilley, Sligo, Ballisdore Bay, Killary Bay, Ballynakill, Clifden, Tramore. Thus, there are twenty-one places in Ireland where oysters are bred, and from some of these places they are brought and laid down to fatten in the English beds. Oysters are exceedingly dear, and will be still dearer. Fine ones are now worth 2d. each; they will be worth 3d., and then 4d., and perhaps 6d. each, and the question is, what is the cause of this high price? Of course the first reply is, their scarcity; but the next step is, what causes the scarcity? Some people say it is due to over-dredging; but Mr. Wiseman has been at work at this question for the last five or six years, and we agree that over-dredging has nothing to do with it. It is a simple case of cause and effect. According to my calculations an oyster brings forth about 800,000 young ones in the months of May and June. That is the number I have found in one shell. I do not know how often breeding takes place in the oyster's life, but after spawning we know that the oyster will fatten. I arrived at the number by weighing the spat from the oyster, and then carefully weighing a grain, and getting the number in that grain counted, which was no easy task, owing to their minute size. In my museum I have some six or eight which have been counted in that way, and the result is about what I have stated. These numbers of young oysters were known to be extruded from the parent oyster, and if the crop succeeded they ought to be found upon the shells placed to receive them, but this is not the case; you do not find them. It is like sowing corn in a ploughed field, and waiting for it to come up, and it does not come. That is the cause of the scarcity. It will then be asked, do these little oysters die? They float a certain number of hours or days in the sea, and then adhere to something, and between the time of their birth and this attachment to a shell or stick, they die. What, then, is the cause of their death? Mr. Wiseman and myself have been investigating this matter for some time, and we both believe that it is a question of temperature; that when these little creatures are floating about, a cold wind comes and chills the water, and they die. I have been trying experiments for the last two years with little oysters, and what one does they all do. I have tested the heat of the water with a delicate thermometer, and I find that by subjecting the spat to different degrees of temperature, I can kill them at once, or partially kill them, and again resuscitate them. I find that they require a very high temperature to be well and hearty. Now, we have had for these last four years very cold nights in June, and in those cold nights I believe that something happens in the sea similar to what happens in my experimental bottles, where I see that a low temperature causes the young oyster to collapse and go to the bottom. The French have bred oysters for some years past, and the idea has got abroad that because the French can do this to a large extent, therefore we can do the same. But this is a great mistake. If a man said—"I have seen vines growing extensively in France, let us get up a company and grow them in Essex or Hampshire," of course the scheme would come to grief. The temperature which is suitable for growing vines from which to make brandy, is suitable to the growth of young oysters. You may put in stones and tiles, or anything you like, but the oysters will not stick to them as they do in a warmer climate than that we have lately had in June. I believe therefore that temperature is the cause of the failure which has been going on ever since 1860. In 1859 there was a very good crop, but ever since it has been very bad. If you leave the oysters, and do not dredge them, the result will simply be that the vermin, the star fish, and so on, will eat them, and the ground will also get covered with mud. At Hayling Island, where they have had such great success in the cultivation, the weather is much warmer than in Essex, as we know by delicate and consumptive persons going to the Isle of Wight as an asylum. Every oyster has a sort of physiognomy of its own, and after some practice you can tell almost with certainty where he comes from. This physiognomy depends very much on the quality of the soil and water on which they are laid, and from which they derive their nutriment, and it is a curious fact that with change of situation an oyster will change its appearance. Lay an Irish oyster on English ground and it will grow a new shell, and taking its material from the water in which it is, will assimilate in character to those indigenous to the place. Here is one, say from Scotland, which has been put into a good English feeding-ground, and in the course of a year it has nearly doubled the size of its shell. It is very necessary in cultivating oyster-beds to know what should be laid down to catch the oysters; and at my museum at the Horticultural Gardens, I have specimens of various substances which are useful for this purpose, but there is nothing at all equal to that which is pointed out by nature—viz., the old oyster shells themselves.

The Chairman—What is the farthest extreme point northwards that you know of oysters flourishing?

Mr. Buckland—There are none, I think, in the Baltic; there are a great many on the west coast of Norway, and on the west coast of Ireland, the reason I believe being that those parts are more exposed to the

action of the Gulf stream. Oysters certainly breed much more freely on the Irish coast than on that of England. There are also oysters on the east coast of Ireland, but not so many as on the west.

Mr. Hollond—The waters of the Connecticut are very cold, the river being frozen over until April, but that river is full of oysters.

Mr. Buckland—The water ought to be warm there in the summer; and you must recollect that in order for oysters to fatten they require cold water, but warm to breed. Deep-sea oysters do not spawn until August or September, while those in shallow water spawn in May and June.

The Chairman—Allow me to read to you a short extract from what Mr. Blake said:—"Something tremendous might be done by artificial culture," &c.

Mr. Buckland—The question of companies is a very serious one, because oyster culture is so uncertain; you may spend a large amount of money, and after all the plans adopted may not answer. Lord Dunmore laid a large number of oysters in the Island of Harris, and the people came in the night and swept them all away. I think it would be a very good thing to cultivate the foreshores, if you can manage it in suitable localities, without infringing upon public rights. Then I come to the question of the mussel fisheries, and that is almost as important as that of oysters, because mussels are used as bait for deep-sea fish. I was at the Board of Trade last week with a deputation relative to the destruction of the mussel "scalps," as they are called on the coast of Lincolnshire. There are a vast number of beds there which supply bait for the haddock fishery, and these beds, not being protected in any way, are now being gradually destroyed. They used frequently to get from fifty to sixty tons of mussels weekly, at 40s. a ton, and it is calculated that one ton of mussels ought to produce £40 worth of haddocks, so that the produce of these beds would in that way be worth from £1,000 to £1,200 a year. Now the farmers are taking these mussels and putting them on their fields for manure, using the young fish that ought to be allowed to grow to maturity in order to form bait. This question is very important at the present time, because if there is no bait we shall have no haddock. All the mussel beds at the mouths of the Wear, Tyne, and Tees ought to be cultivated. These mussels are eaten largely in London as human food.

Mr. Chester—You attribute the approaching scarcity of oysters to over-dredging; would it not appear likely, by analogy, that the scarcity of mussels is, at least in some degree, due to the same cause?

Mr. Buckland—I had that idea at first, but I find on inquiry that plenty of mussels are born every year; there is no complaint of the want of the fall of spat, as in the case of oysters. They are taken away after they are born, before they are grown up. Now I come to whelks; they are exceedingly important, as they afford bait for the cod fisheries in the north. They are also brought to the London market, and sold as food.

Mr. Chester—have any attempts been made to fish for haddocks and cod with artificial whelks and mussels?

Mr. Buckland—I don't see how you could make artificial whelks; an artificial minnow costs 5s., and when you can get whelks four or six a penny, it would not do to buy artificial ones at such a price. I think the fish would be too knowing to be taken in like that. We now come to lobsters and crabs; and this is very important, for lobsters are certainly diminishing in number. The cause of this decrease I am not prepared to state, but my friend Mr. Jonathan Couch, of Polperro, writes to say that he finds in former times the fishermen were in the habit of putting the female crabs back again into the water, taking off a claw as a sort of toll, knowing it would grow again. Mr. Henry Lee, who is here, can also state what was the practice at Margate in the case of lobsters.

Mr. Lee—They used to throw back the younger ones. There was a club called the Dredgermen's Club, all the members of which were bound by the rules to throw back all lobsters below a certain size, and on satisfactory proof of their having done so, a certain sum was allowed them by the club.

Mr. Buckland—A great part of our supply of lobsters comes from Norway. I must tell you that I keep up, through the medium of *Land and Water*, a correspondence with many parts of the fishery world, and from a clergyman who knows a great deal about Norway I have got some very interesting statistics as to the export of lobsters from that country. In 1855 there were exported 814,000; in 1856, 960,000; in 1857, 717,000; 1858, 553,000; 1859, 881,000; 1860, 1,333,000; 1861, 1,480,000; 1862, 1,217,000. But this is not going to last, and I think the reason is that they catch the female lobsters when they are what are called "berried hens." In lobster salad you have the red berries or eggs of the lobster, which would eventually become young lobsters. I do not know why the Norwegians allow them to be caught at that time. They have a close time for lobsters, from the 15th July to the 15th October, but I think it ought to begin earlier, or the fisheries will suffer. I think lobsters might be hatched artificially in many parts of England and Scotland. The first requisite is a rocky coast; they will not thrive where there is mud. If you could get a lagoon among rocks, stopped up to prevent their escape, but allowing the water to go in and out, you probably might grow them. Mr. Lee and myself, and two or three other gentlemen, have an experimental fishery at the Reculvers, near Herne-bay, and into this I put last spring three "berried hens," which I bought at Gilson and Quelch's, in Bond-street, as I was going down. In a few days the water was absolutely swarming with young lobsters. They all have the power of swimming about more or less, like little fish or tadpoles, for a few days, and then they fall to the bottom, and, as unfortunately the bottom of our pond is muddy, I believe they were all destroyed. If we had had rocks for them to get in they would no doubt have been alive now. We found out that it was necessary to feed them, or they would eat one another. There are many places in Ireland and Scotland where, I should think, lobster culture could be carried on.

Mr. Lee—Some fishmongers at Margate met my suggestion as to hatching out the young lobsters by giving me permission to take all the berried hens. The result was that I hatched out the young from more than a dozen female lobsters, and they were allowed to swim out to the rocks from which the old ones were taken.

Mr. Chester—Would not you say it was a very wicked act to make lobster sauce from a "berried" hen, and that it ought to be made felony by an Act of Parliament?

Mr. Buckland—It is contrary to Leviticus, certainly; but when I say to the fishmongers what a shame it is, they say, the gentlemen will have them. I would suggest that the Secretary be directed to write to the Norwegian Government on the subject. I do not think any lobsters come from Canada or North America except as potted lobsters. It is of great importance that there should be a close time for these valuable crustacea.

Mr. Lee—In some places the lobsters have been entirely destroyed through killing the "berried hens."

Mr. Buckland—I think the close time should begin earlier; but, at all events, the Society of Arts should call the attention of the Norwegian Government to the fact that lobsters are sent over here in the spring months full of "berries," and that their fisheries will be injured in consequence if something is not done. I now pass on to the deep-sea fish. I have correspondents who write to me almost weekly in *Land and Water*, which is a paper that has for its chief object fish cultivation. Three clergymen kindly write to me from Great Grimsby, Cullercoats, and Brixham, so that I am pretty well *au fait* at what is going on in the department of sea fisheries. There are between 800 and 900 trawlers

that supply London with fish, and the amount per annum is about 800,000 tons. The best trawled fish fetch about £7, and the worst about £2 per ton, wholesale price at Billingsgate. There is a chart of the North Sea, which has been marked out by a gentleman (Mr. M. Thomas) who owns a fishing smack, the *Hurricane*, from which you will see that fish are caught in different localities, and the kind varies in different places. Each fish seems to have a *locale* of its own. The whole of the North Sea, from the east coast of England going up to Norway, is a sandy plain, more or less, and upon this large plateau of sand you find the flat fish, which correspond, in my mind, to desert animals on land. Directly you get to another submarine country you find another piscifauna. These North Sea fisheries are of the greatest importance to us as a nation, but they are certainly diminishing; fewer fish are caught than were formerly. An inquiry has been instituted by the Commissioners of deep sea fishing, and they propose that there shall be no legislation, but that things shall be allowed to go on as they are. Mr. Lee and myself, and also Mr. Lord, have been inquiring into this matter, and it seems to us that the question is a little jumbled. In the first place people say the trawlers bring up a great quantity of spawn. But what is the spawn? It is probably not the spawn of fish, but of some marine creatures. How is it possible for a 2 or 3 inch mesh net to bring up the spawn of herrings, unless it is gelatinous and adhesive? My own opinion is that trawling may do mischief—I do not say that it does—inasmuch as it kills the little fish. There is a weir down at Hampton, near Herne Bay, in which I found a basketful of little fish dead—sole, plaice, flounders, and so on. This was not 300 yards out to sea, which shows that these creatures come in to spawn upon the foreshore. The result of the trawling, as far as I have seen it is, that the net is dragged along the bottom of the water, and as the water pushes it backwards, the pieces of string composing it are drawn together, and everything is caught within it, and when the net is hauled on board a great many of these little fish drop out, dead. I do not think the deep-sea trawlers do so much harm as the in-shore boats. The former, Mr. Thomas informs me, do not work in less than 10 or 15 fathoms water. I do not at present know how that is to be remedied, but I certainly think that for these fish there ought to be a close time. A short time ago my sea-fishery correspondent wrote to say that the fishermen could catch no soles, and I wrote back to say that I was delighted to hear it, because I believed the soles had gone away from the deep-sea water, where they take up their winter quarters, on to the sand-banks on the coast of Holland or England to spawn. A few weeks after, I was sorry to hear that they had found them again. We have consulted with fishermen, and asked them what they want done, but they cannot make up their minds; they only say they want the number of smacks diminished. I cannot see how this is to be done. I really wish the deep-sea fishermen would say definitely what they really desire. My own idea is, that a gentleman should be appointed to go and live on board the smacks for a certain number of months in the year; some one like my friend Mr. Lord, who has been used to this kind of work; it must be a competent man—who should take his microscope and scalpels and other apparatus, and see what the state of the fish really was at different periods of the year, and report upon it. He should go from smack to smack, and from bank to bank, until we really had full information as to the habits of the fish, and the systems of fishing carried on. By adopting this course for a few years a vast amount of practical knowledge concerning deep-sea fishing would be accumulated, and that is really what we want. We know nothing at all about the habits of sea-fish, and until we do it is perfectly impossible to have proper legislation.

Mr. Chester—Do you see any reason, Mr. Buckland, why all fish should not be sold by weight? Salmon is sold at so much a lb., but turbot and soles, and all other kinds, are sold by the fish, and you cannot tell how much you really are getting for your money.

Mr. Buckland—I cannot answer that question, but I suppose the fishmonger gets more out of it that way. In Manchester, soles, I believe, are bought by the pound.

The Chairman—Allow me to ask whether, in considering the question of trawling, you have taken into consideration that young fish which may be brought up by the trawl may be killed by its passing over them?

Mr. Buckland—As far as I understand a trawl, if any fish once gets within it, it is all up with him. There is a little mistake as to the trawl having an iron frame. There are two iron runners, like sleigh irons, but the bottom of the trawl itself is a rope. The Barking system is to wind rope round a chain so as to weight it. The Torbay system is to use rope alone. Any little fish that got under it would certainly not be benefited. The great point on which I differ from the commissioners is as to various grounds being trawled out; some have been trawled out. But we shall really know nothing about these matters until we have somebody living on board.

Mr. Chester—Do you know at present, really, whether whitebait, anchovy, and sprats, are young fish, or whether they are distinct and separate varieties?

Mr. Buckland—I can only tell you what I know, and that is, that when you eat whitebait you eat about five different kinds of fish.

Mr. Chester—You do not believe it is a distinct species?

Mr. Buckland—I want to see an old whitebait in spawn.

Mr. Chester—Ought we not to ask Government to have large aquaria of sea and fresh water fish; to see whether a whitebait ever becomes an anchovy, or a sprat a herring?

Mr. Buckland—That is most important, and that is what Mr. Lee and myself are trying on a small scale. I should be very glad if Government would take it up on a large scale. I have no doubt they will after a time.

The Chairman—Your desire is that Government should appoint, not so much an inspector as an inquirer, to obtain information, and also that aquaria should be formed in which the habits of these animals might be watched, and experiments conducted?

Mr. Buckland—Exactly. Since I was here, some gentlemen called on me to make inquiries respecting an aquarium on a large scale, but after giving them the information, I have not heard any more of it.

Mr. Lee—They are going to form a large aquarium at Scarborough first, at a cost of £10,000.

Mr. Buckland—It could never be done in London on account of the cost of sea-water.

Mr. Hollond—Have you heard the decrease in the fish off the east coast of England attributed to the fouling of the water caused by so many steamers passing over the sand banks?

Mr. Buckland—Nothing of the sort has been mentioned in the letters of my correspondents at Cullercoats and Whitby, but if such statements are made we will inquire into it. Another point has reference to the use of ice in trawlers. Being out sometimes for several days they use ice to keep the fish fresh for the London market, each vessel using from 5 to 16 tons in the winter, and from 16 to 35 tons in the summer. Mr. Thomas informs me that each trawler uses about 80 tons. His *Hurricane* takes one and a-half ton of ice per week. This is rather expensive; indeed, one gentleman is reported to spend between £2,000 and £3,000 for ice in one year to preserve his trawled fish; and if some process could be discovered for producing a low temperature without the use of ice it would be a great advantage.

Mr. Foster—There are several people hard at work upon that problem now, but the great difficulty is to do it sufficiently cheap.

Mr. Buckland—The cod fisheries I have but a few words to say about, for though it is a very important

fish, its power of multiplication is so great that I have no fear of its being destroyed. I calculated the other day that the roe of a cod contains 6,800,000 eggs, nearly twice the population of London. Still the roes of cod are used in a way they ought not—as bait for the sardine fisheries off the French coast. However, the cod does not want much protection. I should like also to say a word on the Iceland fisheries, which are important to us. The best of the fish is sent to Spain, where it is much esteemed under the name of "Bildals," and the inferior qualities are sent to England. Then we come to pilchards. They come to Cornwall, but no further, and are very rarely sent to the London market; why, I cannot conceive, because they are salted for the Spanish market, where they are much esteemed, and fetch about £3 a ton. It is a question worth inquiry why they should not be brought to London and sold in the markets. As regards herrings, their power of reproduction is marvellous, each roe containing, I find, 19,000 or 20,000 eggs, but still they are not so plentiful as they might be. The unfortunate thing about them is that we can only catch them at the time they are in spawn. They appear to me to come from the deep water into the shallow, not to undertake that beautiful tour which Mr. Pennant described—where they go no human being knows, except that they go into the deep water. There can be no useful legislation until more is known of their habits, but I think the "inquirer" ought to find out and report to the authorities at what time they should be protected. My friend Mr. Couch, the celebrated naturalist, of Polperro, sent me a very interesting account of the herring's spawn, which was observed off the coast of Cornwall. He says, on January 25th:—"A few days since my attention was directed to a fishing drift-net, which was filled with spawn known to be that of the herring, and on inquiry I found that all the nets in the boats were equally filled with this spawn, in some more abundantly, so that one of the fishermen believed there must have been many bushels, and one of the most intelligent of these men assured me that it dropped from the fish as the nets were hauled on board, and that too in such abundance that as he stood in his boat the quantity reached to his knees. This was between this place and Plymouth. The net floats at about three fathoms from the surface, in a depth of about 25 fathoms. The nets of the boats which assemble at Plymouth from the herring fishery are calculated to reach considerably more than 100 miles, and if all of them are filled with this spawn, in a manner like what we have seen and been informed of, the quantity of this destroyed must vastly exceed the number of the fish taken. So far as the public benefit is concerned, such weather as will render it imprudent for the nets to be shot must be of vast benefit. Storms are good for something." If there were such a public officer appointed as I have spoken of he would order the fishing to be stopped in such a case, or do something, but it will not do to have any person unless he is a naturalist. My theory is, protect the fish while spawning, and then I would give you leave to catch them any way you liked at other times. But the protection must be sincere and real. Mackarel have about 56,000 eggs in the roe, and they also are taken in spawn, which ought not to be. Haddocks the same, and soles the same. I can only sum up my evidence by saying that we know nothing about these sea fish.

Mr. Chester—Have you any opinion as to the comparative nutritive value of these fish in and out of spawn?

Mr. Buckland—We never eat herring except in spawn, or just after, but by analogy with all other fish, they would be much better at other times. I conclude by saying that Mr. Lee and myself have this experimental fishery at Reculvers, which we should be pleased for the committee to see. I have also a museum of economic fish culture, which I am making at my own expense, the South Kensington authorities having granted me a good site for it in the Horticultural Gardens. I take a cast of every large fish that I can hear of (they are kindly lent me by the fishmongers, especially Messrs. Gilson and Quelch, of Bond-street; Thomas Grove, of Charing-cross; Charles, of Pimlico; and Grove, of Bond-street), and collect every specimen that seems likely to throw light upon this important subject. I am happy to say that the public are beginning to be aware of the importance of this kind of inquiry in the way of lessening their own expenses, for that is the object of all our researches.

Mr. Chester—Can you say anything about eels?

Mr. Buckland—Eels go down the rivers when the salmon are coming up; they spawn in the estuaries. The little eels come up at this time of year, and in certain rivers, such as the Parrett, in Somersetshire, vast quantities of these elvers, as they are called there, are taken. They are made into cakes and fried. I think, very likely, there are large tracts of country doing nothing at all, where eels might be cultivated with a good chance of paying a dividend. There is a question whether the parent eels return to the rivers; I think they do, or else it would be difficult to account for the large eels sometimes found in fresh water. I have not turned my attention to the question of supplying fish to rural districts, but I should think it could be done by means of costermongers. I will make inquiries on that point.

Mr. Frederick Wiseman, Oyster Merchant—I have very little to add to what has been said by Mr. Buckland on the subject of oyster culture. I quite agree with regard to the low temperature of the water being the cause of the failure. The first failure was in 1860, when it was so complete that, although a sum of money was offered for spat, not one was found. Since then, the fall of spat has been very partial; there was very little in 1861, and even up to the present time, I may say that there has been almost a failure in the spat. Some have attributed the failure to over dredging, but there never was a greater mistake. I have a little pamphlet in which it is stated that all the available oysters have been eaten, and none placed in the beds to replace them; that the demand has exceeded the supply; but this is not the cause of the failure. Oyster beds are not dredged out in that way; I speak of private beds. All the oysters sold in London as Whitstable natives are parent oysters, four or five years old. We do not sell the little ones; and even in the case of public beds, where young oysters are dredged up, they are sold to private persons for feeding. I have kept a diary of the wind and weather since 1858; and on the night of the 10th June, 1860, after a hot day, there was a frost, and the temperature of the water went down ten degrees. I believe the temperature has been colder in June since 1858 than it was before. If you can once get the spat to adhere no amount of cold will destroy it afterwards. In 1858 we had a hot summer, and there was abundance of spat. It is not the fact that long before 1858 there was a gradually increasing scarcity and dearness of oysters. I should think they were as cheap in 1857 as in 1825. They were not dear in 1858, or even in 1860; perhaps 30s. or 40s. a bushel; I have sold native oysters at 18s. 6d. a bushel not many years back. By selling oysters in the way we do, only the parent oysters, it would be impossible to denude the beds if there was spat to replace what was taken away. Oysters begin to breed from 2½ to 3 years old; we do not sell them until after they have spatted; we never sell one under four years old. They spat in June and July, and we do not sell them until the 1st September, so that they have all had time to spawn; but, unfortunately, it has perished from the low temperature. It is not likely we should over-dredge our own beds. I have been in the trade more than thirty years, and my father and grandfather were in it before me, so that we ought to know something about it. I have had the benefit of my fore-

fathers' experience, but, at the same time, I am only too glad to try anything fresh. I have tried cultivating them in a tank; it has not proved very successful, but I mean to continue the experiment. The oyster spat must float for some time, because we sometimes find it on the bottom of the boats. I attribute the success of the cultivation at Hayling Island to the temperature. It is ten degrees higher there than at Faversham. I never knew the temperature in the river Roach or Crouch higher than 71°, and I have found it 82° at Hayling Island.

Mr. Chester—Has it not generally been found that the average temperature of the coast has risen of late years?

Mr. Buckland—We have had very cold summers.

Mr. Chester—As a whole, taking the last twenty-five years, would you not say the temperature had improved?

Mr. Buckland—It may be so; but it is not a question of average.

The Chairman—The Romans used to get oysters from Utuprium, and the climate must surely have been colder then than now.

Mr. Wiseman—I have known of a failure in one year before, but never such a succession.

Mr. Tufnell—At Hayling Island the effect of the Gulf Stream comes direct, but on the Essex coast it has had to travel all round the north of Scotland.

Mr. Wiseman—There is no doubt the water is much warmer there than on the Essex coast. If the failure were caused by the want of parent oysters, how is it that in 1860, when oysters were abundant, we had no spat?

Mr. Chester—No doubt the temperature has a good deal to do with it, but I fancy there must be some further cause for the failure.

Mr. Hollond—I do not understand how the American rivers, which are frozen up for many months, are so stocked with oysters. The Hudson is very cold in July.

Mr. Buckland—I understand it is very hot there in August and September, and the oyster may spawn then.

Mr. Hollond—Would not the same rule operate in England, and if the weather were unusually cold in April and May would that not drive off the spawning to the last week in June instead of the first?

Mr. Buckland—It might in some cases, but not in all. I have had nine samples of oysters from America sent me, and some I have put into the fishery, where they are doing very well. It occurred to me that they might be made hardy, and able to spawn in a lower temperature than our native oysters. Oysters grow from May to the end of August, after which they fatten. A few months ago an oyster bed was discovered off Blankenberghe, on the Ostend coast, which yielded a large quantity of oysters, and I really don't see why the coast-guard boats should not occasionally put a dredge overboard, as in that way new oyster-beds might be discovered of which we know nothing. I am convinced, and so is Mr. Wiseman, that the failure of the spat is from lowness of temperature, and in giving you this evidence we have told you what has cost us much time and money to find out. We are still working at it, and hope yet to arrive at something practicable. I am much pleased that the Society of Arts is taking up the subject of fisheries.

Eighteenth Ordinary Meeting.

Wednesday, April 15th, 1868; C. W. Siemens, Esq., F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Eyre, Major-General Sir Vincent, C.B., Athenæum Club, S.W.
Lawrence, Edwin, LL.B., B.A., 94, Westbourne-ter. W.
Scott, John, 21, Newton-road, Bayswater, W.
Solomon, Asher, 8, South-street, Finsbury, E.C.

The following candidates were balloted for, and duly elected members of the Society:—

Drummond, Peter Robert, Perth.
Foster, George, Rochford, Essex.
Jeffery, Walter, 35, Eastgate-street, Gloucester.
Wilson, Edward, Hayes, Kent.

The Paper read was—

ON LIQUID FUEL.

By Benjamin H. Paul, Esq.

The economy of fuel is a subject of so much importance in a variety of aspects, and it affords so much scope for improvement, that any suggestion made with that object is always deserving of full consideration; and, even if such suggestions should be impracticable or erroneous, it is at least worth while to demonstrate clearly the circumstances which may be considered as justifying an adverse opinion. That such a course is appropriate in regard to a project which is expected to involve a reconstruction of our navy and a radical revolution in steam navigation, will, I apprehend, be readily admitted.

The proposal to substitute for the coal now used as fuel in steam vessels some kind of liquid combustible, is an off-shoot of the excitement which has prevailed during the last few years in regard to the discovery of vast quantities of petroleum in America; and it was that material which was in the first instance recommended as the substitute for coal. A commission appointed in America some years ago, to investigate the subject reported that petroleum was beyond doubt more than twice as effective as anthracite coal in the production of steam, and that steam could, by the use of this material, be produced in less than half the usual time.

It was an inference by no means unnatural that if this were the case, and if coal could be superseded by this material as the fuel of steam vessels, a very great portion of the space required in merchant steamers for the stowage of coal would be rendered available for more profitable cargo; that steam packets might become independent of coal depôts at various points of their passage; and that vessels of war would be enabled to keep the sea for a very much longer time than they now do with coal. Any prospect of such advantages as these being attainable might reasonably have been expected to justify a more thorough and searching investigation of this subject than it has yet received in this country.

Besides petroleum, several other analogous materials have been proposed as substitutes for coal; for instance, the oil obtained by distilling particular kinds of coal, or the shale which occurs in coal formations, and more recently the oil known as "dead oil," which is one of the products obtained in rectifying the coal tar of gas works. All these materials resemble each other closely in being composed chiefly of carbon and hydrogen, which are, in various proportions, the combustible and heat-producing constituents of all kinds of fuel. For the application of these materials and of liquid fuel generally, various methods have been proposed, but before speaking of them it is desirable to consider what is the evaporative power of these materials respectively, since that is a very important point to determine in regard to the question as to the relative merits of these different kinds of fuel.

The heat generated by combustion has been made the subject of the most careful investigation; and since the time of Lavoisier, Laplace, and Rumford, the more precise measurement of the amounts of heat capable of being produced by the combustion of carbon and hydrogen, has been repeated by several physicists with results which agree so closely, that they may safely be regarded as well established. The names of Dulong, Despretz, Andrews, Favre, and Silbermann are, moreover, an unquestionable guarantee that these results, and the methods by which they were obtained, are perfectly trustworthy. According to these results, the maximum heat-producing capabilities of carbon and hydrogen are

in the ratio of 1 to 4·5. The actual quantities of heat generated by the combustion of a pound of carbon or of hydrogen are as follows:—

Relative Calorific Power.

	Pound.	Heat units.	
Carbon	1	14,500	1·00
Hydrogen	1	62,032	4·28

The heat unit here referred to is the quantity of heat which raises the temperature of one pound of water one degree Fahr. (from 40° to 41°). Therefore, the numbers given in the table represent the quantities of water capable of being heated one degree Fahr. by the conversion of one pound of carbon into carbonic acid gas, or of one pound of hydrogen into water. As there are, in the Fahrenheit thermometric scale, 180 degrees between the freezing point and boiling point of water, those numbers divided by 180 give the corresponding quantity of water capable of being heated from 32° to 212° Fahr. Again, the quantity of heat required to convert a pound of water at 212° Fahr. into steam of the same temperature, is nearly five and a-half (more exactly 5·37) times as much as that requisite to heat a pound of water from the freezing point to the boiling point; therefore the quantities of steam capable of being produced from water at 212° Fahr. by the total heat generated in the combustion of a pound of carbon or of hydrogen, are of course ascertainable by dividing the number of pounds heated from 32° to 212° Fahr. by 5·37. These several quantities are given in the following table:—

Quantities of Water

Heated,		or converted into steam,	by the heat generated in combustion of
From 40° to 41° F.	From 32° to 212° F.	From water at 212° F.	
lbs.	lbs.	lbs.	lbs.
14,500	80·55	15·	1 carbon.
62,032	344·62	64·2	1 hydrogen.

These quantities of 15 pounds and 64·2 pounds of water convertible into steam by the total heat generated in the combustion of a pound of carbon or of hydrogen, represent what is termed the "theoretical evaporative powers" of those substances. By the term theoretical, however, it is not to be understood that these values are in any degree imaginary or assumed; they represent actual facts, which have been established as the results of positive observation, and they are theoretical in reference to the practical application, of fuel only in this sense, that these results are not realised in ordinary practice. The reason of this is not the existence of any uncertainty that the total quantities of heat generated by burning a pound of carbon or a pound of hydrogen are respectively capable of converting 15 pounds and 64·2 pounds of water at 212° Fahr. into steam, but it is simply the fact that, under ordinary circumstances, only a portion of the total heat generated in either case is ever *available* for the production of steam. The statement of the theoretical evaporative power of fuel, or of carbon and hydrogen as constituents of fuel is therefore—like the statement of relative calorific power—only an expression of the relative capabilities, and it indicates in this respect a limit which, though it cannot be exceeded in any case, is never fully attained in practice.

In order to ascertain what portion of the heat resulting from the combustion of carbon and hydrogen is available for producing steam, it is necessary to consider what are the conditions under which fuel is usually burnt, and what becomes of the heat generated in the two cases. In making this inquiry it is also necessary to remember that the several substances concerned in the combustion of fuel require different quantities of heat to produce equal increments of temperature in equal weights, as stated in the following table:—

Quantities of Heat.

			Heat units.	
One pound of	Carbonic acid gas	requires ..	·217	To raise its temperature from T to T + 1° F.
	Nitrogen	,, ..	·245	
	Atmospheric air	,, ..	·238	
	Steam	,, ..	·475	
	Water	,, ..	1·000	
	Water at 212° F	,,	966·100	for conversion into steam.

It will be seen that water has by far the greatest capacity for heat, both in the state of liquid and vapour, and that a very large quantity of heat is rendered latent in the conversion of water into steam.

In the combustion of carbon, each pound requires for its conversion into carbonic acid gas, 2·67 pounds of oxygen, which is derived from atmospheric air, and as this contains only 23 per cent. by weight of oxygen, it is necessary to supply about 12 pounds (more accurately 11·61 pounds) of air for every pound of carbon burnt.

In the combustion of hydrogen, 8 pounds of oxygen are requisite for each pound of hydrogen, and to furnish this about 35 pounds (more accurately 34·78 pounds) of air must be supplied.

But fuel is never burnt for raising steam in such a way that the supply of air is only just sufficient to furnish oxygen for the conversion of its carbon into carbonic acid gas, and of its hydrogen into water vapour. In order to maintain combustion it is necessary to remove the gaseous products from the furnace, as well as to supply fresh air continually; and when this is effected, as usual, by the draught of a chimney, the gaseous combustion products become mixed with the fresh air to some extent. The effect of this intermixture would be to retard the combustion of the fuel, if the amount of burnt air or combustion products in the atmosphere of the furnace exceeded a certain proportion. Consequently, it is necessary to prevent this by supplying more air than would suffice to furnish oxygen for combustion, so as to dilute the combustion products and maintain an excess of oxygen in the atmosphere immediately surrounding the fuel in the furnace. Careful observation has shown that in ordinary boiler furnaces the quantity of air requisite for this purpose amounts to as much as that requisite for effecting the chemical change which takes place in combustion, so that the total supply of air to such a furnace is usually at the rate of about 24 pounds per pound of carbon burnt, and about 70 pounds per pound of hydrogen burnt.

Under ordinary circumstances the relation between the quantities of these substances burnt as fuel, the total heat generated, the air supply requisite for supporting combustion, and the furnace gas resulting from it will be as follows:—

Fuel.	Quantity burnt.	Air supply.	Total heat generated.	Furnace gas.
	Pound.	Pounds.	Heat units.	Pounds.
Carbon	1	23·22	14,500	24·22
Hydrogen ..	1	69·56	62,032	70·56

The heat generated in either case is, at the moment of combustion, transferred to the gaseous combustion product, and raises its temperature. In the combustion of carbon, the whole of the heat is effective in this way; but in the combustion of hydrogen, a portion of the heat generated is consumed in determining the vaporous condition of the water produced, in the proportion of nine pounds for each pound of hydrogen burnt. As one pound of water at 212°F. requires 966·1 heat units to convert it into steam of the same temperature, the quantity of heat which becomes latent in this way amounts to 8,694·9 heat units (9 × 966·1) per pound of

hydrogen burnt, or 14 per cent. of the total heat of combustion. That portion of the heat is ineffective, either for increasing the temperature of the combustion product, or for producing steam in the boiler, and it must therefore be deducted from the total heat generated, in order to ascertain the amount of heat available, which is as follows, compared with that generated by the combustion of carbon:—

	Quantity burnt.	Total heat generated	Latent heat of water vapour produced.	Available heat.	Equivalent evaporation of water at 212F.
	Pound.	Heat units.	Heat units.	Heat units.	Pounds.
Carbon ..	1	14,500	..	14,500	15
Hydrogen	1	62,032	8695	53,337	55

In the combustion of carbon, under the conditions above mentioned, the products constituting the furnace gas amount to nearly 25 pounds per pound of carbon burnt, and they require the following quantities of heat to raise their temperature one degree of Fahrenheit's scale:—

	Pounds.		Specific Heat. Heat units.		Heat units.
Carbonic acid gas ..	3·67	×	·217	=	·79639
Nitrogen	8·94	×	·245	=	2·19030
Surplus air	11·61	×	·238	=	2·76318
	24·22				5·74987

The increase of temperature resulting from the combustion of carbon is therefore found by dividing the number of heat units, representing the total quantity of heat generated, by the number of heat units requisite to raise the temperature of these combustion products, etc., one degree, and it amounts to

$$2{,}522°\text{F.} = \frac{14{,}500}{5{\cdot}75}$$

In the combustion of hydrogen, under the same conditions, the products constituting the furnace gas amount to about 70 pounds per pound of hydrogen burnt, and they require the following quantities of heat to raise their temperature one degree of Fahrenheit's scale.

	Pounds.		Specific Heat. Heat units.		Heat units.
Water vapour	9	×	·475	=	4·27500
Nitrogen gas	26·78	×	·245	=	6·56110
Surplus air........	34·78	×	·238	=	8·27764
	70·76				19·11374

Consequently, the increase of temperature resulting from the combustion of hydrogen is:—

$$2{,}791°\text{ F.} = \frac{62{,}032 - 8{,}695}{19{\cdot}114}$$

So far, therefore, as relates to increase of temperature the effect produced by the combustion of hydrogen under these conditions is not much greater than that produced by the combustion of an equal weight of carbon, notwithstanding the great difference in the actual quantities of heat generated, as shown below:—

		Total heat generated.	Available heat.	Increase of temperature.
	Pound.	Heat units.	Heat units.	
Carbon	1	14,500	14,500	2522°F.
Hydrogen..	1	62,032	53,337	2791°F.

We have now to consider what portion of the *available* heat is, under ordinary conditions, *effective* in producing steam. The heated furnace gas, resulting from the combustion of the carbon or the hydrogen of fuel is the medium by which the heat generated is transferred to the water in the boiler; and if it could be managed that, between the moment of combustion, and the time when the furnace gas resulting from it is discharged into the chimney, the whole of the available heat could be communicated to the water in the boiler, the evaporative effect realised might then be equal, or nearly equal, to the theoretical evaporative power of the fuel burnt. But this is never the case in ordinary practice.

The extent to which the available heat could, in any case, become effective in producing steam by direct transmission to the boiler, must, of course, be limited by the temperature corresponding to the pressure at which steam is to be raised. If that were 50 lbs. per square inch, the furnace gas could not be cooled down below 360° F. before being discharged from the heating surface of the boiler into the chimney. The quantities of heat which would in such a case pass away in the furnace gas, without being directly effective in producing steam in the boiler, would amount to 12 per cent. in the combustion of carbon, and to 10·8 per cent. in the combustion of hydrogen, as follows:—

	Quantity burnt.	Furnace gas.	Quantity of heat requisite to produce increase of temperature = 300°.	Equivalent evaporation of water at 212°F.
	Pound.	Pounds.	Heat units.	Pounds.
Carbon ..	1	25	300° × 5·750 = 1,725	1·8
Hydrogen	1	70	300° × 19·114 = 5,734	5·9

These quantities of heat would therefore be wasted as regards production of steam, except in so far as they might be applied in heating the feed-water supplied to the boiler.

But, when, as in ordinary practice, the supply of air for supporting combustion is maintained by the draught of a chimney, the temperature of the furnace gas cannot in any way be reduced below about 660° F. without interfering with the draught of the chimney, and thus a waste of heat is occasioned considerably larger than that just mentioned as being the minimum waste.

In very many instances the furnace gas is discharged into the chimney at a temperature very much more than 600° F. above the temperature of the external air, and then the waste of heat is of course even still greater in proportion as the temperature of the gas is higher.

In the case of furnace gas, discharged at 600° F. above the temperature of the air supplied to the furnace, this waste amounts to 24 per cent. of the available heat resulting from the combustion of carbon, and to 22 per cent. of that resulting from the combustion of hydrogen; these amounts being equivalent to the evaporation of 3·6 lbs. of water at 212° F. per pound of carbon burnt, and to 11·9 lbs. of water at 212°F. per pound of hydrogen burnt.

The amount of heat capable of becoming effective in producing steam cannot therefore be greater than the difference between the total available heat and the heat thus wasted in the furnace gas. This amount is about 76 per cent. of the available heat generated by combustion of carbon, and about 78 per cent. of that generated by combustion of hydrogen. This comparison does not take into account those sources of waste which are due to imperfect combustion, but applies only to such portions of the carbon and hydrogen of fuel as are actually burnt in the furnace. In this case the comparative efficiency of these constituents of fuel in producing steam is as follows:—

Combustion of Carbon.

Quantity burnt, 1 lb.		Equivalent evaporation of water. at 212°	at 60°
	Heat units	lbs.	lbs.
Total heat of combustion ..	14,500	15·	..
Available heat............	14,500	..	..
Waste heat of furnace gas..	3,480	3·6	..
Effective heat	11,020	11·4	9·8

Combustion of Hydrogen.

Quantity burnt, 1 lb.		Equivalent evaporation of water.	
		at 212°	at 60°
	Heat units.	lbs.	lbs.
Total heat of combustion ..	62,032	64.2	..
Latent heat of water vapour	8,695	..	..
Available heat	53,337	..	..
Waste heat of furnace gas..	11,520	11·9	..
Effective heat	41,817	43·3	38

Thus the maximum evaporative efficacy of carbon and of hydrogen is, for each pound burnt, respectively equal to the conversion of about eleven and a half pounds and forty-three and a half pounds of water at 212 degrees, Fahr., into steam of the same temperature, and under the ordinary atmospheric pressure. The extent to which this *efficacy* is *realised* in the ordinary application of fuel for producing steam will depend upon the relative facilities afforded by the rate of combustion and by the construction of the boiler, for the full absorption of the effective heat from the combustion products during their passage along the flues or tubes of the boiler before being discharged into the chimney. But whatever may be the influence of these conditions in regard to evaporative effect produced, they do not in any degree affect the foregoing considerations as to the maximum evaporative capabilities of the carbon and hydrogen of fuel when burnt in the manner stated, with a supply of air just twice as great as the quantity requisite for their conversion into carbonic acid gas and water vapour.

From these considerations it will be evident that in the combustion of fuel, under ordinary conditions, there is always a great waste of heat actually generated and available. The total waste is considerably greater in the combustion of hydrogen than it is in the combustion of carbon, amounting in the one case to 32·6 per cent., and in the other to 24 per cent. of the total heat of combustion, but still the evaporative efficacy of hydrogen is nearly four times as great as that of carbon.

In the combustion of hydrocarbons under these conditions, whether they be solid, liquid, or gaseous, the total amount of heat generated will be determined by the relative proportions of the carbon and hydrogen they contain. The amount of hydrogen in such substances generally ranges from one-seventh to one-fourth by weight, and for such limits the corresponding amounts of heat generated by their combustion, and their theoretical evaporative power would be as follows:—

Hydrocarbon burnt.	Carbon.	Hydrogen.	Total heat of combustion.	Equivalent evaporation of water.	
				at 212°	at 60°
lb.	lb.	lbs.	Heat units.	lbs.	
1	·86		× 14,500 = 12,470		
		·14	× 62,032 = 8,684		
			21,154	21·9	18·8
1	·75		× 14,500 = 10,775		
		·25	× 62,032 = 15,508		
			26,283	27·1	23·3

It must be remembered that these results are above the truth, for this calculation does not take into account the quantity of heat expended in effecting the decomposition of the hydrocarbon, *i.e.*, the separation of the carbon from the hydrogen, nor does it make allowance for the circumstance that the quantities of heat calculated as being generated by the hydrogen, are calculated according to the heat-producing power of *gaseous* hydrogen. The results given above, as expressing the theoretical evaporative powers of these hydrocarbons, are therefore too high by an amount corresponding to the heat requisite to decompose the hydrocarbons and to convert the hydrogen from the *liquid* state it has in the hydrocarbons, to the gaseous state it has in the vapour resulting from their combustion.

The difference between the theoretical evaporative power of hydrocarbons comprised within these limits of composition, and their evaporative efficacy, will be determined by the relative proportions of carbon and hydrogen they contain, just in the same manner as shown already, so far as relates merely to the mode in which the heat generated is disposed of amongst the combustion products constituting the furnace gas resulting from their combustion. And it is here necessary to notice another circumstance of considerable importance as regards the advantageous application of fuel, and especially hydrocarbon fuel.

The following tabular statement will show the manner in which the heat that is consumed in producing a chimney draught, is distributed among the combustion products constituting the furnace gas:—

Combustion of Carbon.

	Furnace gas from 1 lb. carbon.	Quantities of heat in furnace gas.	Equivalent evaporation of water at 212° Fahr.
	lbs.	Heat units.	lbs.
Carbonic acid gas	3·67	600° × ·8 = 480	.5
Nitrogen gas ..	8·94	600° × 2·2 = 1,320	1·4
Surplus air	11·61	600° × 2·8 = 1,680	1·7
	24·22	3,480	3.6

It will be seen from this table that while the total waste of heat in the furnace gas from the combustion of 1 pound of carbon, is equivalent to 3·6 pounds of steam, more than one-half of that heat is consumed in raising the temperature of the surplus air supplied for diluting the combustion product in the furnace. Consequently, any arrangement by which this surplus supply of air could be dispensed with, and combustion maintained at the same rate, would have the effect of reducing the waste of heat to the extent of 50 per cent., and economising the heat generated by the carbon of the fuel to the extent of nearly 12 per cent. Herein consists the advantage gained by blowing the air into a furnace, instead of drawing it in by means of a chimney; for in that case the supply of air may be reduced to just enough to support combustion, and at the same time the temperature of the furnace gas may be so far reduced, either within the flues or tubes of the boiler, or in a feed water heater, as to render the greater part of the heat contained in it effective for production of steam.

The possibility of economising, in this way, the heat generated by combustion of carbon is by no means unimportant; but it is of far greater importance as regards the heat generated by combustion of hydrogen; for in that case the total waste of heat arising from the discharge of the furnace gas at 600° Fah. above the temperature of the air supply is equivalent to about 12 pounds of steam per pound of hydrogen burnt, and nearly one-half of this waste heat is consumed in heating the surplus air supply.

Therefore by dispensing with this surplus air, and cooling the furnace gas in a feed-water heater, a saving of something like one-fourth of the total available heat might be effected. A further advantage would also result from the increased temperature of combustion, viz., 4,692° Fah. for carbon, and 4,922° Fah. for hydrogen, and the consequent more ready transmission of heat from the combustion product to the water in the boiler.

Combustion of Hydrogen.

	Furnace gas from 1 lb. hydrogen.	Quantities of heat in furnace gas.	Equivalent evaporation of water at 212° Fahr.
	lbs.	Heat units.	lbs.
Water vapour..	9·00	600° × 4·3 = 2,580	2·7
Nitrogen gas ..	26·78	600° × 6·6 = 3,960	4·1
Surplus air	34·78	600° × 8·3 = 4,980	5·1
	70·56	11,520	11·9
		Latent heat of water vapour.. 8,695	9·0
		20,215	20·9

The combustion of the carbon and hydrogen of fuel presents another point of difference, which is important as regards the extent to which the available heat is, under ordinary conditions, capable of being rendered effective in producing steam. This difference is due to the presence of water vapour in the furnace gas, resulting from the combustion of hydrogen. As a consequence of this circumstance a large amount of heat is absorbed and rendered ineffective for producing steam. From the foregoing table, representing the disposition of heat amongst the furnace gas, it will be seen that every pound of water-vapour in the furnace gas corresponds to a waste of heat sufficient to produce rather more than $1\frac{1}{4}$ pound of steam; and hence it will be evident how great is the disadvantage resulting from the presence of water in the furnace gas, whether originating from hydrogen burnt or from damp fuel or otherwise.

The volumes of the air supply and combustion products for the extreme cases of carbon and hydrogen are as follow:—

	Air supply at 60° F.			Combustion products at 660° F.	
	Pound.	Pounds	Cubic feet.	Pounds.	Cubic feet.
Carbon ..	1	24	320	25	630
Hydrogen .	1	69	960	70	2,044

In the combustion of carbon there is no expansion of volume in the combustion product, except that due to the heat generated, which would render the volume at the temperature of combustion (2,522° Fah.) rather more than six times that of the air supplied. By the transfer of heat to the boiler, to such an extent as to reduce the temperature to 660° Fah., the volume would be reduced again to about 630 cubic feet per pound of carbon burnt.

In the combustion of hydrogen the supply of air required is about three times as large as that required in the combustion of an equal weight of carbon. There is also an expansion of the combustion products, independent of the heat generated, and amounting to one-half the normal volume of the hydrogen burnt. The expansion due to heat is also greater than in the combustion of carbon, on account of the greater amount of heat generated, so that the volume of the furnace gas at the temperature of combustion (2,791° Fah.) would be about six and a-half times that of the air supplied, and the volume of gas discharged into the chimney would be about $3\frac{1}{2}$ times as great as in the combustion of an equal weight of carbon. This larger quantity of gas will, however, contain nearly four times as much effective heat as that resulting from the combustion of an equal weight of carbon, and its temperature will be about 270° higher, so that in this respect the use of fuel containing a large amount of hydrogen, provided it can be perfectly and readily burnt, presents an advantage as compared with fuel consisting almost entirely of carbon. Rather more than one-fourth of a pound of hydrogen would give as much effective heat as one pound of carbon with a somewhat smaller volume of combustion products. The extent to which this advantage affects the value or efficiency of fuel will, of course, depend on the amount of hydrogen it contains. Since no hydro-carbon available as fuel contains more than 15 per cent. of hydrogen, the actual evaporative efficacy of such a material, when used under the ordinary conditions, cannot, at the utmost, be more than about 40 per cent. greater than that of an equal weight of carbon. This, assuming it to be perfectly burnt, and the arrangement of boiler flues or tubes, etc., to be favourable for the transfer of heat, is the maximum effect to be looked for according to the data already given.

The amount of hydrogen in petroleum is probably larger than in any of the other hydro-carbons proposed to be used as fuel, and that contains, on the average, about 13 per cent. In coal and shale oil the amount of hydrogen is less. Consequently, the evaporative efficacy of these materials, as compared with carbon, would not reach the above limit of 40 per cent. in excess. The ratio between these materials and ordinarily good coal is much about the same in regard to evaporative efficacy, since the hydrogen contained in coal compensates for the oxygen and ash it contains, unless the amount of these is very considerable.

The tables in next page show the relation between the total heat of combustion and the available heat of hydrocarbons, containing respectively 14 and 25 per cent. of hydrogen, as the amounts of heat consumed in the furnace gas, and the mode in which it is disposed of.

I am not aware of any liquid hydrocarbon applicable as fuel, which contains so much as 25 per cent. of hydrogen, so that an evaporative effect of about 16 pounds of steam per pound of hydrocarbon burnt must be regarded as the maximum result to be attained with such material used as fuel. By burning these hydrocarbons with only just enough air for combustion, or half the quantities assumed to be supplied in the above estimations, the effect capable of being realised would be from 13 to 14 per cent. greater than in the case stated above, or about 18 pounds of steam per pound of hydrocarbon containing 14 to 15 per cent. of hydrogen.

The plan of using liquid fuel, which so far as I am aware has proved the most advantageous, is one which does, to some extent at any rate, secure the advantage to be gained by forcing air into the furnace. According to this plan the oil is supplied to the furnace through a small pipe, together with a jet of high pressure steam, by which it is converted into spray, much in the same manner as, in the toy known as the perfume vaporiser, a liquid is blown out of a bottle by a current of air. The steam jet at the same time induces a current of air which mixes with the oil spray and supports its combustion. This is the arrangement used by Messrs. Field and Aydon, and it appears to work exceedingly well, effecting a very perfect combustion of the oil. The oil I have seen used in this way was the dead oil, or creosote oil, which is a refuse product in the refining of gas tar. It possesses characters which render it much preferable to petroleum or to the oil obtained by distilling coal at a low heat for use as liquid fuel. In the first place, its density being greater than that of water—the gallon weighing about 12 pounds—it takes less space for stowage than petroleum or coal oil, the gallon of which weighs only from 8 to $8\frac{1}{2}$ pounds. For the same reason it would not be so dangerous as the lighter oils in case of accident; for instead of floating on the surface of water and burning, it would sink harmlessly. Again, its very high boiling point, approaching to a red heat, and the great density of its vapour as compared with that of petroleum or coal oil, are great advantages as regards risk of explosion in consequence of the oil vapour becoming mixed with air and then catching fire. This could hardly take place with the dead oil, except at a very high temperature, while petroleum readily gives off vapour to the air at a moderate degree of heat.

One pound of hydrocarbon, containing 14 per cent. of hydrogen, yields about 31 pounds of furnace gas, consisting of —

	Furnace gas.	Quantities of heat in furnace gas.	Equivalent evaporation of water. at 212°	at 60°
	lbs.	Heat units.	lbs.	lbs.
Carbonic acid gas ..	3·16	411		
Water vapour	1·26	359		
Nitrogen gas	11·45	1,683		
Surplus air	14·37	2,124	2·2	
	30·74	4,577	4·8	
Total heat of combustion		21,154		
Latent heat of water vapour ..		1,217	1·3	
Available heat		19,937		
Waste heat of furnace gas		4,577	4·8	
Effective heat		15,360	15·8	13·6
Theoretical evaporative power..		..	21·9	

Relative evaporative efficacy as compared with carbon or coal = 1 } 1·39

One pound of hydrocarbon, containing 25 per cent. of hydrogen, yields about 36 pounds of furnace gas, containing—

	Quantities.	Quantities of heat in furnace gas.	Equivalent evaporation of water. at 212°	at 60°
	lbs.	Heat units.	lbs.	lbs.
Carbonic acid gas ..	2·75	358		
Water vapour	2·25	641		
Nitrogen gas	13·39	1,968		
Surplus air	17·39	2,483	2.6	
	35·78	5,450	5·6	
Total heat of combustion		26,283		
Latent heat of vapour		2,174	2·2	
Available heat		24,109		
Waste heat of furnace gas		5,450	5·6	
Effective heat		18,659	19·3	16·6
Theoretical evaporative power..		..	27·1	

Relative evaporative efficacy as compared with carbon or coal = 1 } 1·69

The use of this oil as fuel presents great advantages for gas tar distillers, with whom it is a troublesome waste product. If it should come into demand as steam fuel its value would of course rise above that of coal, to an extent proportionate to its greater efficacy and any other advantages resulting from its application as steam fuel. Such an application might therefore be a great advantage to gas companies.

Unfortunately the quantity of this oil which is available is very small as compared with the requirements of steam navigation, probably not amounting to 100,000 tons a year in the whole country, and therefore its application must be very limited.

In order now to arrive at some estimate of the advantage to be gained in a steam vessel, either in point of weight to be carried, or space occupied by liquid fuel as compared with coal, it is evident that 100 tons of petroleum, or coal oil, would do the work of about 140 tons of good coal. But as coal is rarely burnt in such a way as to be rendered useful to its full capability, and as there is always a considerable waste in the shape of dust and cinders, which would not be the case with liquid fuel, a further allowance must be made for this. Assuming that one-fifth of the coal is wasted in this way, then the equivalent of 100 tons of oil would be 175 tons of coal, for taking the density of the oil as ·850, it would occupy about the same space as an equal weight of coals, or at the rate of about 53 pounds per cubic foot. This difference would enable a vessel capable of carrying coal for twelve days' steaming, to carry oil for twenty-one days. In burning this oil there would be a saving of labour in stoking, and as it would not give any ashes, a great deal of trouble would be saved in that way.

These results differ widely from the statements which have been made in reference to the relative efficiency of oil and coal, according to which it has been represented that one ton of oil was equal to from four to five tons of coal,* and that in regard to stowage room the saving was "more than nine-tenths in bulk"! † It is true that those who have propounded these views have not arrived at them by a consideration of the data I have above referred to, and if I may judge from remarks lately made at the meeting of the Institute of Naval Architects ‡ they would appear to deny the applicability of those data for determining the question between coal and oil as fuel. Such a denial, however, would be of little account if it be not supported by adequate evidence of results, such as those which have been so much dwelt upon, being really obtainable; and although this subject has now been some years before the public, I am not aware of any evidence having yet been brought forward, such as would call for, or justify the abandonment of those well-established principles by which the heating power and efficacy of fuel is determined, as above stated. §

The results of the experiments made at Woolwich, under the superintendence of Mr. Trickett, the Engineer in Chief of the Dockyard, give, as the highest evaporative effect obtained with petroleum, 11·63 pounds of water converted into steam per pound of oil burnt. In this case, however, the combustion was imperfect. But in the most successful trials with coal oil and shale oil, when very little smoke was given off, the evaporative effect was about 18 pounds of steam produced per pound of oil burnt. In this case some deduction required to be made for the steam applied as a blast to the fire, but the amount was not ascertained. This result was also obtained under peculiarly favourable circumstances as regards the proportion of heating surface of the boiler to the rate of evaporation.

In regard to the supply of material capable of being used as liquid fuel, it is necessary to make a few remarks. First, as regards petroleum, I imagine it is now generally acknowledged that this material in its natural state is not well adapted for the purpose. In that state it contains a large amount of very volatile hydrocarbon, which, even at the ordinary temperature, vaporises by contact with air, and the mixture of this vapour with air

* See *Journal of the Royal United Service Institution*, ix. 66. "Petroleum as Steam Fuel," by Capt. J. H. Selwyn, R.N.; also C. J. Richardson, p. 70.

† Ibid, p. 69.

‡ See *Engineer*, 10th April, 1868, p. 257.

§ Since writing this paper I have learnt that the same subject was discussed by Professor W. J. M. Rankine, at the United Service Institution, about a year ago, and I have great pleasure in referring to the opinions of such an authority in confirmation of the views I have expressed in regard to "Liquid Fuel."—["On the Economy of Fuel, comprising mineral oils." *Journal of the United Service Institution*, xi., 218.] The very lucid and exhaustive exposition, given by Professor Rankine, of the conditions which determine the theoretical evaporative power of fuel ought to have been sufficient to prevent any continuance of misconceptions as to the possibility that the evaporative effects realized with fuel can exceed or even equal the extreme calculated power it is capable of producing.

is explosive. At the temperature of a steam vessel's stoke-hole this vaporisation would take place more readily, and if there were any leakage in the supply pipes or tanks, disastrous consequences might ensue. In order to remove this objection to the use of petroleum as liquid fuel, the more volatile portion of it must be separated by distillation, and that operation, when carried far enough to render the oil fit for use with safety, would reduce the quantity to about one-third.

Another objection to petroleum in its natural state is its bulkiness, the gallon weighing only about 8 pounds. This is to some extent removed by the distillation, and by the reduction of the quantity to one-third an oil is obtained which weighs about 8½ pounds per gallon.

According to the latest returns, the total production of petroleum in America—which is out of all proportion the most abundant source of this material—amounts to about 360,0(0 tons a year. It would be mere speculation to offer any opinion as to whether this rate of production is the maximum which is attainable, or as to the time it may continue; but the prevailing impression is that the sources from which this supply originates are subterranean accumulations, and, therefore, not to be depended on beyond a certain limit. The experience of oil winning in America has confirmed this view, for it has been found that the wells which were at first what are termed "flowing wells," *i.e.*, yielding their oil spontaneously, have gradually ceased to flow; and that after pumping has been resorted to for bringing the oil to the surface, even that means gradually declined in its effect. It would, therefore, be unwise to rely upon the supply of petroleum as affording material for fuel. And then, if we consider the vast consumption of coal for the purpose of steam navigation—amounting, I believe, to not less than 10,000,000 tons a year in steam vessels belonging to this country alone, it will be seen that the production of petroleum—gigantic as it is in relation to the use to which it has been applied—is insignificant when compared with the requirements of steam navigation for fuel; that, in fact, the total production does not amount to 5 per cent. of the fuel consumed in the steam vessels of this country.

The possibility of obtaining an oil analogous to petroleum by distilling certain kinds of coal and some varieties of bituminous shale, constitutes another source of liquid fuel, and one which I consider to be far more important, for this country at any rate, than petroleum is. The material obtained from this source, and commonly known as crude paraffin oil, requires to be submitted to the same operation as petroleum, in order to remove the more volatile portion, and obtain an oil suitable for use as liquid fuel, but it would have the advantage of yielding rather a larger amount of such oil than petroleum does. To what extent the production of this oil might be developed as a source of supply for steam navigation it would be almost impossible to form any approximative idea at present. But I may state in regard to this point, that owing to the low price at which petroleum is now imported from America, the coal and shale oil works of this country have been almost entirely stopped, because of their inability to manufacture oil for burning at such a price as to compete with the American product. Circumstances which it would be out of place to enter into here, induce me to believe that if the use of liquid fuel were introduced to any extent into practice, it would be a very great advantage to the oil manufacturers of this country, and would be a means of enabling them to meet successfully the competition of the American oil used for burning in lamps. I have already spoken of the supply of "dead oil," furnished by the rectification of coal tar, and need here only remark again that the quantity is very small. This is certainly the most suitable material for use as liquid fuel which I am acquainted with, and its excellence in this respect induces me to mention another possible source of a similar material, viz., the distillation of "slack," or the waste coal dust, which accumulates at the mouth of a coal pit. It is quite possible that by such means a quantity of oil, similar to that resulting from the rectification of gas tar, might be obtained, and at the same time the slack itself might be converted into a useful fuel.

There is also in the Island of Trinidad a vast deposit of bitumen, which has repeatedly been an object of passing interest on account of attempts to render it in some way useful. Unfortunately, most of those attempts have hitherto failed; but if liquid fuel should become an article in demand, I think there may be good days still in the future for Trinidad bitumen, for it has the peculiarity of yielding by distillation, about 30 per cent. of a thick, heavy oil, approximating very closely to the "dead oil" of the gas tar refiner. This circumstance, which has hitherto been the disadvantage of the Trinidad bitumen, might then become its chief recommendation, and according to all accounts, there is abundance of it, and the getting of it is not attended with difficulty.

The relative cost of coal and oil is to some extent still an open question. If it should be found advantageous to use oil as fuel for steam vessels it is probable that neither crude petroleum nor paraffin oil as obtained by distilling coal or shale would be the most suitable for the purpose, and that it would be advisable to separate from either of those materials the more volatile portions, which are applicable for burning in lamps. The less volatile portion, both of petroleum and of shale oil, amounting in the former to about 30 per cent., and in the latter to about 40 per cent., would be for several reasons best adapted for use as fuel. It is not so much in demand as the oil used for lamps, and being less volatile it could be stowed with greater safety. But I doubt much whether this oil could be shipped for less than £5 per ton. If that opinion is correct, according to the comparative estimate already made between coal and oil, the cost of the latter would be about three times as much as that of coal. That there may be circumstances under which the advantages to be gained by the use of oil as fuel would altogether outweigh any considerations as to this or even a greater rate of cost, it does not require any great penetration to perceive; but it appears to me equally evident that if those advantages are to be attained only at such a cost, the use of oil as fuel for steam vessels must in any case be restricted to exceptional cases, in which cost is comparatively a matter of secondary importance, and that it cannot be regarded as likely either to revolutionise steam navigation in general, or to call for a total reconstruction of our navy.

At this point, however, the consideration of the subject reaches a stage where it is more the province of the merchant and of the naval engineer to deal with it, and to determine the balance between the greater efficacy of this material as fuel, and the greater cost which its application would involve. I therefore leave it here for those more competent than myself to discuss these points, with the hope that the attempt I have made to elucidate the subject, so far as I am able, may be found of some utility in its further development.

I cannot, however, conclude this paper without taking the opportunity of expressing my opinion that the mode in which this subject has hitherto been dealt with, illustrates in a most striking manner, the want which is now somewhat vaguely felt of what is termed "technical education," by which I understand a means, not merely of making those whose business is of a practical character better acquainted with the principles of science and the laws of nature than is generally the case in this country, but also of educating the cultivators of science in a knowledge of the requirements of art, and of the conditions under which science can be made serviceable to practice. If such a closer alliance between science and practice were achieved, I believe it would be found of mutual advantage, and then I apprehend we should soon cease to hear anything more of that fancied antagonism between the two which is the most effectual barrier to progress, and deserves only to be regarded as an indication of ignorance or bigotry.

DISCUSSION.

Mr. Warriner said for the last three years he had expended his time, his money, and that of his friends in endeavouring to work out the problem of how best to consume liquid fuel, having been led to turn his attention to the subject from observing the waste of fuel in cooking. When attention was drawn by Sir William Armstrong to the probable exhaustion of our coal-fields, his thoughts were still more strongly directed to the question of liquid fuel, and he had visited almost every part of the three kingdoms, and had taken notice of the localities where it seemed probable that oils such as had been mentioned would be found; although he did not mean to suggest that these natural oils were so suitable for the purpose under discussion as creasote or dead oil. He believed these oils were to be found in large quantities in England, Ireland, and Scotland, and in all parts of Europe, and that they could be produced at a price much less than £5 per ton, in fact at very little above the cost per ton of coal. He was the patentee of an invention for the use of petroleum as fuel, and there were 38 patents now taken out for the same thing, and 62 more for processes pertaining to it. The petroleum had been discovered quite accidentally at Mold, in Flintshire, and he could name many places in England where he believed it would be obtained by simply boring. The writer of the paper seemed to object to the use of this oil as fuel, but it had been tried in America, and although the results of Mr. Richardson's experiments at Woolwich were failures, they were such failures as showed that with proper means success might be expected. He considered it desirable that the Society of Arts should assist in these matters, and suggested the offering of premiums for the best method of burning these oils. There was one liquid which Dr. Paul had not mentioned as fuel, and that was water. At the present moment there were locomotives in New York running by means of decomposed water as fuel, and, knowing what had been accomplished in the smelting of iron in common furnaces with the aid of superheated steam, he had tried the same thing with petroleum oil, or rather creasote, and very good results had been obtained. At this very time he was melting scrap and pig-iron in a very short time by these means, and getting 14 heats per day in a cupola which before only yielded 6, and this without any great expense. There were 150,000 men employed in this country in coal mining, many of whom did not, during a great part of the year, see the light more than once a week, and they were the most immoral and illiterate of the working classes, but if the consumption of coal were not kept up, many of these men would be employed in other ways to the benefit of themselves and society.

Mr. Blackie begged leave to deny that coal miners were the most illiterate and immoral class of men. He had known them many years, and some of them were very well educated indeed for their station.

Mr. Lambert said he had been a coal owner for many years, and there was not a more moral, intelligent, and cleanly set of men in the world than the colliers.

Captain Selwyn, R.N., said he had come fresh from the study of this subject, as he had been all the afternoon driving a boiler with creasote which had been built for the Admiralty under his superintendence. He had expected to find Dr. Paul a formidable enemy to the burning of liquid fuel; for hitherto chemists, with the exception of Professor Rankine, had rather discouraged its use, and had even refused to receive facts which did not happen to agree with their own theories. It was a fact that a boiler of 35 horse-power, of the ordinary Cornish type, with Galloway tubes, had been since Christmas at work at Hackney with oil. The consumption was 230 gallons per day, and 23 lbs. of water at 35 lbs. pressure, were evaporated for every pound of fuel used. That fact could not be got over. Naphthaline was the fuel used, and it was melted in tanks by the waste steam, and then run into an ordinary apparatus for burning. In speaking of the experiments at Woolwich, he would remark that if any chemist, engineer, or practical person had seen the process adopted there for burning liquid fuel, he would have come to the conclusion that one more wasteful, or less likely to yield good results could not have been employed; and if with that process 18 lbs. of water were evaporated for each pound of fuel consumed, he considered the result very encouraging. The data to go by were not what could theoretically be done, but what was practically effected in steam boilers; and this, with coal, had hitherto been about 7lbs. of water evaporated per lb. of fuel; 10lbs., and even 11lbs. had been evaporated in experimental boilers, but never in a run across the Atlantic. Therefore, even 18lbs. was a great increase of power; and they must recollect that if this were once obtained it could be relied upon, as there was no deposit of any kind to foul the boiler or tubes, no smoke, or residual products of any kind. Mr. Richardson, it was true, had an enormous deposit of carbon, but that was because he did not know how to apportion air to the supply. Even 18lbs. of water evaporated, however, was a much greater advance than Dr. Paul had given them credit for, being about 2½ times the result obtained from coal, but if they got 23lbs. evaporated at a pressure of 35lbs., which was equivalent to 27 at atmospheric pressure (though he never claimed more than 23lbs.), they had obtained a most valuable result. Naval steamers carried coals for ten days, not more; but if instead of 7lbs. of water evaporated per lb. they had 23lbs., it was evident they could be provided with fuel for 30 days, and this would be worth attainment, whatever might be the price of the fuel. As a naval officer, he could state that no price could be too high to pay for the power of fuelling a war steamer for 30 days instead of 10. It might be the means of averting a great national disaster. Nor would the reconstruction of the navy be required. With the expenditure of £5 for an apparatus, which any engineer on board ship could put up, he could convert any ordinary boiler into one which would burn either wood, coal, or oil, and that in two days after receiving the order. A great advantage would result in stowage. Coals could not be pumped up; they had to be trimmed in coal-bunkers, which, as they were emptied, could not be filled with ballast, and the result was, that when a vessel left port in such trim as to obtain the best results from her particular motion, a change must immediately take place in the trim; the change took place irregularly, and they never knew whether they were doing what they ought. With oil, particularly heavy oil, which alone he advocated, as all possibility of evaporation could be prevented by keeping water constantly over it, and if any ran out it sank below the water in the hold—these difficulties were avoided, for, as the oil was consumed, water could take its place as ballast, and thus the trim would be preserved. If they considered the commercial part of the question it amounted to this, that an ordinary vessel on the Havre line to America, carrying cargo, would save about £3,000 per round trip by the use of creasote instead of coal, allowing it to evaporate only 2½ times as much water per lb. as the latter. There would be a saving in stokers' wages and victuals, and of course in cargo room. That was reckoning the price of the fuel the same as at present; of course the price would rise with the demand, but he trusted to competition in such a case to increase the supply. It would be folly to take the production of petroleum in America as any measure of that in the world; it was probably much more widely spread than coal, and it was evident it existed in immense quantities, because in many localities it actually made its way to the surface in flowing wells, by the pressure of the gas upon it. If they happened to bore down at the top of such a cavity, for some time nothing but gas would be produced, and in some places a boring would produce salt or impure water, but when that had flowed

off there was either a flowing or pumping well, according to the part which was struck. This deposit of oil had been in existence since the days of the Maccabees, as he had formerly shown by a quotation from the Bible, and it had been constantly used by large tribes in all ages. He estimated the production of kerosene at about 300 pounds, or thirty-two gallons per ton of coal distilled, but in this country creasote was a waste product, the price of which was, until very lately, three farthings a gallon, but it had now gone up to one penny, but if it went to sixpence it would not frighten them. He was quite sure the oil interest in Flintshire would revive under the excitement consequent on a large demand for oil as fuel, and, in fact, he was somewhat surprised in going through the paper to find that the author had set up so many giants for the mere sake of knocking them down again. Amongst them was the idea that nobody but himself had studied the chemical theory of the subject, and that those who had been engaged upon it had been working in the dark. This was not the case, for Professor Rankine, in a paper read by him before the United Service Institution, had given to all inclined to study it the complete alphabet of the subject. They knew perfectly well what to do and how to do it, and, what was more, they were doing it. He had seen how to do it for a long time past, and he was now doing it for the Government, in the first instance on a small scale, for a steam launch, which answered admirably. He was next about to apply the principle to an evaporative boiler, the same as employed by Mr. Richardson, and he hoped to show that instead of 18lbs. of water he should evaporate 23 for every lb. of fuel, but if he could not, it would only be because he had got a bad type of boiler. They must not forget that for years they had been trying to obtain a good type of boiler for coal, and had not yet decided upon the best, and therefore it could not be expected that they should all at once hit upon perfection for burning oil. In the latter case, however, there was no necessity for the waste draught which was adverted to in the paper, which made a considerable saving, and as there was no deposit, the tubes might be made considerably smaller, so as to get a much greater heating surface than could be obtained with coal. He thought Dr. Paul had laid too much stress upon the theoretical data to be obtained from carbon, which never had been and never could be realized in practice. The conflict between the stoker's work and the chemist's theory had only been successfully reconciled by the chairman in regenerative furnaces, and that was done in a manner which was not quite applicable to the case of marine boilers. Any one who could enable them to do away with the nuisance of getting up ashes and storing coal, and being annoyed with smoke, would, he was convinced, find his efforts very readily appreciated.

Mr. Carnegie had listened with much pleasure to the glowing details of a plan by which weight would be saved and speed gained in steam vessels; but when he found that only two and a-half or three times the result obtained from coal could be looked for from petroleum, and that the author of the paper estimated its cost at £5 a ton, he thought the advantage dwindled away altogether. He had no object but that of getting information as to how to reduce the cost of carrying a certain amount of weight in a steam vessel; but he did not yet see how, on the figures given them, this was to be accomplished. Three tons of coal, free on board at Havre, would cost something like 60s., and if one-third the amount of liquid fuel cost the same, there would not be much gain except in space, which certainly was an important item. However, he could not see how a saving of £3,000 a trip could be effected, because he believed—putting aside any idea of vessels from Havre, under a French flag, commanding exceptionally high freight—on a vessel of 1,000 tons, the whole profit of a voyage across the Atlantic would not exceed £3,000. He was not an engineer, but spoke only as a commercial man, and, from his point of view, he did not see that any great saving had yet been made out. With regard to the possible exhaustion of coal in England, he would remark that there was coal all over the world, and if they could get coal on the coast of the Black Sea costing much less than English, why should they continue to export coal to Turkey? Then, again, Austrian coal, which two or three years ago could not be obtained on the Lower Danube, was now produced from the mines of Oravicza in large quantities. 4,000 tons were supplied from those mines last year, and it drove the English completely out of the market. If they were going to have the Suez Canal opened, and a great development of trade with the East, he did not doubt that the Austrian and Turkish coal—and in time, the Russian—would find its way to India, and that in a commercial calculation therefore the exhaustion of English coal would not be taken into account.

Mr. C. F. T. Young said the oil which would be used for fuel he was now getting at the rate of 17s. per ton instead of £5, and if the price were put at £1 that would be an ample margin, and would show an immense saving by the use of oil. Besides that, there was a great saving in convenience, and in enabling all the products of combustion to be used with greater effect from the non-deposition of any dirty matter in the tubes or heating surfaces. Another advantage was that the fire was instantaneously under control. In an ordinary furnace you had either to draw the fire or damp it down, and in either case there was a lapse of some minutes before the effects of the heat were checked from acting on the boiler, but with oil the effect was immediate, both in turning off and on. He was now preparing a boiler of between 200 and 300-horse power, with which oil was to be used. He intended to use dead oil, the commonest which he could get, and this, after all, was best suited for the purpose. He considered the use on board ship of any oil which gave off vapour would be most dangerous and reprehensible, and ought not to be permitted. The author of the paper had remarked on the small quantity available; but that showed nothing, because a demand always created a supply. He believed the number of gallons which could be obtained from a ton of coal would average fifty or sixty, which, at 10 lbs. weight a gallon, would be about one-fourth of the weight of coal. If, then, the same weight of liquid fuel did three times the duty, and there were many other advantages, it was a question whether it would not even pay to destructively distil the coal for the sake of the oil, rather than use it in its raw state. A friend had sent him a slip from an American paper, stating that a steamship was being tried there burning liquid fuel; it did not state the arrangement, but he believed there was a kind of retort, by which the oil was first converted into gas and then burnt. He took his figures as to the amount of oil to be obtained from coal from Mr. Gesner's book, which gave the largest quantity at about 120 gallons per ton, the average being about 60 gallons.

Mr. Phillips thought if fuel could be obtained at 1d. a gallon, weighing 12 lbs. to the gallon, and doing three times the duty per pound that coal would, the question was virtually decided.

Captain Selwyn said the specific gravity of the oil he used was a very little over that of salt water.

Mr. Rippingale here introduced an experiment, having for its object to ascertain the exploding temperature of mineral oils. The peculiarity over the ordinary method was that the action took place in a closed vessel, into which a thermometer was inserted, an electric spark causing the explosion. The advantage claimed for this method of testing was, that it was much more reliable than the ordinary one in open vessels. The specimen of oil exhibited exploded at 90°.

Mr. Young said he understood that before the Select Committee on Fire Protection, some oils were found to explode at 80°, and some even as low as 60°, and that the proposal made was that none should be allowed to be sold which exploded at less than 120°. In the case of

creasote, all the volatile spirit had been extracted, but it did not pay, as a rule, to do this, and that was why the common oil was so dangerous. He believed there was only one firm in Scotland who extracted the spirit properly. He had actually seen on board a ship in the port of London casks of raw oil smelling very strong of spirit put against the bulk-head, close to the boiler, and had told the men how dangerous it was, which seemed quite to surprise them.

Captain Selwyn would like to know the proportion of atmospheric air required to form an explosive mixture with the volatile spirit from petroleum?

Mr. Rippingale said the proportion was about the same as in the case of coal gas—about one-sixth part in volume.

The Chairman said that nine parts of air and one of gas was the lowest proportion in which explosion occurred.

Dr. Paul, in reference to the remarks of Mr. Warriner, said he did not profess to be much versed in cooking, but as that was managed entirely by means of heat, he had no doubt, from the way in which fuel was often wasted, that there was immense scope for improvement in that direction. He was not prepared to share the opinions which the same gentleman had expressed as to the value of water as fuel; setting the Thames on fire had been often talked of, but was still, he believed, a long way from being accomplished. There was a great deal of misconception as to the influence of steam in the use of fuel, and many erroneous opinions were entertained. Similar opinions had been broached some time ago with regard to superheated steam, and though these ideas had to a great extent died away, the same fallacy seemed to be cropping up again in a new form. In the burning of a given weight of any elementary substance whatever, the effect of combustion was to produce a certain amount of power, and that effect was represented partly by the heat capable of effecting the evaporation of a certain weight of water, and partly by the conversion of the substance burnt into gas. The power thus produced was a perfectly definite and constant quantity, and for separating the constituents of the product of combustion, an expenditure of force was requisite exactly equal to that produced by the combustion. Consequently, there was no advantage gained. For instance, in burning a pound of hydrogen a certain definite amount of heat was generated, but if they first took nine pounds of water, decomposed it, and got the one pound of hydrogen out of it, they simply expended in obtaining that hydrogen the same amount of heat which might afterwards be got out of it again by combustion. That principle was simple enough, and he was surprised at any one with any pretensions to an opinion upon the subject talking of the benefit to be obtained by the decomposition of water. Captain Selwyn had entirely mistaken him in supposing that he was at all an opponent of the use of liquid fuel, or had any objection to the experiments which any one might think it right to make in that direction. He considered the subject well worthy of attention, and that it would well repay the labour of any one who would investigate it in a rational manner; but when he heard statements made to the effect that oil would do five times as much work as its own weight of coal, he must enter his protest against them. He had always thought it highly desirable that proper experimental data should be procured. Those necessary data were very simple. They required to know the weight of water evaporated in a given time, and the temperature at which it entered the boiler, and the weight of oil burned. But they wanted those three facts with absolute accuracy, and in the determination of them there was great possibility of errors arising which would materially affect the result. He believed Captain Selwyn and his coadjutors in these experiments had fallen into serious errors, and had made mistakes in their deductions accordingly. Professor Rankine had been cited, but he was quite sure that gentleman would not allow his authority to be brought forward in support of a statement that one pound of any kind of fuel would evaporate twenty-three pounds of water. In the paper read by him, before the United Service Institution, he distinctly stated that the highest evaporating power was under twenty-two pounds. But that number represented the maximum theoretical evaporating power, which was a very different thing from the duty, and was never arrived at in practice, for, as he had already pointed out, only a portion of the heat actually generated was effective in producing steam, because a considerable quantity was usually wasted in producing the chimney draught. A great portion of heat might be saved, which now went up the chimney, by reducing the volume of air supplied; and a still further saving might be effected by substituting oxygen for air, so as to reduce the products of combustion to the smallest quantity possible. The heat contained in the smoke which escaped from a chimney represented so much steam which had not been produced in the boiler. At the present time it might seem premature to talk of the application of oxygen to burning fuel, but it was by no means impossible. Several methods had been suggested for obtaining oxygen for such purposes, and it was quite feasible that some plan might be discovered for extracting the nitrogen from the air, so that the residuary oxygen might be available for combustion. With regard to the available supply of hydrocarbon oils, he regarded that of American petroleum as the most copious, out of all comparison with any other known, and he had visited and made careful observations of all the petroleum fields in Europe. The continuance of that supply, however, he could not regard as to be depended upon as a source of fuel. He quite agreed with Captain Selwyn that the attempts which were made by Mr. Richardson to obtain greater economy of fuel were the most futile that could be conceived, although he believed Captain Selwyn had not always held that opinion. He believed the direction in which they might most usefully look for an improvement in the economy of fuel was in the consumption of coal in steam vessels. He thought that engineers present would support him in the statement that for each indicated horse power they had, in a certain class of freight steamers, a rate of fuel consumption amounting to from 4 lbs. to $4\frac{1}{2}$ lbs. of coal per hour, and in some cases even more. There was another class of vessels in which the consumption of coal per indicated horse power was not above 2 lbs. or $2\frac{1}{2}$ lbs. of coal per hour; and statements had been made that the same result could be obtained by the consumption of $1\frac{1}{2}$ lb. or even 1 lb. of coal. If a saving in the consumption of coal amounting to the difference between these quantities could be effected, a result would then be realised far in excess of anything which could be expected from the use of liquid fuel, and in regard to steam navigation generally, that, he apprehended, was a far more legitimate and promising field for the exercise of skill and ingenuity than the attempts to introduce liquid fuel. He did not at all wish to detract from the merits of this kind of fuel, and there were no doubt certain exceptional cases in which an increased cost of fuel would be but a secondary consideration, where it might have great advantages, but he did not think it could ever be generally employed. With regard to the statement made as to the quantity of oil which could be obtained from coal, and quoted from Mr. Gesner's book, he might say that that authority was not to be trusted. The average coal in the country would produce perhaps about two gallons of oil per ton; the oil-producing coal formed only a small portion of our coal. Cannel coal was of that character, the very best specimens of which would yield about 60 gallons of oil per ton, while the more anthracitic coal of South Wales would not yield so much as two gallons.

The Chairman said that the discussion had elicited

quite a conflict of opinions, while those held on each side were apparently based on independent facts; but he believed it was not impossible to reconcile many of the statements which were apparently contradictory, by properly discriminating between theoretical and practical results. These two ought to be kept distinctly apart. The practical result would ultimately approach to the theoretical, if all the conditions of the various operations were perfect, but it could never quite attain it; and, unfortunately, in the consumption of solid fuel, the practical results did not nearly approximate to the theoretical ones. He believed that some years hence any engineer who looked at the furnace of one of our present marine boilers would be ashamed of it. The mode of throwing the fuel on a kind of volcano, giving off a large proportion of valuable substance in the form of thick smoke, was very objectionable. As far as he could follow the calculations given, he thought Dr. Paul had rather overstated than otherwise the theoretical evaporating power of liquid fuel as compared with coal. He gave the evaporating power of hydrogen at 64 lbs., which agreed with the statement laid before the United Service Institution by Professor Macquorn Rankine, but there was a correction to be made in that. Professor Rankine gave the evaporating power of hydrogen at 64·2, and of carbon at 16·05, but he considered, in this calculation, the hydrogen as existing in a gaseous state, and the carbon in that of a solid. He made an allowance for the chemical affinity between the hydrogen and carbon when in the form of marsh gas, but he did not allow for the hydro-carbon as being in a liquid condition, in which state it was when in the form of oil. There must be a correction made on that account, though he could not precisely say what it should be. There was another correction to be made with regard to the latent heat of the steam resulting from the combustion of hydrogen, by which, no doubt, the results would be very sensibly modified. However, if they went from theory to practice, they had certainly great allowances to make in favour of the oil. For instance, coal contained not only alkaline matters, but also a great deal of water, which oil did not; then, a certain portion of oxygen was already absorbed by the coal, and there was a great waste by smoke. Further, it was impossible, whilst burning fuel upon a grate, to obtain that regularity of proportion between the air and the material consumed, which was necessary to produce an economical result. All these points were arguments in favour of the liquid fuel. He must say, that he quite agreed with several of the speakers, that *volatile* liquid fuel was totally inapplicable, and would be one of the most dangerous things imaginable on board ship; they must, therefore, consider the question as confined to the use of heavy oils, which might, no doubt, be employed with advantage. They admitted of better stowage than coal, occupied much less bulk, and would save on board ship a great deal of labour, which meant space, of course, as less men would be required. Then there was another great advantage—there was no smoke. This, in the case of men-of-war, was very important, because a fleet of steam vessels at present could be seen while they were many miles below the horizon. For the mercantile marine, however, the question would reduce itself to one of price; and if the oil were £5 a ton, and the coal £1, no doubt the advantage would be in favour of the latter.

Captain Selwyn said he was now using oil at 1d. a gallon, or not quite £1 1s. a ton.

The Chairman said, that so long as the oil could be obtained at anything like the price now mentioned, no doubt it would be a most valuable fuel; but the question was, would the price remain so favourable to the consumer if the demand should increase? Of that he must say he had considerable doubt. If they had to distil the oil specially for the purpose from coal it must be expensive, and they must therefore fall back upon the natural supplies, or those which were incidental to other manufactures, which supplies must necessarily be limited. As to the use of water for burning, he was quite sure that no one acquainted with the subject would attribute any special evaporating power to water itself. Water might be usefully applied sometimes in conveying heat from one place to another, as, for instance, the introduction of a jet of steam under a grate on which anthracite coal was burning produced a gaseous fuel, the heat from which might be readily conveyed to a considerable distance, but as to getting heat out of water it was absolutely impossible. He would conclude by moving a vote of thanks to Dr. Paul, to which he was sure they would feel he was fully entitled for his able and carefully written paper.

The vote of thanks was then passed and acknowledged.

PARIS HORSE SHOW.

The exhibition of *chevaux de service* horses for driving and riding, of the Société Hippique Française, has just closed in the Champs Elysées, and attracted large numbers of visitors. The character of the collection was essentially practical, neither race horses nor hunters were included in the classification; and the ponies, which form class six, were, in fact, all galloways, and not ponies, in the English sense of the word.

There were in all 441 animals exhibited, namely:—Class 1, carriage horses, full $16\frac{1}{2}$ hands high, 64; class 2, ditto, $15\frac{3}{4}$ hands, 207; class 3, ditto, over $14\frac{3}{4}$ hands, 154; class 4, post horses trained in pairs, over $14\frac{3}{4}$ hands, 16; class 5, saddle horses, in two divisions, respectively of $15\frac{3}{4}$ hands and upwards, and between that and 15 hands, 41; and class 6, ponies, under 15 hands, 20. Each class, with the exception of the last, was subdivided into two sections, one for animals of four years, and the other for those of five and six years.

A large majority of the horses were from Normandy; but Vendée and Poitou made a better show than they have ever made before. The exhibition was peculiarly interesting from the fact that it shows the results which have been obtained by the training establishments (écoles de dressage), which have been instituted principally by the Société Hippique, which includes amongst its members the Emperor and Princes, General Fleury, director of the Imperial haras, and many of the wealthiest men in France. The exhibition was, in fact, principally composed of the results of these establishments, for the Ecole of Caen contributes 70 horses; that of Séez, 40, and of St. Maixent, 64. M. Gustave Marion, a breeder, sent 38 horses; but these, and the animals contributed by most of the leading breeders, have been trained in one or other of the above-named establishments.

The prizes offered amount to 59,288 francs (£2,371), and vary in value from 200 to 1,500 francs; additional sums are added when carriage horses are also exhibited as trained saddle horses. There are extraordinary prizes, varying from 1,500 to 3,500 francs, for the most remarkable animals in the four principal classes, and two prizes of honour for the best and second-best stable of not less than five horses of any kind.

The exhibition was extremely well arranged, there being ample space for double the number of horses, and the central portion of the building supplying a capital ride, with a tribune for the judges, and seats and standing room for two or three thousand spectators. Riding horses and carriages of all kinds were exercised during all hours of the day, the interest being increased by a hurdle fence for leaping. The exhibition was to remain open until the fifteenth instant inclusive, the grand day being the fourteenth, when all the horses for which prizes have been awarded were to be exhibited.

In connection with the horse exhibition were a few very elegant carriages with improvements and adaptations; a considerable number of velocipedes, which are very popular in Paris at present, including one for a

party of four persons; stable fittings from English and French houses, chaff cutting, crushing, and other machines; patent horse shoes, and miscellaneous articles. On the whole the exhibition was a thoroughly practical and an important one, and marks great progress.

Fine Arts.

Statue of Palissy the Potter.—The inauguration of a statue of Bernard Palissy is to take place at Saintes, where the famous potter was born, on the 3rd of the coming month of May. The *fête* to be given on the occasion will recall one of the most interesting events in the history of the town, namely, the entry of Charles IX. and Catherine de Medicis, and their visit to Palissy, whom they took with them to Paris, where he was installed in the old Louvre, and executed some remarkable works; and where the remains of his kiln and a number of his moulds were discovered last year.

Manufactures.

Mode of Cleaning Buildings.—M. Nivert, of Paris, has invented an apparatus for cleaning public buildings, houses, and statues very cheaply and expeditiously, and, it is said, very effectually. It consists of a steam generator, with one or more of Giffard's injectors, and a light scaffolding, by which a tube communicating with the apparatus may be raised to any part of the building, so that the water or other cleansing fluid may be projected forcibly against it. It may be employed with water, or water and steam mixed, or silicates may be used if it be desired to preserve the stone from the action of the air. It has been in use in Paris for the last eighteen months, and it is there called *nettoyage normal.* Mr. Nivert, the inventor, recently cleaned a house in Paris sixty mètres long by twenty mètres high in less than three days, at a cost of 1,200 francs. A patent has been secured in England, and the apparatus has been tried with success in London, at the Church of St. Paul's, Covent-garden.

Commerce.

Silk Trade of Lyons.—The following were the imports and exports of silk at Lyons during the month of January, 1868:—

Imports.

	Frs.
Eggs or grains from Japan	1,472,500
,, ,, Italy	46,500
,, ,, British Dominions on Mediterranean	69,750
,, ,, Various other countries	170,500
Total......Frs.	1,759,250
Cocoons from Italy	167,508
,, ,, England	6,204
,, ,, Greece	607,992
,, ,, Turkey	612,128
,, ,, various other countries	322,608
Total......Frs.	1,716,440
Raw silk	16,409,250
Thrown silk	7,725,000
Floss silk	3,546,450
Total......Frs.	27,680,700

In the above items, raw and thrown silk, Italy figures for 9,963,500 frs.

Exports.

	Frs.
Plain stuffs	17,378,998
Worked do.	533,463
Ribbons	4,142,806
Total......Frs.	22,055,267

Of the plain stuffs 2,533,130 frs. were exported to the United States, and 7,649,669 frs. to England.

Cotton Growing in India.—According to the latest statistics on cotton growing in India, at the end of last year there were in the Madras Presidency 1,361,474 acres under cotton crops, as compared with 1,229,531 acres in 1866. For Indigo, 111,484 acres in 1867, as compared with 80,911 acres in 1866. At Bellary the increase in cotton growing is estimated at 74,368 acres; at Kurnool, 72,499 acres; and at Tinnevelly 12,638 acres.

Colonies.

Manufacture of Salt.—A company has lately been formed at the salt lakes near Cressy, to manufacture salt by natural evaporation. These lakes are about 45 miles from Geelong, and are about 30 miles from the Leigh-road station of the Melbourne and Ballarat Railway. Large quantities of salt have years ago been brought into Geelong and Melbourne from the lakes, and went into general consumption, and the trade gradually progressed from 1844 to 1850, when the gold fields caused its total abandonment. Some years ago about 80 tons were collected for the Ballarat market, since when other annual deposits have been collected and disposed of at Geelong and Ballarat.

Crops in Australia.—The crops, both in Victoria and South Australia, promise unfavourably. Early in the season rust made its appearance and did much damage, whole fields of wheat being mowed down for hay; the oat crops were in many instances quite eaten away. The average yield in South Australia will probably be between 12 and 15 bushels to the acre, ; and it is not expected that this return will be exceeded in Victoria.

The Labour Market in Sydney is adequately supplied with mechanics, agricultural servants, gardeners, and general labourers, for which classes there is only a moderate demand. The supply of clerks, grooms, storekeepers, porters, and persons requiring light work, is considerably in excess of present wants. Female servants are in request for town and country. The following are the present rates of wages, with board, lodging, and rations, per annum:—Carpenters and blacksmiths, £50 and £70; rough carpenters, £35 and £40; married farm and domestic servants, £45 and £50; grooms, coachmen, and gardeners, £35 and 40; farm and garden labourers, £26 and £30; female servants, £18 and £26.

Boiling Down Horses.—There appears to be some chance that horses will soon become of a commercial value for boiling down. One of the breeders on the Murrumbidgee has lately experimented upon a fat but otherwise useless horse, as to the profit of boiling down. After the process had been carefully carried out he realised fifteen gallons of pure oil, which he readily sold at 6s. 6d. per gallon. To this is to be added the value of the hide and hair, also the glue from the hoofs and manure from the bone. The idea of using the flesh for food does not appear to have been entertained.

Preservation of Food.—A Brisbane paper says considerable attention is being paid to the subject of meat preserving, not there only, but in all the colonies. A bill, offering 10,000 acres of land as a premium to the first party who lands 100 tons of sound uncooked meat in Europe, has been before the Legislative Council, and will probably become law. A desirable impetus will

thus be given to the exportation of the surplus fat stock. Boiling down is becoming prevalent in all parts of the colony.

Colonial Railways. — The *Perth Gazette* says:— Among other panaceas for promoting the success of the colony which has lately been brought forward, and perhaps will be brought before the Council for discussion, is that of the construction of a railway or tramway between some central point in the corn-producing eastern districts and the seaport, the argument being that the colony having now gone beyond the point of home-consumption of bread-stuffs, the means of cheap transport are absolutely necessary to enable it to increase its production and to export with any hope of profit; also that permanent means of transport would induce settlement upon, and the cultivation of, the good land in the east district, now only devoted to pasturage.

Obituary.

The Marquis of Salisbury, K.G., died suddenly, on Sunday last, at Hatfield House, Hertfordshire. He was the only son of James first Marquis of Salisbury, by his wife, Lady Mary Emily Hill, second daughter of the first Marquis of Downshire. He was born April 17, 1791; consequently, had he lived a few days longer, he would have attained his seventy-seventh year. He succeeded to the family honours on the death of his father, June 13, 1823. The deceased marquis was twice married—first, Feb. 2, 1821, to Frances Mary, only daughter and heir of Mr. Bamber Gascoyne, who died on October 15, 1839; and secondly, he married, on April 29, 1847, Lady Mary Catherine Sackville West, second daughter of the Earl Delawarr. By his first marriage he leaves surviving issue Lady Mildred, married to Mr. Alexander J. Beresford Hope, M.P.; Lady Blanche, widow of Mr. James Maitland Balfour, of Whittinghame; Viscount Cranborne, M.P. for Stamford; and Lord Eustace Cecil, M.P. for South Essex. By his second marriage his lordship leaves issue three sons, viz., Lord Sackville, Lord Arthur, and Lord Lionel Cecil; and Ladies Mary Arabella and Margaret Elizabeth Cecil. The Marquis of Salisbury was appointed lord-lieutenant of the county of Middlesex on the resignation of the late Duke of Portland; was made a D.C.L. at Oxford in 1834, and was created a Knight of the Garter in 1842. He had been colonel of the Hertfordshire Militia since 1851, and was major of the South Hertfordshire Yeomanry Cavalry from 1847 to 1854. He was appointed a deputy-lieutenant of Argyleshire in 1859, and on the resignation of the late Lord Dacre was unanimously elected chairman of the Herts Quarter Sessions. He accepted office in the Earl of Derby's first administration, in 1852, as Lord Privy Seal; and again, in Lord Derby's government, from February, 1858, to June, 1859, as Lord President of the Council. He was elected a member of the Society of Arts in 1858, and filled the office of Vice-President for some years, taking a warm interest in many of the Society's proceedings, and being always ready, at any time, to aid it with his valuable influence and advice.

Notes.

Russian Game in Paris.—During the last few weeks the shops of Paris have exhibited a considerable number of strange water-fowl, and magnificent specimens of the great grouse, the cock of the woods. These birds come from Russia, and arrive at the Paris market in considerable quantities twice a week, special arrangements having been made with the railway authorities both with respect to rates of carriage and early delivery. The three kinds quoted in the official lists are:—Cocks of the woods, 8 to 11 frs. each; gelinottes, 3fr. 50c. to 4fr. 50c.; and logapèdes, 2 fr. to 2fr. 75c. The gelinotte has become a favourite in Paris, as the price will show, for the birds are small, about the size of a widgeon. The crops are found full of the buds of the willow or other trees, which seem to be the usual food of the birds, for the skin exudes a resinous matter, which, without care in the cooking, is extremely disagreeable, but which is easily removed by means of warm water or milk. The best treatment, however, is said to be to keep the birds in hot milk for several hours before dressing them, when they become extremely delicate. Immense flocks of woodcocks are just now passing over Russia towards the north, but their admission is prohibited by the French game regulations.

Competition in France for Poems to be set to Music.—The new system of competition for the lyric theatres of Paris has commenced with the Grand Opera. The time for sending in compositions to be set to music elapsed a fortnight since, when 168 works had been received from Paris and the provinces. The authors of these productions were invited to meet in the bureau of the Director-General of Theatres, to elect a jury of nine members, with as many supplementary names, and fifty-six responded to the invitation. The nine jurors elected are MM. Perrin, director of the Opera, Gounod, Félicien David, Ambrose Thomas, Emile Augier, Théophile Gautier, Paul St. Victor, F. Sarcey, and Victor Massé, four being musicians and four writers. The authors of the poems sent in for competition expressed a desire that besides the prize poems the five compositions considered next in merit shall be announced in the order in which they shall be placed by the jury by their titles and mottoes; and that similar competitions shall take place at fixed periods. The commission has now made its report. Seventeen of the works sent in were first selected, as deserving of careful examination, and from these five were eventually selected, as possessing considerable merit, and the work selected for the prize is described as in most respects very remarkable; the subject is from Russian history, is said to be treated in a grand, poetic, and varied manner. As soon as the award of the commission shall have been approved by the Emperor, composers will be invited to set it to music.

Correspondence.

Railway Management.—Sir,—In the valuable papers on railway management which have lately been read before the Society of Arts, attention has been greatly directed to the means of reducing expenses, and very little to a topic no less important—the increase of revenue. It is generally assumed that all traffic does and must come upon a railway; and yet, with regard both to income and expenditure, it is questionable whether all that can be has been realised in this country, and whether we have all the fruits of good management. Many years ago the same remarks were made as now about the larger results of French railways in a poorer country, and with a population less commercial, and supposed to have less aptitude as men of business. I made it, therefore, a matter of investigation, to ascertain the French system of management; and in 1851 I published some observations in a railway paper. They were well received, and met with attention, but, in the end, they produced little practical effect, as our own management has been supposed to be sufficient, and now we find ourselves in the same situation as before. All my subsequent observations have led to the same conviction—that the English system of a g n ral manager or goods manager is vicious; and the mischiefs are not confined to this country, but propagated by us in those foreign countries where we establish railways, and hence the

very heavy losses to which shareholders in such undertakings are subjected, particularly in the early years of working. As the French system is very simple, it may be useful to describe it, and it is as well to begin at what may be considered the wrong end. One chief key to French working is the Statistical-office, not the Audit-office, but one distinct. On an ordinary line this will consist of a superintendent, at £200 a-year, and a couple of clerks. On a very great line more will be required, but under no circumstances is the expense large, for there is mere clerk's work carried out on printed forms, and such an office soon pays itself. In this office each train is worked out in every statistical detail, as if for a minute Governmental return—its passengers, receipts, station traffic, goods, consumption of fuel, cost, &c. Each train is watched. If found to be increasing or too cumbrous, the result suggests an augmentation of trains; if falling off, then some train is stopped, not at haphazard, but at an hour convenient to the traffic. If a station falls off it is reported, and inquiry made as to the cause, whether temporary or permanent, and it is dealt with accordingly. Thus an investigation is constantly proceeding, apart from the administrative authorities, which enables them to take their measures with certainty, so as to conform, as far as possible, to the necessities of the traffic, and not to attempt the conforming of the traffic to the ideas of the goods or locomotive manager. The audit department is, as here, an audit or check on the tickets or vouchers. Its tabulated results pass to the statistical department, and constitute the basis of much of its operation, but the locomotive and all distributing departments contribute to the statistics. Of the locomotive and goods department, it is unnecessary to say more than this, that they generally conform to the English departments, but there is a material difference in the administration of the goods department, resulting from the circumstance that the manager is stationary in his office, that he has the assistance of the statistical department, and that all outdoor touting and bargaining is done by the commercial agents. The commercial agents constitute a department, and an important one, in the French system. They are young men, with small allowances, who are, in fact, the commercial travellers for the railway. It is their business to see that all the produce of the country comes on the railway, and to allow none to go by road, river, canal, or sea, which can be secured. They must look after every source of traffic, great or small; each mill, farm, and quarry, and make the best bargains they can. When this comes to be discussed before the traffic committee, the general manager, or goods manager has only to say whether they can carry it, and the traffic committee decide on the contract. The French companies began on the English system, and even with Englishmen, and at the time I made my first inquiries the experience of the English system was still fresh and unfavourable. The French administrators found a great objection to a goods manager running about everywhere over the country. They found he had not the time for small operations, and neglected them, and neglected, at the same time, the conduct of his own official duties. They therefore consider it a great advantage that he shall be relieved from the necessity of seeking out traffic, and have it brought to him, thereby devoting his undivided energies to the working of the traffic, in which he is materially assisted by the condensed information of the statistical department. The principle is the division of labour, with precision of administration. The commercial agent is a functionary in strict conformity with commercial practice, and indeed all the arrangements are thoroughly practical and systematic. The French administration is further helped by a thoroughly good constitution of the staff. Although the salaries are moderate, every one is well provided for, not on the footing of a driver's or servant's charity poundage and charity dole, but on that of great public establishments, conferring privileges on its members of all degrees. The French companies pay more in this way and less in salaries, and in the end the French railway *employé*, high or low, is better off than the English, all things considered. On this head a very remarkable article will be found in a recent number of the *Revue des Deux Mondes*, which institutes a comparison altogether unfavourable to the English staff, the advantages enjoyed by a French *employé* being enough to make the hair of an English director stand on end. There is no one in the service of the English Government possesses equal advantages, not even a sailor. There is no grinding down, there are high retiring pensions, sick allowances, medical service, and all the benefits of co-operation in the purchase and supply of eatables and necessaries, which are conveyed free by the companies. The organisation of the Paris and Mediterranean service has been brought to a very high pitch. Of course we may be told that everything exists in England,—statistics, goods agents, every means for getting goods, and that *employés* are indulgently treated. In sober truth there is nothing of the kind; and on the best managed lines everything is capricious for want of system. The inferior clerks and servants, unless *protégés* of some powerful favourite, are subject to constant vexations. The removal of a family and furniture on duty is sometimes made a matter of harsh treatment. There is no assurance of fair advancement, and no prospect of fixed employment, except at a low salary, and he who obtains an advance after long years of service may find himself cut down by a committee of inquiry or new board. The first operation of a reforming chairman or opposition board is to cut down the salaries, though with the certain effect of restoring them to the old level in two or three years, the efficiency of the staff having been much damaged in the meanwhile. The percentage system for increase of traffic and diminution of expenses is fully carried out in France, and has never been adequately applied in England, though it was here the allowance on saving of coke was first introduced. It might have been thought that a principle found successful would have been more freely applied, but the political changes of administration, consequent on ill-success, and the operations of committees of inquiry have generally been unfavourable to liberal and systematic treatment of *employés*. The benefit of a good and reliable staff is a great advantage to the French manager. The man, high or low, is bound up with the service for his life, he can scarcely get anything better elsewhere after a few years' duty, and dismissal would be the loss of a valuable property. Every year of the company's success brings greater privileges to himself, however humble may be his branch of employment, and, if in the higher ranks, he has a direct interest in promoting economy and prosperity, which yield him an annual bonus. The system here described is not the sole cause of French success, but it greatly contributes to this, for it is businesslike and justified by common sense, while our practice is unbusinesslike. There are arrangements in France in conformity with French ideas, which greatly reduce expense, but our people are not so ready to sacrifice time for advantages they consider questionable. The details of the French system here described are thoroughly applicable at home, and, if applied, they would not only do no harm, but must result in great pecuniary advantage.—I am, &c., Hyde Clarke.

32, St. George's-square, S.W., April 11, 1861.

MEETINGS FOR THE ENSUING WEEK.

Mon......Society of Engineers, 7½. Adjourned discussion "On the Sewerage Works at Redhill," by Mr. Sydney A. Reade.
R. United Service Inst., 8½. Capt. T. B. Heathorne, "A Muzzle-pivoting Gun Carriage, on the Lever and Fulcrum Principle."
Asiatic, 3.
Victoria Inst., 8.

Tues ...Civil Engineers, 8. 1. Mr. A. Wilson, "Irrigation in India." 2. Mr. T. Login, "On the Benefits of Irrigation

in India; and on the proper Construction of Irrigating Canals." 3. Mr. Geo. Higgin, "Irrigation in Spain, chiefly in reference to the Construction of the Henares and the Esla Canals in that Country."
Statistical, 8. Mr. Samuel Brown, "On the Population Statistics of Europe."
Pathological, 8.
Ethnological, 8. 1. Mr. Fred. Whymper, "On the Natives of the Alaska Province of Russian America." 2. "On the Wild Tribes of Southern India," from the Records of the India Office.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

Wed ...Society of Arts, 8. Mr. W. A. Gibbs, "On the Cultivation of Beetroot, and its Manufacture into Sugar."
Geological, 8. 1. Mr. George Maw, "On the Distribution of Iron in variegated Strata." 2. Dr. H. B. Holl, "On the older Rocks of South Devon and East Cornwall."
R. Society of Literature, 4½. Annual Meeting.
Archæological Assoc., 8½.

Thur ...Royal, 8½.
Antiquaries, 2. Annual Meeting.
Zoological, 8½.
R. Society Club, 6.
Mathematical, 8.
Royal Inst., 3. Dr. W. Odling, "On Chemical Combination."
Society of Fine Arts, 8. Exhibition of a part of the Drawings and Sketches of John Constable, R.A.

Fri.......Royal Inst., 8. Dr. Gladstone, "On some New Experiments on Light."
R. United Service Inst., 3. Commander F. Warren, "Cooking for Troops." (M. Sorensen will exhibit his Norwegian self-acting apparatus.)

Sat ......R. Botanic, 3¾.
Royal Inst., 3. Dr. Odling, "On Chemical Combination."

Patents.

From Commissioners of Patents' Journal, April 10.

Grants of Provisional Protection.

Animal and vegetable substances, drying and preserving—1030—M. B. Orr.
Axles, &c., lubricating—1007—A. Elliott and J. Barker.
Bale ties—981—W. R. Lake.
Bale ties—1079—J. F. Hadland.
Blow-pipes—963—J. O. Spong and J. F. Haddaway.
Boiler flues, &c., cleaning—1047—I. Bates and J. Taylor.
Boilers, &c.—1039—W. S. Page and R. East.
Boots and shoes—1065—J. Macintosh and W. Boggett.
Braces—971—T. Pope.
Carriages—992—T. W. Fuller.
Cement, manufacturing—1045—A. Warner.
Chemical substances to be used in preparing paper pulp—1050—F. Bauman.
Cocks and taps—1031—W. H. S. Aubin.
Collars, cuffs, &c.—1040—B. Browne.
Conveyance, &c., appliances for—961—G. Macdona and O. Hilliard.
Cork, treating—1077—J. H. Johnson.
Cylinders, drying, of sizing and other machines—1012—G. Hayhurst.
Engines—991—W. R. Boothby.
Engines—1056—W. E. Newton.
Engines, locomotive, &c.—1034—W. Clark, jun., and J. Clark.
Engines, steam—1011—J. Warburton, jun.
Engines, steam—1033—H. Davey.
Engines, steam—1052—G. Davies.
Esparto, &c., bleaching—1044—T. Routledge and W. H. Richardson.
Fabrics, cut-pile—1060—S. C. Lister.
Fabrics, woven, producing designs upon—1051—G. Hodgkinson.
Fabrics, &c., washing, bleaching, &c.—1072—O. Ormrod.
Filters—1070—W. R. Lake.
Fire-arms, breech-loading—1054—C. E. Brooman.
Fire-arms, &c.—1024—H. G. P. Meade.
Flasks, dram—1017—J. Plant.
Furnaces, blast—1020—T. Whitehouse.
Furnaces, smoke-consuming—990—W. E. Gedge.
Furnaces, &c.—753—C. Schinz.
Gaseliers—1066—C. Joyner.
Grease cups—979—C. N. Leroy.
Ice, &c., producing—1006—R. Little.
Iron—1073—C. F. Claus.
Iron—1074—C. F. Claus.
Iron, &c., coating—1067—J. C. Coombe and J. Poole.
Iron and steel—965—H. Bessemer.
Iron and steel—967—H. Bessemer.
Iron and steel—1071—H. Armstrong.
Iron and steel—1076—J. H. Johnson.
Kilns for burning bricks, &c.—1038—W. D. Cliff.
Knives, pocket—1003—A. V. Newton.
Ladles containing molten metal, support for—1062—J. G. Fildes.
Lamps—973—S. Holmes.
Lamps—1043—J. H. Johnson.
Letter clips, bill files, &c.—1041—S. Perry and F. Brampton.
Linen, &c., extracting ink and iron-mould from—3625—B. Engel.
Looms—1014—T. Lane.
Looms—1021—T. Sagar, T. Richmond, and C. Catlow.
Looms—1042—J. Lyall.
Mashing apparatus—1009—A. McGlashan and J. Hendry.
Metal bars for horse-shoes, &c.—994—E. Gray.
Milk, preserving—1063—T. C. Currie.
Millstones, dressing—1028—J. T. King.
Mines, &c., hauling minerals in—1058—J. G. Jones.
Motive-power from rivers, &c.—705—L. Roman.
Needles, securing and wrapping up—1055—C. B. James.
Optical illusions, producing—1049—J. Maurice.
Paper bags, machinery for making—1001—C. Harris.
Paper-cutting machines, &c.—1032—T. Bettney.
Paper, safety—1023—J. Jameson.
Paper tubes for spinning machinery—1015—C. E. Brooman.
Pencils, indelible—977—C. McDermott.
Persons, deaf or dumb, apparatus for communicating with—1075—B. Mitford.
Pistons—1035—M. Havenhand and J. Allen.
Postage stamps, &c., moistening—1069—W. E. Gedge.
Presses, hydraulic—1029—W. Oram.
Railway points and signals—1013—W. Buck.
Railway rails—989—H. Burgess.
Railway signals—987—J. S. Farmer.
Railway trains, stopping—1080—F. Wirth.
Railways—1068—W. J. Addis.
Reaping and mowing machines—1037—W. Manwaring.
Seeds and oil nuts—1081—J. M. Day.
Seeds, &c., decorticating—1084—J. Walker and J. Wharrie.
Sewing machines—856—E. K. Dutton and J. and H. Holme.
Sewing machines, &c., stands for—951—W. and C. E. Taylor.
Sheep, &c., shearing—1053—P. Adie.
Ships' hatches, &c.—997—J. A. Farrar and B. R. Huntley.
Shirt and waistcoat combined, &c.—927—S. Wenkheim.
Shutters, iron—1064—H. G. Warren, S. Stuckey, and P. Froud.
Slate, &c., working and manufacturing—1027—E. J. J. Dixon.
Spinning machinery—1018—A. V. Newton.
Spirits, distilling and rectifying—983—E. Vignier.
Steel, &c.—1078—J. H. Johnson.
Streets, &c., cleaning—941—R. W. J. Trueman.
Tables, portable—999—D. Lewis.
Telegraphic apparatus—1026—W. P. Piggott.
Thrashing machinery—985—A. V. Newton.
Tiles, ornamenting—1016—S. Fisher.
Traps for catching mice, &c.—849—W. E. and F. A. Bush.
Traps, stench—1002—J. Antill.
Trowsers—1036—J. Cocks.
Valves for regulating the flow of water—969—E. K. Dutton.
Valves made from india-rubber, &c.—118—W. Firth.
Watches, &c.—993—C. D. Abel.
Whist counters—1057—H. Jones, jun., and W. F. De La Rue.
Wool-cleaning machines—1019—W. Richardson.
Wool, &c., carding—1022—J. Anderson.

Invention with Complete Specification Filed.

Engines, &c., packing for—1120—W. E. Boardman.
Horse-shoe nails, manufacturing—1110—W. R. Lake.
Iron and steel—1167—A. L. Holley.
Liquids, measuring—1128—C. W. Baldwin.
Railways—1159—C. Desnos.

Patents Sealed.

2846. C. Avery.	2891. H. A. Bonneville.
2849. A. F. Hobhouse.	2912. J. Rives.
2850. W. R. Lake.	2917. G. M. Wells.
2853. R. George.	2929. J. Seward and H. Smith.
2855. E. Haigh.	2944. J. Schwartz.
2857. J. C. Wilson.	2955. J. Hunter.
2861. A. Helwig.	3033. C. E. Brooman.
2868. J. Buckingham and J. S. Blockey.	3123. A. V. Newton.
2872. H. A. Dufrené.	3129. H. A. Bonneville.
2873. R. Canham & J. Thomson.	3219. A. V. Newton.
2878. B. Nicoll.	3301. W. J. Murphy.
2882. E. Ward.	3359. E. Belknap.
2883. W. Gadd and B. Walker.	313. W. Guise.
	464. F. Schäfer.

From Commissioners of Patents' Journal, April 14.

Patents on which the Stamp Duty of £50 has been paid.

1030. H. Bridson.	1104. D. Greig.
989. E. Welch.	1041. F. P. Warren.
1024. S. Wright.	1026. D. Payne.
1045. J. M. Hart.	1038. J. Haworth.
1046. T. J. Mayall.	1047. F. Bapty and E. B. Sayers.
1051. A. V. Newton.	1048. G. Jackson.
1077. A. W. Hale.	

Patents on which the Stamp Duty of £100 has been Paid.

876. F. Taylor.	1009. E. H. Bentall.
858. H. Wilde.	891. J. Lancelott.
927. F. Gye.	892. T. Don, T. Smith, and L. Horsfield.
933. R. Ransome.	

Journal of the Society of Arts.

FRIDAY, APRIL 24, 1868.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'Clock :—

APRIL 29.—"On Progress in Oyster Culture." By HARRY LOBB, Esq.

MAY 13.—"On the various Methods of Lighting Streets by Gas, with Proposals for the introduction of an Improved System." By S. TUCKER, Esq.

ALBERT MEDAL.

The Council will proceed to consider the award of the Albert Medal at their first meeting in May next. This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded as follows :—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

The Council invite Members of the Society to forward to the Secretary, before the 15th April, the names of such men of high distinction as they may think worthy of this honour.

INSTITUTIONS.

The following Institution has been received into Union since the last announcement :—

Denton and Haughton Mechanics' Institution.

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

NINETEENTH ORDINARY MEETING.

Wednesday, April 22nd, 1868 ; J. CHALMERS MORTON, Esq., in the chair.

The following candidates were proposed for election as members of the Society :—

Powell, Evan, St. Mary's-villa, Newtown, Montgomeryshire.
Welshman, Richard Nash, Dean-street, Soho, W.
Wilson, John, 159, New Bond-street, W.

The following candidates were balloted for, and duly elected members of the Society :—

Barry, J. J. Redmond, Ireland.
Cleghorn, J. The Mount, York.
Fraser, Alexander Colvin, Colchester.
Mitchell, Albert, Elmstead, near Chiselhurst.

The Paper read was—

ON THE CULTIVATION OF BEETROOT, AND ITS MANUFACTURE INTO SUGAR.

BY W. A. GIBBS, ESQ.

It was with great pleasure that I accepted the suggestion of your excellent secretary to bring this subject to your notice, because it is one upon which a learned and influential society like yours can most powerfully and beneficially guide public opinion and direct private judgment. I trust that I shall be able to show both that it is a subject sufficiently large to merit some notice at your hands, and also that there is just now a very urgent need for a thorough and searching discussion of its possibilities; inasmuch as the time has evidently arrived for a renewal of enthusiastic but somewhat desultory efforts to establish this special manufacture in these islands. One gentleman who has been successfully engaged for many years in the refining of sugars, and who has of late been importing from the Continent raw beetroot sugar to the extent of 300 tons per week, has already commenced an establishment at Lavenham, in Suffolk, and made some preliminary arrangements with the farmers for a supply of roots. Others are reported to have pledged themselves to follow in the same track, and this in the face of some five or six former failures. One cannot but admire the indomitable English perseverance that, in the fights of industry, as well as on the field of battle, ignores defeat, and refuses to accept any failure as final; but one knows that if this courage were less rash and hasty it would achieve still greater results, and suffer fewer disasters.

A few statistics of the steady and enormous growth of this industry abroad, will, perhaps, show a good and sufficient reason why British enterprise returns again and again to the attempt to vie with the Continent in so large and important a manufacture. The number of factories abroad, in 1839, was about 270; in 1848, about 1,200 or 1,300; and at the present time about 3,200. Thus, in thirty years, the Continent has increased its possibilities of production more than tenfold, and now contributes about 670,000 tons of sugar per annum to the world's stores. This is nearly one-third more than we import from our colonies into the United Kingdom, and represents an annual value of nearly twenty millions sterling. Coincident with this growing production abroad was a somewhat noteworthy change in our imports at home; in 1843 we derived nearly the whole of our supply from our own possessions, 4,000,000

cwts. being imported from the colonies as contrasted with 70 cwts. or 80 cwts. from the Continent; but by 1859, our consumption having regularly but rapidly risen to a total of 9,000,000, 5½ millions of that supply was obtained from the colonies direct, and 3½ millions from the Continent. Whether any notable quantity of these 3½ millions was absolutely beet-sugar or merely colonial sugar for which there no longer existed a demand on the Continent, and which was therefore passed on to us, the effect appears to have been the same, for by 1859, their manufactories had attained colossal proportions, both as to number and extent. One factory alone, at that time covered twelve acres of land with its buildings, besides having fourteen subsidiary kilns placed at intervals within a circle of seven leagues around the central establishment, 670 tons of sugar per week being the average product, and 300 head of cattle being fattened on the beet pulp after the extraction of the sugar. In another establishment a capital of eight million francs was embarked, and 3,000 people employed; and it had become quite a customary thing for even princes and noblemen to erect factories and distilleries on their estates. Up to this time nearly all the sugar thus imported into England was in the raw state, and required to be prepared for English palates in English refineries. Hence arose in London, Liverpool, Glasgow, and other of our great cities, a number of extensive and costly refineries, wherein every appliance of scientific discovery and mechanical skill was adopted and perfected to the end in view. Steam engines of large power, air pumps, vacuum pans, hydraulic presses, centrifugal machines, steam hoists—all the powers of art and nature seemed to be impressed into the service; and that *primum mobile*, gold, being also lavishly expended in rendering perfection more perfect, a large body of skilled artisans and well-paid labourers found ample employment in this industry and its correlative branches. But whilst capital and labour were thus building up a prosperous manufacture here, the same two agents were at work on the Continent also; and, not content with supplying us with the raw material, and competing with our colonies only, the foreigner gradually added refineries to his factories, and having that raw material direct from mother Earth, without any intermediate profit to pay for, undersold us in our own markets. This he was the better able to do, inasmuch as our legislative experiment of equalisation of the duties enabled him to send us the refined and manufactured qualities at a very slightly higher duty than the raw. As a consequence of this and other causes many of the capitalists who had embarked their property in this special trade were obliged to close their works, and large numbers of workpeople have been turned adrift to swell the tide of pauperism at the east end of London. Within the last three weeks some of the largest and best-appointed refineries in London, costing for their erection and internal fittings little less than £50,000, have been put up to auction, pulled to pieces (although in first-rate working order), and their contents sold for the price of old metal. During the past year eight others shared the same fate, and many others will shortly follow. It is not, therefore, to be wondered at that energetic, forecasting men should be again bestirring themselves to bring to issue the question whether England, Ireland, Scotland, or Wales cannot compete with France, Germany, and Holland in the growth of a produce which would help to support the existence of their trade. At this point, therefore, I would again revert to the valuable aid and encouragement a scientific body such as your Society of Arts can give to this revived experiment—First, by organising systematic wide-spread trials of experimental culture of this root in various districts, with a view to determine whether any soils and climates in these islands are more favourable to its production than others. Secondly, by suggesting careful analyses of the roots so grown, to ascertain their percentages of sugar as compared with those grown abroad; and, thirdly, by stimulating and rewarding agricultural skill and manufacturing ingenuity, in the production of the largest amount of sugar from the plant, and the utilization of its other valuable constituents. The two first of these points, viz., the best locality for the culture, and the obtainable per centages of sugar, seem to call for the more notice, inasmuch as very little, and very uncertain information at present exists upon them. Startling differences of opinion have been uttered in the public papers upon the subject; some asserting that sunshine and light were all essential; others flatly contradicting these assertions, and declaring sunshine and light to be wholly inimical to the end in view. Some tell us that the root will grow in poor boggy soils and damp climates, and instance North Germany as a corroboration; others insist that it must have a rich deep soil, and that marshland and moistures are fatal. Some dogmatically assert that the per centages of sugar in home-grown roots must ever remain too small to pay for extraction, whilst their opponents enthusiastically confute them with the results of some few isolated growths and analyses. Now there is very little real practical experience at present to fall back upon in this country, because the British farmer has always looked upon the beet root as a mere garden plant, mangold wurzel finding much more favour in his sight for stall feeding, and especially for selling purposes, on account of its bigger bulk and weight; but there are a few starting points in this matter that it may be as well to summarise. 1st. The root being long and taper by nature, a deep, and somewhat loose and light staple will afford it the best chance of "form" development. 2nd. Solid constituents, rather than watery bulk, being the measure of its value, a well-drained subsoil, and a frugal amount of forcing manures will best produce that value. 3rd. As per centage of sugar is in the inverse ratio to the size of the root, such species of seed, and such mode of culture as will result in the smallest rather than the largest roots, will best obtain the desired product; this fact is so important that it will be well to note the difference obtained by careful analysis; it was to the extent of 13 per cent. of sugar in roots of ½ lb. each, as contrasted with 6 per cent. in roots of 4 lbs. and upwards. There is another very important consideration attaching to this culture of small rather than large roots; that is, the lesser weight per acre requiring cartage from the field to the factory. Hitherto, the Silesian white beet seems to be the species most in favour on the Continent, and by general consent is now recommended for adoption here. It can be conveniently taken as one of the crops of the four-course system of husbandry, *ex gr.*,—wheat, with manure; beetroot; clover; oats; but to obtain the best result, it is recommended to sow the seeds in a sheltered place, about the end of February or beginning of March, and to transplant to the fields in May. The after-culture consists in hoeing and weeding exclusively, and hence it is a crop that enables a farmer to clean his land very thoroughly. The quality of seed being of paramount importance, and even the best species having a tendency to degenerate, it would be well to direct the attention of skilful cultivators to the experimental trials of other species of seed, with a view to obtain still higher percentages of sugar from the root. I have been favoured by the Secretary of the Royal Agricultural Society with five choice specimens of foreign seeds, which I have had sown, for comparison with the Silesian, and I shall hope next season to be able to report the results obtained; but to give any extended value to such results, similar experiments ought to be carried out in many different kinds of soils, and in various districts of the kingdom, and a comparative analysis made of the varieties thus produced. It is by no means improbable that in this way a species of root might be discovered, containing a much higher percentage of sugar than that hitherto obtained; indeed, credible analyses from various authorities

have shown 10, 12, and even 15 per cent. as the contents of certain roots under favourable conditions. Mr. Arnold Baruchson, of Magdeburg and Douai, gives 12 per cent. as the average for Germany; Sir Robert Kane found 14 per cent. in some roots grown in the Botanic Garden, Dublin; Johnston asserts positively that 18 per cent. was found in some beet grown in North Germany; and Vilmorin and Knauer both speak confidently of 18 to 20 per cent being obtainable. If this result should be ultimately realised, beetroot would be able to compete most successfully with the sugar-cane, seeing that that only contains an average of 18 per cent. But setting aside for the present these future possibilities, it is to be noted that the French and German beet sugar makers, obtaining (as they did) only 5 to 6 per cent. from the roots, have been able to develop this manufacture into a large and profitable trade. It would seem, therefore, a fair inference that if our farmers can produce a root containing even this low percentage, our manufacturers ought to be able to deal with it advantageously. But here it will be urged that former and frequent experience disproves the soundness of that inference. Let us, therefore, take a short summary of the former failures, and trace out as closely as possible the reasons why they were failures. By far the greater number of these attempts were undertaken without any requisite knowledge of the details of growth or manufacture, and with a totally inadequate capital. In the first adventure that has been recently described by some of those concerned in it, the land was unsuitable, the supply of roots uncertain and fluctuating, the percentage of sugar obtained absurdly small and so badly manufactured as to be bitter and unsaleable. Other shortcomings and blunders were also described, but I do not think it was needful to particularise more than those just named to account for the inevitably disastrous winding up of that (very) "limited" company. The next failure was graphically described at some considerable length by Mr. Sproule, of Dublin. Briefly, it was a company started in a hurry, in the spring of 1851, and expecting the farmers to have Silesian roots grown ready for them by the autumn of that same year; the farmers, having probably sown their fields before the contracts were offered, did not respond; but some gentlemen at Mountmellick offered to grow some hundreds of tons each; the public, however, did not take up the shares, so an old brewery was turned into a sort of sugar factory, and proved utterly unsuited to the purpose; some machinery was tardily supplied, but no one knew how to fit it, so that when the roots were ready the factory was not; the farmers grumbled, and the season was nearly past before work commenced; at this stage (that is, just when work had commenced) the practical manager was replaced by a gentleman of high theoretic attainments; these failing, a young man from the continent was imported to assist. Fresh contracts were made with the farmers for the following year, and during the summer the old buildings were demolished, and, at heavy cost, new ones were "being erected" when the roots were again ready. Thus ended season the second and last, for the money was spent, the farmers disgusted, and the whole affair speedily found its way into the Irish Court of Chancery. It cannot for one moment be maintained that the disastrous ending of such a disgraceful muddle as this is any evidence whatever, either for or against this manufacture. If men who know little or nothing of a certain branch of trade intrust the management of it to others who know less, I should think that even Zadkiel could predict the result without the aid of the stars. If the mischief ended in the disaster of those who, without sufficient knowledge, undertake small ventures of this kind, it would be bad enough, but these bold espousals and timid abandonments of any cause bring upon the cause itself undeserved and unreasoning discredit, and by confirming prejudice in its instinctive dislike to novelty, retard progress and dishearten enterprise.

In commendable contrast to this absurdly misconducted affair, is one that has not been made public, but the history of which has been described to me, by one of the promoters, so clearly and succinctly that, although I am not at liberty to mention his name, I shall take leave to repeat it in his own words:—

"The experiment of manufacturing beet-root sugar, referred to in yours of yesterday, was made about thirty years ago by a kind of 'company limited,' with a view of proving if it could be done with the root as grown in England, so as to compete in the English market with the then slave-grown sugar of the West Indies and other parts of the world. The capital subscribed was about £2,000. The best method of manufacturing then known in France was adopted. Two Frenchmen, recommended by manufacturers in the north of France, were brought over to instruct and superintend those employed. The machinery—viz., the rasp, hydraulic press, and steam-evaporating pans, &c., were obtained from an engineer who thoroughly understood the whole subject, and I believe the thing had a very fair trial, and some as good sugar was made as the average of the French factories at that time produced. Nevertheless, it was found we could not produce it so as to compete with imported sugar, even though prices were then perhaps on an average 15s. per cwt. higher than at present. The duty on colonial and foreign sugar was much higher than now, and there was every probability that the then Government would be compelled to put a duty on native sugar if its manufacture was extended, and as none of the 'company' inclined to take this and other risks on themselves by continuing it on (it might be) an extensive scale, it was 'wound-up' at very considerable loss. I will just add from recollection two of our difficulties—First, That of getting from the farmers a sufficient supply of roots within a reasonable distance of the factory (we found them the seed—white-beet, imported from France) although we gave from 15s. to 20s. per ton delivered; 2nd, We found, then, the pulp from the rasp of no value—could not even give it away."

In answer to further inquiries, he explained that 3 per cent. was about the average yield of sugar obtained, and that no duty was charged upon what they made.* Now in this case many elements of success seemed to exist; but the poor yield of sugar, the fluctuating supply of roots, the non-utilisation of the residuary pulp, and other valuable constituents of the root, and, finally, the small amount of capital employed, and an apparent want of boldness, combined to defeat what might by perseverance and skill have been developed into a most valuable enterprise. In all these small tentative trials several of the necessary conditions for success were totally wanting. Farming and stock feeding were never systematically combined with the manufacture as they are abroad; and it will be easy to see that without some degree of independance as to the supply of the raw material, and without some compensation in the shape of beef or mutton for the sugar and other feeding properties still remaining in the roots, the work could scarcely be carried on with regularity or without loss; when the farm is conjoined with the factory, such parts of the roots as by want of skill or from inevitable cause are lost to the latter, re-appear in the former in the shape of meat, and this to a considerable extent forms a compensation for the first early blunders. Another point of manufacture, which has never received attention in any former attempts, is the extraction and utilisation of the valuable salts of potash and soda that exist in beet root. Analyses show that an average crop of 20 tons per acre would contain 100 lbs. of potash and 60 lbs. of soda; the former of these alkalis, when recovered and converted into the mercantile form of carbonate, would represent nearly 1½ cwt. of what is commonly known by the

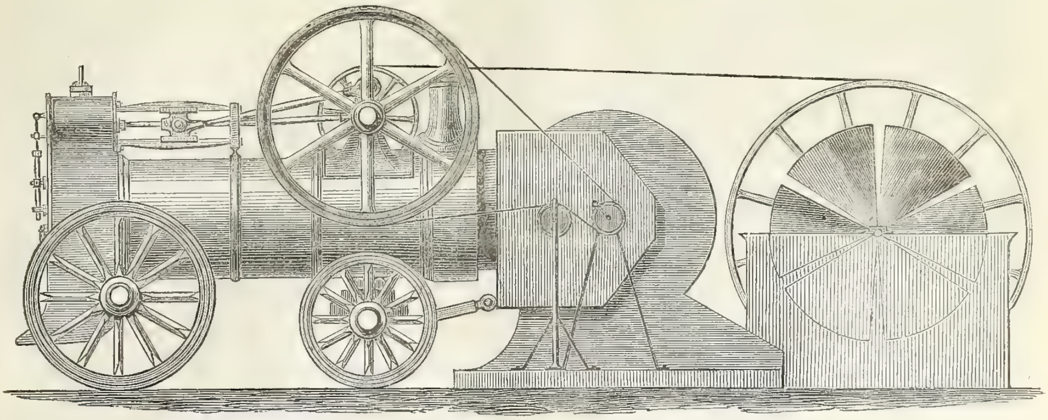
* At or about this date, Dr. Ure, without any "rasps," "hydraulic presses," or "vacuum pans," obtained 5 per cent. of sugar from some white beet grown at Mitcham in Surrey.

commercial name of pearlash, a product which has an average value of between 30s. and 40s. per cwt. This may seem a small matter, but if we estimate the value of the pearlash only, and even deduct one-third of that for possible waste, this alone would give an additional value to the crop of 30s. to 40s. per acre. I can speak confidently as to this product being saved and utilised abroad, because I have of late purchased several tons of it derived from this source. I hope to be able to prove, further on in this paper, that the residuary pulp and the leaves may be rendered much more valuable than they have hitherto been; but before passing from the subject of the comparison of foreign processes with English attempts, I would remark that there are three distinct modes of dealing with this manufacture abroad, and only one of these has as yet been tried here. The first is, rasping the fresh roots, pressing out the juice and treating it in the same way as the juice of the sugar cane, and this is the only method that has been imitated—and very badly imitated—in this country; but there are two other modes in practice—the one finds most favour in France, and the other is very generally practised in Germany. The French plan is to slice the roots thinly, and then steep them in hot water, passing the liquor thus obtained over continually fresh quantities of the sliced roots until the syrupy extract is sufficiently strong for final evaporation and crystallisation. One great disadvantage of both the rasping and steeping is that the extraction can only be carried on during five or six months of the year—say, from mid-October to the end of March, because after this latter date the roots rapidly deteriorate. This circumstance leaves a large portion of the machinery and plant idle and useless for the remaining six months of the year, and involves the necessity of discharging the greater number of the workpeople at the end of each season, and collecting others again in the following autumn. It is true that arrangements for obtaining large bodies of men for temporary and fluctuating work are quite possible, as, for example, in harvesting, draining, and other rough labour; but still, in a manufacture requiring some amount of practical skill, it cannot but be a disadvantage, especially at the outset of a new undertaking where the men lack training to their work. Besides which, if we take a *pro formâ* sum of £10,000 or £20,000 as capital sunk in the erection and fitting up of a factory, the whole interest for the year of the money thus invested has to be borne by the working six months. It would seem, therefore, that if some means of dealing with this manufacture can be adopted, by which the work may be carried on regularly through the whole year without let or hindrance, such a mode of operation would have much to recommend it.

Accordingly, we find that in Germany an elaborate system has been in practical operation for many years, whereby the roots are dried in kilns and preserved for use all the year round. In one large establishment — that of Scheutzenburg's, in Gallicia—fourteen such kilns, costing £500 or £600 each, have been erected within a circle of seven leagues around the central factory, the object of this distribution over so large an area being to reduce the heavy cost of cartage, which upon a root containing fully eight-tenths of its weight of water is very considerable. If, after a searching investigation into the respective merits of these three modes of dealing with the root, it were determined to try this last named one of drying, I would suggest that there seem to be three modes in which this arrangement might be carried out. First, by establishing on a grand scale, and upon the exact system of the continental houses, a vast central establishment and its ring of fixed kilns, taking in an area of some hundred square miles, and absorbing all the roots that could be grown in that area; undertaking also extensive farming operations to consume the residue of the roots profitably. This, if well managed in all its several departments and supported by ample capital, would, in all probability, gain an ultimate and large prosperity; but I do not think public opinion or private enthusiasm is prepared to take so heavy a risk until to some extent assured that soil, climate, and customs of any special district are favourable to the project. A second mode would be to erect a more modest central factory, and to employ, in lieu of the fixed kilns, travelling engines with drying cylinders and hot blast, to deal with the roots on the fields, and draw them in, thus lightened of their excessive water, to undergo the final processes of extraction, evaporation, and crystallisation, returning the pulp to the farmers at an agreed valuation. If this plan were adopted, it might be found convenient to draw in such crops of roots as lay near to the factory, without the previous drying, and extract the sugar from them by either the pulping or the macerating process, whilst the more distant crops were being dried, brought in, and stored, to be worked up during the (otherwise) idle months of the year. My own impression is, that this would be by far the soundest and safest mode of action; but there is yet a third manner which might also have some advantages. A great many farmers throughout England now possess either fixed or portable engines, and every year adds to that number. What is to hinder them from turning these engines to good use for some additional months of the year, by applying them to the drying of any crops of beet-root that they may choose to grow; and thus either sell such dried roots, at a remunerative price, to the sugar factories, or, if failing to obtain a satisfactory price, retain them as a most valuable and concentrated food for stock? Such a method of dealing with this manufacture, in its first stage, would have the following important advantages:—1st. It would dispense with the necessity of risking upon the experiment, heavy and irretrievable sums for new buildings, costly plant and elaborate machinery. 2nd. It would be a very easy and accurate mode of ascertaining if any special district possessed advantages for the growth of this sugar-producing beet, and hence would be the best preliminary step towards the ultimate localisation of this manufacture on a large scale. 3rd. It would, if portable engines were employed, enable the farmer to dry off his roots on the field in which they were grown, and to reduce his cartage home from 100 tons to 20. 4th. It would further enable him to dry the leaves both of beet-root and mangold into valuable and storeable forage. 5th. It would give additional and profitable use to his engine, and furnish him with an apparatus, which, with some slight additions, would enable him to dry his hay or wheat in wet seasons. For farms not yet possessing engines, there is ever ready the hiring system, which could be adapted for root drying just as well as for wheat threshing. Those who lend these engines would be often glad to get additional work for them in this or any other way.

Having thus, as I hope, indicated that such a system would work in practically and easily with our existing agricultural customs, I will now proceed to describe as briefly as possible what, for want of a better name, I will call a "portable kiln," and also some of the experiments that seem to demonstrate its efficiency for the end in view.

The woodcut on the next page shows an ordinary portable engine, from which the chimney stalk is removed, and the usual vent for the smoke closed by a plate of iron. A huge iron fan, partially encased in a kind of jacket, and having an aperture in the back of that jacket corresponding in diameter to the opening in the smoke-box, is easily adjusted to that opening, requiring no intricate fitting or fastening; movement by means of a band being now given from the large fly-wheel of the engine to the rigger on the flyers-shaft of the fan, a great volume of hot air is drawn from the furnace of the boiler through its tubes, generating steam very rapidly and plentifully in its passage. Malting coal or coke being used in the furnace no smoke is produced, and the air thus obtained, consisting largely of



sulphurous and carbonic acid gases, is peculiarly suitable to the drying of a fermentable juice such as that contained in the beet; inasmuch as they arrest any tendency to fermentation that may have commenced. So far the apparatus is exactly the same as that shown by me last year for drying hay and wheat in wet seasons; but after many trials, finding that neither the steam hay-chamber nor the tubular wheat-house could be utilised for drying either the leaves or roots of beet, I had various shapes, sizes, and forms of cylinders constructed, and have finally found the best result from the segmented cylinder now shown; the speciality of this form of cylinder is that it presents a very large open-floor surface to the action of the hot air in a very small compass, and the air having access by the narrow spaces between the segments, as well as through the wire mesh of which those segments are made, rushes up into the very centre of the slowly-revolving mass of roots. The relative velocities of revolution of the fan and of the cylinders are of the utmost importance to the rapidity of result; when the former was driven at 1,630 revolutions per minute, and the latter at three revolutions per minute, it took 4½ hours to dry its charge of roots; but when, after several tentative changes in various ways, I increased the velocity of the fan to 2,640, and reduced the pace of the cylinder to one revolution in one minute 20 seconds, we dried the same quantity in two hours. The temperature of the ingoing air in both these cases was 520° Fah., and the outgoing 260°; the high temperature up to which I have gradually adventured in dealing with these roots, will possibly cause surprise and provoke the natural question, does it not char and utterly destroy the sugar in the root? The simplest answer I can give, is to ask your examination of the three specimens now upon the table. No. 1 is the root previously sliced into thin ribbons, and then subjected to this ingoing air at 520° for about one hour; it has lost two-thirds of its weight of water, and, although indicating here and there a few specks of char, the bulk of it is, I believe, utterly unchanged; it has kept also (unchanged by the keeping) for three weeks, and I subjected it to this test of time in view of its being possibly convenient in some cases not to carry the dessication beyond this stage. No. 2 was subjected to 520° for two hours; it shows more indication of char than the other, but that arises partly from the dessication having been carried further than it need be, and partly from some previously dried root adhering to the wire mesh of the cylinder; this specimen has parted with nearly nine-tenths of its water, and yet, as proof that the sugar in it has not undergone a change into the glucose state, No. 3 shows the crystallised sugar obtained from it by boiling alcohol precipitated again by cooling upon the sides of the bottle and the fragments of the root. No. 4 is the same root purposely dried to complete dessication; it has a brown colour, and an aroma strongly resembling chicory. An infusion of it, made in the same way as coffee, was absolutely mistaken by some of my people for that beverage. No. 5 shows the leaf of the mangold dried so as to be stored and used for food, instead of being (as now) ploughed in. By Dr. Voelcker's analysis this dried product showed a considerably less per centage of inert woody fibre and a higher per centage of azote than the best meadow hay. All kinds of stock ate it eagerly, and several practical farmers have given an unhesitating opinion that it is worth fully hay price. But to return to the subject of the root drying. I must explain that the results just described were obtained from a working model only, and not from the full-sized apparatus, but having had the relative areas of the model fan and cylinder made to the exact scale of one-fiftieth of the full size, and having tested the accuracy of the calculations thus deducible, by drying fifty times the quantity of wet hay with the large hot blast, in the same time that one part was dried by the model fan, I venture to assert that with four cylinders and one fan of six feet diameter and six feet broad, driven by a six or eight horse engine, a farmer would be able to dry 360 tons of roots in a week. Of course this calculation is based upon the expediency, which attaches to all continuous engine work, of carrying on through the night, so as not to waste time and fuel in letting steam down each evening, and getting it up again next morning. Now if we take twenty tons per acre as an average crop, three hundred and sixty tons would be the product of an eighteen-acre field. If upon the continental system it were needful to cart this quantity an average distance of two and a half miles, to a central factory, the positive cost of such cartage would be fully two shillings per ton, which would constitute a first charge of thirty-six pounds on the three hundred and sixty tons. But if the system now suggested were adopted, and these three hundred and sixty tons were carted to the portable kiln in the centre of the field in which they were grown, they could be brought in by

			£	s.	d.
2 horses and carts, at 5s. per diem each, per week			3	0	0
2 men	at 2s. 6d.	,,	1	10	0
2 boys	at 1s. 2d.	,,	0	14	0
After drying there would be 92 tons to be carted the 2½ miles, at 2s. per ton......			9	4	0
			£14	8	0

This £14 8s. deducted from £36 would show a saving of £21 12s. per week.

It will, I think, be conceded that whether a fixed kiln

at a factory, or a portable one in a field, be used, an engine for washing and slicing the roots, and afterwards pressing the dried root into cake or manufacturing it into sugar, would be indispensable if the operation is to be carried on to any extent; the engine, therefore, would not be a heavier charge on the one plan than on the other. The labour of charging and emptying the cylinders would not be greater than that of charging and emptying a kiln; indeed, by a little mechanical ingenuity it could probably be made less, and the consumption of fuel would not, I think, be greater in the one case than in the other, because, although in a kiln on the old principle the loss of heat by radiation would be less, on the new, that loss would surely be compensated by the novel utilization of the waste heat from the engine. So far the matter rests upon its comparative merits only, and the argument in its favour merely stands thus—that as a certain process has been found to answer abroad, if that process can be adapted to this country so as to show a saving of £20 per week in the item of cartage, it forms a *primâ facie* evidence that it should answer here also. But I have not drawn up this paper with a view to advocate blindly any pet plan of my own, but simply to exchange such knowledge as I have been able to glean upon this subject with others, many of whom probably know a great deal more about it than I can pretend to do. In this view I would ask the attention of the Society, and information from some of its members, as to the relative value of labour here and in the beet growing countries. I have waded through a great number of books and a large amount of correspondence, but I cannot find any reliable data as to the wages of the men employed or the number required for the conversion of a given number of tons of beet into their relative tonnage of raw sugar. I have obtained the latest returns issued by the Prussian Government, and am told that they are generally very correct. These give 1,600,000 tons of raw roots converted, during the year 1865-6, into 128,000 tons of raw sugar; this latter quantity gives 2,461 tons per week; and 35,000 people being employed in this industry, would show rather more than fourteen people requisite for the production of each ton of sugar. This seems a very heavy amount of labour; and I can by no means vouch for more than the correctness of the figures as deduced from the report. Mr. Arnold Baruchson, who has just returned from his establishments at Magdeburg and Douai, assures me that a man's wage there is about 12s., and a woman's 5s. per week; in that case there are many parts of England and Ireland, where labour is equally cheap, and the comparative cost of production would not be affected by the number of people employed. But if there be other districts on the Continent where men may be obtained for say 9s. per week, and women for 4s.; and if at a rough estimate we take the labour of eight men and six women as required to produce one ton of sugar, then 8 at 9s. $+$ 6 at 4s. $= 72 + 24 = 96$, must be deducted from 8 at 12 $+$ 6 at 5s. $= 96 + 30 = 126$s. minus 96s. $=$ 30s., giving a nett advantage to any such district over this country of 30s. per ton on the sugar so produced. This is a large difference, but carriage and freight, and many other circumstances might reduce the inequality; besides, it is worth remark, that mere money wage does not express all the difference. The value of a body of workmen to a manufacturer is not represented solely by what they are paid, but by what they can do; if in Germany the wages of the labourer are low because he can buy his food cheaply, then the man there at his 9s. per week may be as able and willing to work as one here or in Ireland at 12s. or 15s; but if (as has unhappily been the case in the latter country especially) wage is low and food dear, such an underpaid and half-starved workman cannot do anything like the same amount of labour as his better-fed rival, and the money-cheapness of wage becomes a mere delusion. I can speak from personal experience upon this point, because, five and twenty years ago, we established a branch of our manufacture in the south of Ireland, and employed a considerable number of men at the (then) highest wage of 7s. per week. At this time we were also employing a large proportion of Irishmen in London at from 15s. to 18s. per week. Passing from one manufactory to the other I was struck with the much larger amount of work which our men in England could willingly and cheerfully do than in Ireland. The former were able to keep steadily on at hard work for hours together without flagging, and with very little disposition to shirk their fair share in it; but the others could only make a spasmodic effort whilst the eye of the foreman or the master was upon them, and, directly they believed themselves unobserved, would crouch down into corners, pull out the inevitable short-pipe, and console the cravings of their empty stomachs with enervating and unwholesome smoke. This was so evidently a question of sufficient and insufficient food that, as a mere matter of policy, we gradually raised their wages; and if the undertaking had been carried on, I firmly believe that we should have found it to our pecuniary interest to have equalised their pay with that of our London men. I have ventured to intrude this digression to indicate the fallacy of founding any manufacturing calculation upon the mere money wage in any particular country, without due regard being had to the condition of the labourer.

I have now only one more circumstance to bring to your notice, and that, also, is much more with a view of eliciting information from others, than with any pretence of conveying it myself. In the returns of the imports of sugar into the United Kingdom (with which I have been favoured by the Board of Trade), it appears that whereas, in 1859, five and a-half million hundredweights came from our colonies, and three and a-half millions came from the Continent, in 1866, about nine and a-half millions came from the former, and only about one and a-half millions came from the latter. It would be very instructive if those who are well versed in the philosophy of statistics would give an explanation of these figures. To a superficial observer, like myself, they would seem to show that our colonies have not much to fear from Continental competition, and thus indirectly lead to a suspicion that the home growth of sugar would have to compete with a colonial rather than a Continental rival.

Whatever be the ultimate fate of this manufacture, surely those who come forward and risk their capital and their credit with sufficient courage and perseverance to demonstrate either its possibility or impossibility, well deserve the warm encouragement of public opinion during their experiment, and an equally hearty sympathy and honour whether they fail or succeed. When we remember that success would, in all probability, lead to the profitable investment of some millions of idle capital, and give wage and work to twenty or thirty thousand idle men, all who wish well to their country must wish success to such an enterprise.

The establishment now commenced at Lavenham has been set afoot, as I am told, with the thorough approval and valuable advice of two of our most eminent agricultural authorities, Mr. J. Chalmers Morton (whom I am glad to see occupying the chair this evening), and Mr. James Caird; this latter gentleman, in his admirable letters on "English Agriculture," nearly 20 years ago, called attention to this subject, and has seen no reason to alter his opinion of its importance. It is, I am also informed, being carried out at the sole risk, and under the sole management of Mr. James Duncan, a gentleman of thorough practical knowledge and long experience. Under these good auspices, and with ample guidance from past failures, and a large increase of present knowledge, I think we may fairly hope that the renewed adventure will ultimately achieve a prosperous future.

This short and imperfect review of a large question

has only touched upon a few points, I fear very superficially. It may, therefore, be of some service to those who may care to pursue this subject farther, to append a list of the works which contain valuable technical and minute information upon it. In Loudon's and Morton's "Encyclopedias of Agriculture," and Rham's "Dictionary of the Farm," very full and excellent descriptions of the best rules for growth and manufacture may be found. Lowe's "Practical Agriculture," and Stephen's "Book of the Farm," are also worth consulting upon points of cultivation, whilst Ure's and Muspratt's "Dictionaries of Arts and Manufactures" contain ample details of processes of manufacture, and statistics of consumption and imports. In Muspratt's, especially, there is a very valuable description of both this and the "Colonial Sugar Manufacture," by Dr. Angus Smith, of Manchester. In the *Agricultural Gazette* of the 28th of March, there is an interesting passage from Johnston's "Chemistry of Common Life," and a minute description of the best species of seeds, by a foreign correspondent. Two German treatises, by Dr. Fühler (not yet translated), may be obtained from Berlin, through Messrs. Assher and Co., Bedford-street, Covent-Garden; and, finally, a paper read by Mr. Arnold Baruchson before the Social Science Congress at Belfast, and a pamphlet, by the same author, now in course of publication, are doubtless both of them well worth study. There is, therefore, no lack of book-knowledge upon this matter, and it seems now only to remain to put the various processes and theories described and advocated to the crucial test of systematic experiment, in order to provide a sound and secure basis for practical enterprise.

DISCUSSION.

The Chairman said that as there were single counties in England in which no less than 20,000 to 30,000 acres of mangold-wurzel were grown annually, it was evident that the climate and soil were perfectly well adapted to the growth of the sugar beet. If therefore any gentleman had any information to give on the subject he would be conferring a public service by making it known, particularly at the present time, when circumstances seemed favourable to this manufacture being started.

Mr. Botly, from what he had himself seen of the cultivation of beet root on a small scale, thought that there were many soils well adapted to the growth of it, in the same way as turnips and swedes were now grown on land which it was formerly said would not produce them.

Dr. Voelcker thought the paper was more valuable for its suggestive character than in any other respect. He would not offer any remarks on the merits of the various systems of manufacturing sugar from beet-root, because the whole question would really turn upon the description of root which was most remunerative to the farmer. This simple question lay at the root of the whole matter,—was it more profitable for the English farmer to grow large crops for feeding purposes, or small crops for the manufacture of sugar? Although he agreed in many respects with the opinions expressed in the paper, he did not fully endorse the statement that an average crop of beet-root, useful for the manufacture of sugar, would amount to 20 tons per acre, nor could he concur in the view that as yet they had very scanty information respecting the description of land and climate suited for the growth of beet, or as to the kinds of manure best suited for the production of a large percentage of sugar. On these various topics they had very sound information, which had been accumulating during the last ten years on the Continent, and this should be taken advantage of, and the difficulties which the English farmer and manufacturer of beet-root sugar would have to meet must not be lost sight of. In many parts of England there would be a difficulty in the climate. It was not so much heat that was wanted as a dry autumn for the production of sugar in roots generally, more especially in beet. Just when the root was beginning to ripen they wanted not a very hot but a dry season. For that reason he very much doubted whether the cultivation would be successful in Ireland, or on the west coast of Britain, or perhaps even in the Midland Counties. Experience rather pointed to the eastern counties of England as the most likely field for this experiment, and he was glad to see that Mr. Duncan had established, or was about to establish, a manufactory in Suffolk, because that was a dry county, and one in which the soil was not all of the best description, some being indeed very poor land. These circumstances he considered rather propitious for the manufacture of beet-root sugar, although unfavourable for ordinary farming; unfortunately the interest of the farmer and of the beetroot sugar manufacturer would appear to be antagonistic. As soon as the farmer began to grow large crops of roots the percentage of sugar in them would fall; and as soon as his crops fell below a certain tonnage per acre he would find a difficulty in paying his rent. Land on the whole was more valuable in England than on the Continent, and land here was more adapted for the production of beef and mutton. Fattening stock did not pay on the Continent, and was, consequently, neglected; but it was just the reverse in England; so that all circumstances combined to point out to the farmer the desirability of growing large crops rather than small ones; yet this was incompatible with having a large quantity of sugar in the roots. The average per-centage of sugar in the root in England would not be more than 4½ per cent. It was a very good mangold wurzel which gave five per cent. of sugar, and it was only under exceptional circumstances, in cases were they were grown on very poor land, with a very little farm-yard manure, and no guano or stimulating ammoniacal manures, that seven per cent. of sugar was obtained. He had lately made some analyses for Mr. Duncan, of beetroots grown at Lavenham. He had found in roots of about 3lb. each, by no means large ones, in round numbers, seven per cent. of sugar. That was above the average in England, whereas in the sugar growing districts in the north of Germany, about Magdeburg and Halle, 12 per cent. was the average. That gave a very wide margin for profit to the continental manufacturer. Then, again, the value of land here tended to the employment of more capital in farming than was usual on the Continent, where manures, especially artificial ones, were not sufficiently employed, and the consequence was that crops were much smaller, but the percentage of sugar in the root was much greater than in England. In England manures were largely employed, and as soon as this was the case the percentage of sugar in the roots diminished. It appeared to him that the whole gist of the question whether beetroot sugar manufacture could be profitably carried on in England depended on the answer to the problem whether it was more profitable for a farmer to grow small crops with much sugar, and with little manure employed, or large crops for feeding purposes. He was very glad the experiment was set on foot, and no doubt in a year or two very valuable information would be obtained. No man could be found more likely to go thoroughly into the matter, and to obtain trustworthy results of permanent value, than Mr. Duncan, and even if he were unsuccessful, which he (Dr. Voelcker) hoped would not be the case, he had no doubt that very valuable lessons would be learned from his experiments in Suffolk.

Mr. W. Foster White said he had had no intention of entering into the discussion, although there was hardly any question of more importance than that before them. They all knew the large amount of sugar which was required for various purposes, even leaving out of view its domestic use. He need only refer to various manufactures, and particularly to breweries; and he could not help thinking that Mr. Gibbs must have been under some mistake in his statistical information as to the imports. He had been connected all his life, directly

or indirectly, with sugar; and he might say that that trade had lately had to encounter very considerable difficulties indeed in connection with the article of glucose. He should like to know whether the statistics quoted included that article?

Mr. Gibbs said that the returns he had obtained from the Board of Trade distinctly specified raw sugar only.

Mr. White said they had dealt with this article in England, and it was found to answer all the purposes of sugar admirably, but no sooner had they succeeded than they found they were impeded by the excise laws. For instance, he could produce from glucose an article which would be extremely useful to a certain manufacturer who desired to use it, but the excise laws stepped in and prevented the one from selling and the other from buying. They would permit the manufacturer to buy the glucose himself and manufacture the article he required, but this did not suit him; the operation was costly, a certain amount of danger was attached to it, and it was inconvenient to him to put up the requisite apparatus on his own premises. The consequence was that he had entirely failed to bring this exceedingly useful article into consumption owing to the stringency of the excise laws. Then, returning to the question of beetroot; the chairman knew very well what large amounts of money had been lost, literally sunk, in attempts to extract spirit from it, during the last few years. Upon this point, again, he happened to possess very full information; and he had no hesitation in saying that the labour and capital which had been devoted to that subject had all been lost. He was old enough to recollect the efforts of a gentleman whose name must be familiar to many members of the Society, Mr. John Howard Kyan. He succeeded in extracting spirit from beetroot, leaving behind a deposit or pulp, which, after much labour, he was able to convert into paper. The paper was brown at first, but after some difficulty he succeeded in bleaching it and converting it into writing paper. That was a very excellent operation, and showed what even 30 years ago British capital and energy could do with beetroot or anything else in the manipulation of which they were not interfered with by the excise laws. He was thoroughly persuaded that this matter was yet in its infancy. If he rightly understood the paper, the author was about to enter on a large experiment in this direction, which would be surrounded with considerable difficulties and risk, but he wished him Godspeed; and if he succeeded either in the production at a profit of spirit or sugar from beet, and if the remaining pulp could afterwards be turned to advantage in the feeding of cattle, he would be undoubtedly a great benefactor to his country.

Mr. Botly, in reference to a remark by Dr. Voelcker, hoped he might be permitted to ask that gentleman if he had not known instances of the yield per acre having been raised from 20 up to as much as 40 tons per acre by the application of manure, industry, and skill. He believed it was not large crops, but large roots that yielded less sugar, and it was now well-known that a moderate-sized swede was better for fattening and kept better than a very large one. He did not see why there should not be a good weight per acre of small or moderate-sized roots.

Mr. David Martineau, being engaged in the sugar manufacture, and using about 200 tons of foreign beetroot sugar weekly, said the subject was of great importance, and if they could get a supply of sugar at home it would be very advantageous in many ways, and they would be able to command many markets from which they were now excluded by foreign competition. At the same time they must remember that the continentals had arrived at their present success only after many years of trial and difficulty, all of which we could not escape in this country, even by availing ourselves of their experience, for the conditions were not in all respects alike. For instance, our autumns were generally much wetter, and there might be differences in the soils, and in the kind of roots best adapted to them. Independently of that, there were differences in the excise laws. At the present moment treacle was prohibited from being used either in breweries or distilleries, for both of which purposes it was well adapted; and if these laws were continued, so as to prevent the profitable employment of the treacle from the beet-root sugar manufacture, he apprehended the experiment must fail, as he understood it was so nauseous as to be unfit even for feeding cattle. Abroad it was used almost entirely for distillation. If it could be so used here it might make all the difference between a profit and loss in the manufacture. It was, no doubt, the case that the largest quantity of sugar was obtained from what would look very poor roots to English eyes; but he believed that very nearly the same weight per acre of small roots as of large ones might be produced; and if this were so, and if the small roots yielded 10 or 12 per cent. of sugar as against 3 or 4 per cent. from the large ones, that, again, would make all the difference between a profit and a loss. He might say that the trade in general wished the experiment every success, and would do all they could by offering a market for the produce.

Mr. Jones thought it very doubtful whether it would be for the advantage of the country to devote the land to the cultivation of sugar, seeing this article could be imported from abroad much more easily than beef, and they wanted the latter as much or more than they did sugar, whilst the price per pound was about double. In the present system of agriculture a great deal depended on keeping a good stock of cattle on the land, and if the root crop were sent off the land instead of being consumed by the cattle, he did not see how they were to keep up a proper succession of wheat and other crops in rotation. He believed their great object should be to attend to the feeding of stock, for on that depended the superiority of their wheat crops. He thought the average of mangold-wurzel stated in the paper was rather below the mark at twenty tons per acre, for he had recently sown some from which he was assured by the seedsman he should get eighty tons.

Mr. Pearsall agreed with Dr. Voelcker that the paper was most valuable for its suggestions, and thought the statistics were not quite reliable. It was wrong to quote figures at random, but he had no hesitation in saying that the difference between the quantity of sugar imported into this country in 1866 and the present time was so enormous as to render the sentence which was founded upon the Board of Trade returns for that year, and which stated that it would appear "that our colonies had not muuch to fear from continental competition" absolutely incorrect. The French and Germans were now saying that the day was coming when they would have to supply their own colonies with sugar grown at home. He believed that in 1867 at least 28 million pounds were imported into England. Mr. Gibbs had not pointed out how the manufacture had grown up on the Continent, nor how it was supported, nor had he pointed out to the farmer or capitalist how the processes were carried on so as to affect other produce. He believed if any one went into the manufacture here on a broad view of what had been stated as the results on the Continent he would be ruined, unless the excise laws were modified. On the Continent the manufacture could be conducted in any way that was thought proper, and the molasses could be devoted to any purpose which appeared profitable. This could not be done by a farmer in England, and therefore, without some change in the law, there would be an enormous waste. This manufacture was now carried on to an immense extent in Germany, Holland, Belgium, and France, and our colonies were driven out of the market. With proper regulations he could not imagine a better crop for the farmer, so capable as it was of being turned to account in various ways, either as food for cattle or for the use of the manufacturer.

Mr. Campin said the excise laws seemed to be regarded

in some quarters as an insuperable difficulty in the way; but if this were so, he did not think any statesman would long resist such an alteration as was required to meet the circumstances of the case.

The Chairman thought, perhaps, the best answer to the gentlemen who had dissented most vigorously from the idea that this manufacture could be introduced into English agriculture, was the fact that a very intelligent sugar refiner was about to take these risks upon himself, and offer 18s. per ton to farmers for beetroot for manufacturing purposes. He probably knew his own business well enough to feel safe in making such an offer, and on the other hand it would pay the farmers very well to grow the crop at that price. Of course it would not be to their advantage to grow an unsuitable article, but what they had to guard against was not so much a large crop as a crop of large roots. He thought perhaps it would be possible to grow a large tonnage of small roots; a single lb. per square foot would give 20 tons per acre, and surely it was possible to grow roots averaging 1lb. each over an acre. Some guidance might be obtained from what was done in Germany. He was told that in France the tax was levied on the sugar as it was manufactured, but in Germany on the root itself; and there it was found advantageous to cut off that part of the root which appeared above ground, as it contained less sugar than the portion beneath. He would venture to recommend to gentlemen about to cultivate mangold or sugar beet, to depend rather upon transplanted roots than on sowing seed; that they should not follow the practice hitherto generally adopted of sowing the seed in rows upon raised drills, which were afterwards levelled, so that the earth was taken away, and the roots were more exposed than they would naturally be, but that they should cultivate seed in seed beds, and transplant the seedings. If the ground was cultivated deeply, well manured in the autumn, and the plants put in in May with the last ploughing, planting them at intervals of 15 inches in very narrow rows about 12 inches wide, they would get a plant which would grow mostly underground, and would probably be better for Mr. Duncan's purpose. Having a plant to every square foot and a-half, if they averaged one and a-half pound per root, they would have 22 or 23 tons per acre of small roots, and therefore of good quality, which, at 18s. per ton delivered, would pay very well. It was worth any man's while to grow a green crop for which he got £20 per acre; and if the farmers in the neighbourhood of Lavenham adopted a proper mode of growing, no doubt they would find the beetroot crop very profitable. He concluded by moving a vote of thanks to Mr. Gibbs for his valuable paper, which he hoped would not be too late to have some effect on the crop of the ensuing season.

Dr. Voelcker begged leave to suggest that, instead of applying farmyard manure in the autumn, no manure at all should be used if they wished to give satisfaction to the beetroot sugar manufacturer. He knew that in the north of Germany it was made a condition with the farmers that no manure, either natural or artificial, should be used with the root crop, although it might be used with the one previous.

The Chairman said Mr. Duncan had issued the conditions upon which he offered the 18s. per ton for the roots, and he permitted the application of manure in the autumn preceding the sowing, and of bone-dust in the spring.

The vote of thanks having been passed,

Mr. Gibbs, in acknowledging the vote of thanks, said, I cannot pretend to take up and confute all the objections that have been urged against this manufacture, because I do not stand here to-night either as an advocate or an opponent of it. In many of those objections I heartily concur; in others I admit great force and cogency; and in all I see additional reason for caution and further inquiry. My own impression is that we require to know a great deal more of this subject before it would be safe to embark in it to any great extent. In the hope, therefore, of giving some little additional light upon one branch of it, viz., that of the drying process suggested in my paper, I will venture to refer to two or three more detailed and minute calculations than I could embody in the paper itself. First in the calculation for time and quantities, I assume that the drying power is proportioned to the area of the column of hot air used (velocity and temperature being equal); I take, therefore, a fan mouth of 6 ft. $\times$ 2 ft. 10 in., the area of which is 2,448 sq. inches, *i.e.*, 200 times greater than my model fan of 4 in. $\times$ 3 in., and as this latter is able to dry $\frac{1}{2}$ cwt. in 2 hours, the former would obviously be able to dry 200 times $\frac{1}{2}$ cwt., *i.e.*, 5 tons in the 2 hours; now 5 tons in 2 hours = 60 tons in the 24 hours = 360 tons per week. With regard to the capacity of the cylinders, I believe it will be found that four of the size indicated will hold fully 5 tons, but if more space were required, an increase of 2 ft. in these diameters, or the addition of two more cylinders would not affect the practicability of the arrangement; each set of 2 or 3 could be contained in a closed portable chamber, of the size of a threshing machine, and placed, like it, on travelling wheels. If the quantity of fuel requisite to drive off this large bulk of water were found too great to pass through the furnace of the engine, a supplementary furnace of any desired size might be improvised upon the field by the aid of a few fire-bricks and furnace-bars, and the hot air from it led into the same fan already attached to the engine. This fan is by no means an unwieldy thing; when placed upon wheels two men can get it into position very quickly and easily. Touching the question of cost for fuel, having been able, with a very imperfect arrangement of firing, (wherein a heavy loss by radiation largely reduced the effective result), to expel 7 lbs. of water from these roots with 1 lb. of coke, I think I may fairly assume that with better arrangements, one ton of coke will expel 8 tons of water, leaving 2 tons of dry product. Taking coke at 20s. per ton, this shows a first charge of 2s. per ton on the roots so dried; but this must not be estimated as wholly an extra charge on the ultimate manufacture, because this drying largely reduces the cost of fuel in the final evaporation; and if the alcoholic process for extraction of the sugar came to be adopted, this preliminary drying of the root is absolutely essential. Dr. Paul, in an able paper read here last Wednesday, estimates 600° or 640° as the temperature of the air which is inevitably wasted in engine furnaces, and the consequent loss of fuel at 40 per cent.; now as I have been able repeatedly to take this hot air, and by passing it over three cylinders containing wet roots, reduce its final temperature to 140°, there would seem to be a considerable saving in this utilisation. If traction engines came to be ultimately employed in this process, Captain Selwyn's evidence that 1 lb. of napthaline will evaporate 23 lbs. of water, would seem to point to a very advantageous use for liquid fuel rather than coal or coke. We have no sufficient data for estimating the labour and other costs in this country, but as a basis of calculation, I will read the statement given by M. Scheutzenburg of the total expenses of kiln drying at his works. He states that—

	Francs.
40 hectolitres of coal, costing 60f., will dry 40,000 kilos of roots, or about 40 tons,	60
And the labour amounts to, 20 days women's wage, at 80 cents.	16
14 days man's wage, at 1f. 5 cents.	21
Interest on kiln, costing 14,000fs. at 7 per cent.	11
Total	108
Now, if we double the "wage item" to assimilate it in some measure to the cost of labour here, it will add 37fs. more to that total	37
Making	145

40)145(3 francs 25 cents. per ton on the roots,
120
——
25 or about 2s. 9d. per ton.

This therefore does not sound like a fatal or prohibiting cost upon this particular process; indeed, if dryage can be effected at this, or even somewhat larger cost, farmers in far-away and out-lying districts might find their account in adopting it, for the mere purpose of being able to send their produce to distant markets, where they could obtain for it a higher price. I have been told by a practical farmer, of large experience, that many times, when mangold is worth 18s. to 20s. per ton near London, it might be purchased for 7s. 6d. at the far-off farms. Now, 13s. 6d. per ton looks like a fair margin to cover a cost of 2s. 9d., or even double that sum. Before concluding I would ask permission to mention some of the many purposes to which this particular mode of drying may be applicable. The Duke of Sutherland, for whom I am having a wheat-house and hot-blast constructed, intends to have it used not only for harvesting hay and cereals, but for drying peat for fuel on his Dunrobin estates. A gentleman who has large sugar plantations and factories in Demerara, considers it would be of great value there for drying the sugar cane after the extraction of the juice, so as to render it immediately available for the furnaces. General Askwith, the late superintendent of the Royal Gunpowder Works at Waltham, spoke favourably of its probable utility in drying more rapidly the wood required for the charcoal which is used in the manufacture of gunpowder. Mr. Brandreth Gibbs suggested that it would form a valuable and manageable means of preparing agricultural seeds for export to the colonies. Mr. Arnold Baruchson considers that it would be an advantageous mode of drying and roasting chicory; and others have suggested its use in the desiccation of fresh vegetables for ships' stores. It appears, therefore, that the economical and easy utilisation of a volume of hot air, practically unlimited in quantity, and perfectly under control as to temperature, gives a power that may subserve many various uses both in agriculture and manufacture; and if it proves in any way serviceable to the special manufacture which we have been discussing to-night, I shall perhaps be excused for bringing it to your notice. It now only remains to me to thank you very much for the kindness and patience with which you listened to my hasty and imperfect paper, and to express my belief that the discussion which followed it will be of great value.

PRESERVATION OF MEAT.

Shipment of Meat to England.

On the 4th February a meeting of gentlemen interested in the success of a project for the shipment of all the surplus meat of the colony of New South Wales to England (under what is usually known as "Mr. Mort's Freezing Process") was held in the Chamber of Commerce, at the Sydney Exchange, the Hon. Charles Cowper in the chair. Nearly 300 of the most influential gentlemen in the commercial portion of the colonial community were in attendance, a large number of the names of whom were placed upon the committee formed shortly before the close of the proceedings.

The Chairman said that it had been required that some person should be found to step forward, and with sufficient enterprise to see whether Mr. Nicolle's discovery could be made practically available. That person had been found in their valued friend and fellow-colonist, Mr. T. S. Mort, who had kindly intimated his willingness to attend and explain his views. The time had arrived when the boiling-down process was no longer that by which it was desirable for them to dispose of their surplus stock, in the face of the fact that there was a sustained demand for meat in England, which it might be possible for the colony to supply. It was with a view to the furtherance of this idea that Mr. Augustus Morris had already gone to England. They all felt that Mr. Mort ought not to be left to carry out this great enterprise alone, without that co-operation and encouragement which they were all desirous of giving him. He should call upon Mr. W. Forlonge to move the first resolution.

A motion was then made by Mr. Forlonge, seconded by Mr. Richardson, and carried,—"That the chairman do now wait upon Mr. Mort, and intimate to that gentleman that this meeting will be much gratified if he will submit to it any information he possesses relative to the exportation of fresh meat under the freezing process, and also if he will say in what way the colonists interested in such export can aid in the advancement of his enterprise."

The Chairman and some other gentlemen then left the room, and returned with Mr. T. S. Mort, whose appearance was received with applause.

Mr. Mort said he could not but be very much gratified at seeing so large and so influential a meeting assembled to investigate a matter in which he certainly took a deep interest, although its importance to him individually was, in reality, nothing, as compared with its relative importance to the community. He was of course personally interested in the general utilisation of this freezing process; but when that was said it must also be remembered that his friends, Mr. Morris and Mr. Nicolle, were likewise deeply interested therein—the former having given great attention to the carrying out of the idea, and the latter being its actual discoverer. The process which had been erroneously alluded to as "Mr. Mort's Freezing Process" was, in fact, not his at all; the discovery was Mr. Nicolle's—his was only the enterprise—the practical application of the discovery which the genius of Mr. Nicolle had perfected. At the time that he (Mr. Mort) had been engaged in investigating a process for preserving meat which had been discovered by Mr. Blaxland, this refrigerating scheme had been suggested to him by Mr. Morris, but he had not then paid much attention to the idea. Subsequently, however, on finding that Mr. Blaxland's plan for preserving meat could not be made available to the extent that he had desired, he had more fully entertained an idea of the freezing process, and Mr. Nicolle's gradually perfected apparatus had been the result. To the great Faraday they were indebted for the principle which Mr. Nicolle had so successfully applied. It was twenty-eight years since it had been discoverd by that eminent chemist that cold might be obtained by the liquefaction of ammonia, and now there was every reason to believe that that principle might be so beneficially applied as to promote the well-being of thousands. Gentlemen had waited on him (Mr. Mort) to acquaint him with their desire that he should accept at their hands some assistance in his enterprise. Now, he wished it to be understood that he had taken this up as a mercantile speculation, and could do nothing which would interfere with that position. These gentlemen said they wished for their own sakes to further the enterprise by assistance. They asked him to accept at their hands as much meat as he was prepared to take home, and they would pay the freight of the same. A meeting like this could not be assembled without impressing on him a sense of how much he owed them for their kindness and good-will towards the enterprise. His idea was, to bring it to a successful issue, it would be necessary to go to work on a considerable scale. A mere experiment of fifty tons would not, owing to the prejudices existing in England, be recognised in that mercantile spirit by which it was necessary it should be met in order to convince people of the value of the process in a commercial point of view. Almost anything could be carried out as an experiment if money enough was spent upon it; but in this experiment they had not only to show that they could send the meat

of these colonies to England, but that they could send it as a mercantile success; and to do this they ought to send at the first not less than 250 to 300 tons. If Mr. Nicolle and he were not mistaken, and nothing untoward occurred, in about six weeks, or at most two months, he would be in a position to say, "If you are ready with the meat, we are ready with the freezing apparatus and the cylinders for the meat." If they would be so go good as to entrust the meat to his care, his first object on arriving in England would be to realise to the extent of their outlay, which would be repaid to them, and the balance of the meat would be taken by him (Mr. Mort) to distribute through England and France, so as to make the enterprise as widely known as possible. Mr. Morris, in a letter from England, while stating that no invention of the kind had been thought of in Europe, had informed him that a very strong prejudice existed against meat preserved by means of cold, and that nothing but experience would convince the people of England that meat so kept would not putrefy immediately after thawing. He (Mr. Mort) had read and otherwise ascertained the cause of such putrefaction. Albumen in combination with water, of all substances, most easily becomes putrid. When a beast is killed in a cold climate the pores are very quickly sealed up by the cold. It neither bleeds properly, nor "breathes" properly. All who have watched a beast on a cool day after it was killed must have observed the vapour which rose from it—that is called breathing. Now, in a freezing climate, both the vapour and the blood are congealed in the beast; and the albumen of the blood combining with water forms a substance which readily decomposes. But, in our case, a beast is killed in a climate in which it is allowed to bleed properly, and to breathe properly, and they knew for a fact that no such consequences followed in the meat frozen by Mr. Nicolle's plan. Meat which had been kept for months in their cylinder, and afterwards hung for days, had been eaten by many of those present, and they could testify to its being as fresh and palatable as fresh meat, and that no change whatever was perceptible in it—the sole operation of this process being, in fact, to arrest all change. Their experiments showed that their frozen meat had an advantage of from twelve to sixteen hours over meat fresh from the butcher. A strong prejudice exists also in London against the mutton of this colony, and he had lately seen an extract from the *Times* in the *Sydney Morning Herald*, saying that our "inferior mutton" would have to be much improved before the English people would eat it. Now, in the first place, he was at a loss to know what opportunity they could have had of forming this judgment; and next he maintained that our small mutton was equal to the finest produced in England. Still there were these prejudices to contend with; and he felt that in order to enable him to combat them successfully, he could with a good grace accept any balance of meat that might remain after the sale of that which might be required for the repayment of the outlay contemplated by the promoters of this meeting. It would be necessary to give away a great deal; indeed, success could only be attained within any reasonable period of time by extensively disseminating it throughout England and France; and he would here beg to say that whoever may have the selection of the meat must take the greatest care that the quality shall properly represent our production. And now, as to the probable cost of the process per pound; he had gone into the calculation very carefully, and the result he had arrived at was, that after paying all expenses, including freight, working expenses, interest on the cost of machinery and cylinders, it would, if carried out on a large scale, amount to somewhere about 1d. per lb. If that was correct, there could be no question that the shipment of meat from here was a possible thing. The *Times* published a round robin by some butchers, who stated that they were paying on the average for joints of beef in June, 8¾d.; in July, 8½d., in August, 8½d.; in September, 8¼d.; in October, 8½d., and for rumpsteaks and loins, in June, 10d.; in July, 10d.; in August, 9½d.; in September, 9d.; in October, 9¼d.; in November, 9¾d. With an expense of only a penny a lb. we have a magnificent margin for profit left. There are in England thirty millions of people, in France thirty-five millions. There are in the colonies forty millions of sheep. The average increase of sheep is one fifth; so that the increase of forty millions is eight millions. Take off two millions for our home consumption (much less than what it really is) and that leaves six millions to be shipped for England and France. That would be only one-tenth of a sheep per annum for each individual. They could not possibly overdo those markets. If we were prepared to send home all our surplus mutton—and he took no account of the beef, as that would not be much—we could not make an impression on these two countries. We could not do away with the use of horseflesh. Mr. Morris had had a long talk with Mr. Larnach and Mr. Campbell Tertius, and they said that if the plan was at all what he represented it to be there would be no difficulty in carrying it out by a company. In fact, there is at present no topic that excites so much interest in England and France as this meat question; and the feeling is very strong that meat must be obtained from Australia and elsewhere by some means or other. All depended, continued Mr. Morris's letter, on starting from Sydney and arriving in England with a cargo of well-preserved meat. Some other letters did not speak quite so hopefully. There is great difficulty in pressing anything forward in England, in the present depressed state of things and the general want of confidence. His (Mr. Mort's) brother, a very cautious man, told him if he went home—as he conceived he must do—he should go armed with every testimonial he could possibly bring. Now, no better testimonial could go before the British public than the one they were proposing to give, and no greater proof of confidence could be given than that they were willing to entrust him not only with their property, but with the conduct of an enterprise on the successful carrying out of which so much depended. In a matter of such great and universal interest, he thought our Legislature might well step forward. He held in his hand a copy of a bill to provide for the exportation of meat to Queensland. They offered 10,000 acres of land to the man who first landed 100 tons of uncooked meat in England. There was a bonus at once. And it would be no small advantage in forming a company for the carrying out of this scheme, to be able to hold out an inducement of this description from New South Wales. Things of the kind ought to be largely supported, and it would be well that such an inducement should be in readiness to offer to any company of capitalists who might be found willing to enter upon the development of this all-important business. Amongst the pleasures he anticipated in the realisation of this scheme, not the least would be the credit that would be reflected on Australia by the genius of Mr. Nicolle. He deemed it to be an achievement of which the colonies might fairly be proud, that in spite of the greater necessity that existed for an invention of this description in England, the plan should be evolved in New South Wales. He felt sure that the transport of fresh meat would not be the only advantage to be derived from the power of obtaining cold. It would prove to be a mighty agency—the opening up of a great avenue for industry, with roads branching from it on every side. He confidently believed that if cold could be obtained at the price he expected, the social condition of the old world would be altered, and the necessaries and comforts of life brought to every man's door at a rate hitherto unknown.

A vote of thanks to Mr. Mort "for the very valuable information just imparted, and for the public spirit and energy with which he has carried out so far to a comparatively successful issue, an enterprise in which the best interests of Australia are so materially concerned,' was then moved by Mr. Hay, seconded by the Hon. Mr. Busby, and carried.

Mr. Mort, in acknowledging the compliment, said he had been asked what would be the effect upon wool freights if meat became an article of export? In answering, he might say that commerce would be sure to right itself; but as the matter, if rightly worked out, might, in his opinion, be turned to colonial advantage, he would, with the permission of the meeting, answer the question more fully. If the holds were taken up by meat they would doubtless require more 'tween deck room. In rough arithmetic, two 'tween decks would make one hold, and it would, therefore, be necessary to double our shipping to provide room for wool. That settled the question on this side the water. The question then arose, how shall we fill the extra ships with outward freight in England, as ordinary cargo would not be forthcoming for the immense amount of shipping; and, if vessels came out half-laden, return freights would certainly be called upon to make up for the loss? To a small extent freights would doubtless increase, as many deliveries—such as fish, game, &c.—would find their way out, but as a rule the holds would carry all the cargo the colonies could take, and these goods could be stowed in the meat cylinders. But his (Mr. Mort's) idea was to fill the 'tween decks with living freight, and so make our operations to have a double blessing attached to them—that of bringing the people to the meat as well as taking the meat to the people. Both the late and the present Governments had initiated plans favourable to immigration, which we all well knew was life-blood to the colonies. With the help of the Government, therefore, these 'tween decks might be availed of for immigration purposes; and as fresh meat could be supplied at about half the cost of preserved provisions, immigrants could be brought out at a much lower rate than heretofore; and if they were allowed to pay a portion of their passage-money, and the Government would supplement the amount by a £10 land order for each person landed, our prosperity would be increased and our shipping difficulties overcome.

A resolution was then moved by the Hon. P. A. Jennings, and seconded by Mr. John Richardson, "That subscription lists be opened for the purpose of raising funds for providing meat for shipment, and for the payment of the freight thereof." The resolution was put and carried as before.

Sir W. Manning moved that the gentlemen whose names follow be appointed a committee to carry out the objects already approved by this meeting, and for placing the meat to be purchased at the complete control and disposal of Mr. Mort, with power to add to their number, and to take steps for securing the co-operation of the neighbouring colonies, and to form sub-committees in those colonies.

Mr. Alexander Stuart seconded the resolution, and the lists as finally adopted, comprised the following names:—Messrs. Charles Cowper, John Young, Edward Flood, F. H. Danger, H. Glen Walker, William Macleay, G. King, W. Dumaresq, Percy Simpson, A. Walker, Charles Smith, W. Forlonge, Edward Lee, P. A. Jennings, John Morrice, William Busby, Sloper Cox, Edward Knox, Edward King Cox, Thomas Skinner, Francis Lord, James Tyson, R. P. Raymond, John Blaxland, Andrew Loder, John R. Howe, J. B. Rundle, William Norris, James Laidley, Charles D. Bardwell, Marshall Burdekin, T. A. Murray, J. T. Ryan, Walter Hall, W. F. Richardson, Seymour Marten, Edward Wienholt, William F. Lambert, A. J. Mackinnis, Walter Douglas, Arthur Bloomfield, Matthew Young, J. Eales, George Loder, John Frazer, J. J. Phelps, J. Buchanan, John Wyndham, Charles H. Lloyd, H. Hassell, John Robertson, S. C. Burt, John Musson, W. B. Tooth, James Chisholm, Philip G. King, Thomas Ieely, Thomas Rutledge, C. W. Lord, W. Grahame, J. C. Ryrie, John Eales, John Brewster, John D. Macansh, William Nicholson, T. E. Lance, Jean Te Kloet, S. D. Gordon, George Rouse, H. R. Blackman, Thomas H. West, John Browne, Robert W. Smith, John B. Suttor, F. B. Suttor, George Campbell, Euston Bloomfield, William Lee, jun.,; Shepherd Smith, H. Gordon, John Alger, John Hay, Arthur Hodgson, Tertius West, F. Bucknell, G. A. Lloyd, — Higgins, H. Moore, W. Trebeck, J. Murray, James Henderson, Alexander Stuart, Sir William Manning, Messrs. John Christie, S. B. Daniels, John Humphrey, J. F. Frith, John Richardson, James White, Thomas Hungerford, George Thorne, Edward Moriarty, Holden Molyneaux, — Landale, William Archer, — M'Hardy, A. S. Webster, Dr. Jenkins, and W. H. Eldred.

The resolution was put, and carried as before.

It was then moved by Mr. George King, seconded by Mr. A. Hodgson, and carried,—"That Mr. Edward Knox and Mr. John Alger (formerly Treasurer of the Society of Arts) be requested to act as hon. treasurers."

Dr. Bedford moved the sixth resolution,—"That Mr. R. P. Raymond and Mr. Trebeck be requested to act as honorary secretaries, with power to appoint a paid secretary."

Mr. S. C. Burt seconded the resolution, which was carried unanimously.

M. Jules Joubert, a native of France, said that in England, beef and mutton, although selling at 8d. and 10d. per lb., still was to be seen on every man's table, while in France, not only in the lower classes, but in many of the middle classes, meat is scarcely put on the table above once a-week, and then looked upon quite as a luxury. I consider, gentlemen (said M. Joubert), that the admirable scheme entered into by Mr. T. S. Mort, in which you seem all to join so heartily, will achieve for my countrymen more than has ever been done by our Government, and I feel sure that the promoters of such an undertaking will be looked upon in France as public benefactors.

A vote of thanks to the chairman was moved by Mr. Matthew Young, seconded by Mr. T. S. Mort, and carried by acclamation.

ROYAL IRISH INSTITUTE.

The following is from the *Athenæum*:—

"Ireland to the rescue! We are a failing and falling people; slackening in the race, drooping in the flight, going down in the strife. The neighbouring nations are all passing us on the road to wealth and honour. But we have one last chance of life. We may call the Irish to our aid, and so restore the balance of forces now so heavily turned against us. This aid we can procure—this insurance we can effect—at a comparatively trifling cost. We have only to found—under some such name as the Royal Irish Institute—a new South Kensington Museum in Dublin. At the small cost of £100,000 a-year the thing may be commenced.

"We are not jesting; indeed, although fully conscious that the project now put forward in Ireland will be scouted by many as a mere job, we confess to an opinion that there is something in it worthy of serious thought. The Committee, which dates from the Mansion-house, Dublin, puts the case of English need and Irish sympathy in this rather striking way:—'In the fifth report of the Commissioners of the Great Exhibition of 1851, prepared by the Right Hon. Gathorne Hardy, will be found the unanimous opinion of the most eminent men in practical science, art, and manufacture, "that the English workman is gradually losing in the race of competition through the superior intelligence which foreign Governments are carefully developing in their artisans," and that "if we are to maintain our position in industrial competition, we must oppose to this national organisation one equally effective and complete. If we continue the fight with our present voluntary system we shall be defeated, and generations hence we shall be struggling with ignorance, squalor, pauperism, and crime." We believe that the native taste, quickness, and perception of the beautiful which characterise

Irish genius will supply the very elements necessary to place English manufacture above all competition.' Put in that way the offer of help is at least generous. Who can say that the Irish have not a special faculty in the finer arts? Who are our most distinguished artists? Are they not Irish? Who is our chief painter? Maclise—an Irishman. Who is our chief sculptor? Foley—an Irishman. Who is our chief actor? Macready—an Irishman. The fire, the fancy, and the elegance of Irish genius cannot be denied; and, therefore, this promise of help is not to be treated as a passing jest.

"Ireland," says the Committee, "is as yet an almost unbroken field for industrial and art manufactures; its cultivation is certain to produce abundant and profitable fruit. The youth of Ireland are singularly intelligent, docile, quick-witted, and ready at expedients. It is admitted that they have a natural taste for art; and the number and value of the prizes won by them in art-competition against the pupils of English schools, notwithstanding the difficulties which impeded them, ought to impress the State that they have hitherto neglected an element now absolutely necessary for the maintenance of the manufacturing supremacy of England. The ancient works of art in gold, jewellery, and stone preserved in Ireland attest the native taste of past generations. The grace and beauty of ancient Irish ecclesiastical architecture charm to this day, even in their ruins; and we can point now to the restored cathedral of St. Patrick as an enduring testimony to the genius of our ancestors. The beautiful sculptures of the new Museum buildings in the University of Dublin—sculptures designed as well as executed by the artisans alone—prove that this taste and elegance of design are hereditary.'

"All that Ireland wants, is a little help in coming to our help. Ireland, rich in genius, is poor in pelf. It wants a little money, nothing else. It has within itself every other condition of success, even what the auctioneers call an unrivalled opportunity—such 'an opportunity,' to use the words of the Committee, 'as never occurred before, and cannot return again, and such as a legislator anxious to conciliate a people would desire to attain.' Yes; here it is. 'The extremely beautiful building and grounds of the Dublin Exhibition Palace are for sale. They can be purchased for about £90,000. No metropolis possesses so admirable a site for a Royal Institute as this. The magnificent entrance-hall of the Palace seems to have been constructed for the display of sculpture; the galleries would form an unrivalled place for the exhibition of paintings; the lecture-halls cannot be surpassed for convenience, extent, and acoustic properties; there is ample space for displaying in the most effective manner vast collections of raw and manufactured material, so that there would be an exhibition of manufactures at all times open and accessible. The Palace, in fact, can be made an Irish Kensington, in immediate connection with the industry, the science, and the art of this kingdom. With the Royal Irish Institute may be incorporated the Museum of Irish Industry, the Geological Survey of Ireland, the Royal Hibernian Academy, and other kindred institutions; while the Royal Dublin Society, with extended means and increased influence, would pursue with it, in a parallel line, its most useful and patriotic course. If on such a question it is permitted to descend to pecuniary considerations, the rent saved by the concentration of these societies in the one building would amount to double the interest on the sum required for its purchase.' The whole thing, in fact, is cheaper than dirt.

"'To accomplish this great design, and to render the Institute not merely permanent but useful, a grant of £100,000 per annum is required. A less liberal amount will not suffice.' This is quite frank. For the small sum of £100,000 a year, Irish genius will come to the help of English sloth and stupidity, and aid us to redress the balance of nature.

"Apart from jest, we think our Irish friends have a real claim to consideration in such matters, though we doubt whether they have put their case in a winning way."

HAMPTON COURT PALACE.

Hampton Court Palace, open to all classes without payment every day in the week except Fridays—and especially thronged on Sundays by artisans and their families—was the subject of discussion in the House of Commons, when an attempt was made by Mr. Labouchere, the member for Middlesex, and by Mr. Alderman Lusk, to reduce the vote for repairs. The following appropriate remarks are extracted from the *Times*:—

"What, then, is the position of Hampton Court Palace and gardens, and their claim on the national purse? We have not too many palaces or public gardens. We have not too many spots for a day's "outing." Our own metropolis and suburbs are not overdone with the historical monuments, the picture galleries, the vestiges of old, the objects, curious, quaint, or picturesque, that we travel a thousand miles to see, with passports and heavy purses in our pockets and red books in our hands. When the happy day comes at last—that long-looked for holyday which the sun at last smiles upon—one is not embarrassed by the variety of excursions presenting themselves. Some of the number are not very inviting. A regular Londoner has little relish for at least half the items in a Stranger's Diary. There are things, not without their value, which it is sufficient to have seen once, perhaps thirty years ago. On the other hand, there are a few, very few, places which are always enjoyable. They are graceful; they are calm; they offer beauties to the eye and associations to the mind. Hampton Court Palace happens to bear the palm in this last mentioned, very rare, and very precious class. The stateliness of the buildings and gardens, the sweet tranquillity of the scene, the dignity of the immense façade and long broad walks, may predispose and raise the dullest mind and the most jaded spirit for the very strange and very eventful story of the place. That story is the history of England for 200 years, beginning with the rise and fall of Wolsey, and only ending with George II. During that long period, kings, queens, ministers, protectors—more than one—ecclesiastics, from the great Cardinal to the Presbyterian divines—every kind of greatness or notability has left its mark here, and stamped a recollection. The Palace has been a court and a prison; it has even been the property of a private individual, but more generally the fitting edifice for State ceremonies, sumptuous entertainments, Royal marriages, Church conferences, and the reception of foreign potentates and ambassadors. It seems to have been to everybody's taste, for every successive holder of power, during the whole of that ever-changing time, whatever else he liked or disliked, liked Hampton Court. Henry VIII. certainly did, and all his family after him; both Charleses, and he that came between them; William III., its second founder, and his successors to the second George. The architecture writes its history large to the eye of those who require this scale of instruction. An exceedingly curious and interesting collection of a thousand pictures supplies characters, names, and incidents to those who can look closer into the past and take in more. When the visitor is tired of the pictures, there are the gardens; and when he wants a change, there are the river and the park. On any fine Sunday in the summer—indeed, on most fine days—one may see that Hampton Court is appreciated, and that it is a palace of the people. In truth, it is our Versailles, and if not so vast as that greatest of Royal follies, is large enough for enjoyment. Out of a public expenditure now amounting, we are sorry to say, to seventy millions, Mr. Lusk and Mr. Labouchere wish to save £5,000 by cutting down the allowance for this place of popular resort, curtailing the attractions, reducing the scale of repairs, and putting the whole place on what is called an economical footing.

"Such a saving would be singularly misplaced, and out of all proportion with the generally handsome scale of our public expenditure, or, indeed, with a much less handsome scale. Why are the people—for this is a people's question—to be grudged the full enjoyment of their own palace? They do not grudge its royal name, for its story is that of royalty; but they accept it as a gift of royalty to themselves. Nobody here would like it better if it were called a museum. Nor does the public grudge that the palace should still be occupied, for the sentiment of utility itself suggests a preference for an inhabited building. There is no ground for importing invidious comparisons into so simple a matter, but it would be easy to point out expenditures of ten, twenty, or fifty thousand pounds for which the public had much less advantage, and of which, indeed, they are likely never to see the fruit at all. These gentlemen have taken up a very good cause, for the economical use of our means and opportunities is a sacred duty, incumbent upon States as upon private persons. Economy, however, is a thing to be studied, for it is a science; and carefully practised, for it is an art. Nothing depends more on the rule of proportion. It is easy to be penny wise and pound foolish—many thousand pounds foolish, for that is the colossal disproportion of these days. It is no small difficulty, not to say calamity, that the purse our Parliament has to deal with is almost inexhaustible. Our resources being apparently infinite, we cannot distribute them in finite proportion or frame any just system at all. We do it by fits, for want of a method, After a hot fit of extravagance, when, perhaps, Parliament had lost its head altogether, it cools into a cold fit, and repents of its late extravagance in shabbiness and cheeseparings. The inevitable result is a reaction, when Parliament rewards itself for saving five thousand pounds by throwing away, perhaps, five hundred thousand; all the quicker, perhaps, because the object is inappreciable."

PROPOSED ARRANGEMENT FOR TECHNICAL EDUCATION IN FRANCE.

A draft bill was laid before the Corps Législatif last year, the object of which was the establishment of a separate and special system with respect to technical or professional education, under the Ministry of Agriculture, Commerce, and Public Works. The draft was submitted to a committee in the usual way, and M. Chauchard was appointed reporter, but nothing has been heard of the subject since, and it was supposed to have been abandoned.

It appears, however, that such is not the case, for the Minister of Agriculture and Commerce has addressed a circular to all the Chambers of Commerce in France, calling attention to the proposed arrangement, and quoting the objects of the draft bill in the following terms:—"1. To regulate the legal position of the establishments now existing, and of such as may in future be created; and 2. To assure to the administration the means of giving to establishments for technical or professional education, both moral and pecuniary support by the aid of subventions and rewards."

In the circular in question the Minister requests the Chambers of Commerce to examine a new system of organisation (not made public) for the formation and management of such schools, and to report to him thereupon. The committee entrusted with the draft bill awaits, it is said, the result of this appeal to the Chambers of Commerce.

It is scarcely necessary to add that not only are all technical schools at present under the Minister of Public Instruction, but that nearly the whole of those which have been established of late years have resulted from the efforts of M. Duruy. The separation of one class of establishments from the other is entirely a new idea, and will doubtless give rise to considerable discussion.

Fine Arts.

Archæological Exploration at Rome.—A fund is being raised under the auspices of the British Archæological Society at Rome for this object. In a circular issued by the promoters, they point out that while there is no city in Europe that possesses so many objects of historical interest and importance as Rome, there is no place where so many important additional discoveries may not still be made, or so much valuable information be obtained by a very moderate expenditure of money. Many historical questions of considerable interest can only be solved by a more careful examination of the remains of ancient Rome than has ever yet been made. Many passages in classical authors relating to the topography of the city admit of two interpretations, and the right one can only be obtained by archæological investigation; that is, by the careful examination of the remains still existing. To enable archæologists to make these examinations, they must be able to see the construction, but by the filling-up of the fossways of the time of the kings of Rome during the period of the empire, and by the accumulation of the rubbish of old buildings in the middle ages and in modern times, the portions that remain of the original construction are often buried twenty feet deep, or sometimes more. It is only therefore by excavation, and by getting access to cellars or subterranean quarries, or watching the rebuilding of houses, that the archæologist can pursue his explorations and investigations. For this purpose a special fund is required, and the British Archæological Society of Rome propose to act as trustees for such a fund, and to undertake its direction, with the consent and approbation of the Government. The art of photography will enable the society to show how the fund is applied. Photographs will be taken showing the progress of excavations that may be made or of works of art and antiquity that may be discovered, copies of which will be sent to the subscribers. Subscriptions will be received by Messrs. Coutts, to whom they are to be paid to the credit of the Treasurer of the British Archæological Society of Rome, Mr. J. H. Parker.

Colossal Statue of the King of Italy.—A colossal equestrian statue of his Majesty Victor Emanuel, King of Italy, modelled by the sculptor Salvino Salvini, of Leghorn, is about to be placed in the new Piazza Vittorio Emanuele at Florence, near the Cascine, and exhibited to the public during the festivities which will take place on the occasion of the wedding of the Prince Humbert. It then will be taken down, and cast in bronze by the well-known founder, Clemente Papi, of Florence. This immense statue, which is one of the largest in Europe, measures eight metres in height.

Manufactures.

Paper Material.—The *Paper Trade Review* says:—"Several paper manufacturers of the east of France have jointly offered, as a prize, a medal and the sum of 4,000 francs to whomsoever will produce and apply in France any economical filamineous matter which, in the state of paste, may serve for the manufacture of paper, and which, when mixed with three-fourths of rags, shall make a paper of as fine a quality as if mixed with rags alone. Medals will also be given (1) for the best processes for discolouring and bleaching rags; (2) for the best size for paper; (3) for an apparatus or any process which may neutralise the electricity which develops itself in the paper while it is in the machine, and which is hurtful to its manufacture; (4) for a statistical work on the state of the paper manufacturing industry in the principal countries of Europe and in America.

Havre Maritime Exhibition.—Our leading ship-builders, engineers, and others, are likely to be well represented. Messrs. R. Napier and Sons, of Glasgow, who carried off the Grand Prix at Paris last year, are again exhibitors. Messrs. Randolph and Elder, who have a dozen new vessels nearly completed in their extensive building-yards on the Clyde; Messrs. Gourlay Brothers, of Dundee; Mr. James Laing, of Sunderland; Palmer's Shipbuilding and Iron Company, Jarrow; Mr. G. Farrans, North Shields; Messrs. Earl and Brownlow, and Lumsden and Co., of Hull, send models; whilst anchors, chains, cables, ropes, sail-making, fishing tackle, preserved provisions, and other industries will have numerous exhibitors.

Manufacture of Musical-boxes in Switzerland.—The visitors to the Exhibition at Paris, 1867, may remember having seen in the Swiss department a goodly collection of musical boxes, charming the public with their pretty and often complicated airs. The chief centres of production of this agreeable knick-knack are Sainte Croix, in the canton of Vaud, Teufenthal, in the canton of Aargau, and Geneva. At Sainte Croix there are not less than 30 manufacturers of this article, employing upwards of 700 hands; about two-thirds are engaged in making the smaller or snuff-box size, and the remainder the larger, or, as they are technically termed, *carlets*. The aggregate annual production is valued at two millions and a-half francs, or thereabouts. At Geneva there are seven establishments, counting 300 hands in all, which are exclusively devoted to the manufacture of the different parts of musical-boxes. Six other firms, occupying 200 workmen, do nothing but mount and adjust the pieces, and ultimately export the finished article. The number of boxes of all sizes annually made at Geneva is about 6,000, representing a total value of 700,000 fr. (£28,000). The prime cost of a small box is 40 fr., and for a large one varies from 200 to 500 frs. The manufacture of musical birds partakes rather more of the nature of jewellers' work; they are fitted with pretty gilt boxes, from which they emerge when the latter are wound up. There are only two firms in Geneva engaged in this special line; in the aggregate they do not produce more than 100, which are sold at the rate of from 500 to 1,000 francs each.

Manufacture of Combs in Italy.—The manufacture of combs in Italy is carried on principally in Lombardy, Tuscany, and the Neapolitan provinces. In Tuscany, especially at Florence, Leghorn, and Arezzo, they are made chiefly of ivory and bone. At Naples they manufacture excellent articles from the hoofs of bullocks and horses, and also from tortoiseshell. In Lombardy the manufacture of ivory and tortoiseshell combs is very limited, whilst on the other hand a great trade is carried on in combs of bone. Milan may be said to be the chief seat of this manufacture, supplying not only Lombardy, but the whole of Italy. This industry has not been carried on in this city for more than thirty years. Formerly there were only a few small manufactories, where this industry was carried on in a most primitive manner, and the produce was either bad or costly. At the present time there are two large manufactories of combs, occupying about 200 workmen, and eight smaller ones, occupying from six to eight men each, and besides these there are many artisans who work at their own homes for the manufactories. The total number of workmen employed in this industry is about 250. In the other provinces of Lombardy there are several small manufactories. At Milan 4,000 horns are used per week—that is to say, 208,000 horns yearly, representing the value of 150,000f. (£6,000). The total value of the production is estimated at half a million of francs (£20,000). The principal part of the raw material is purchased in the country, but some is obtained from South America, Brazil, Montevideo, and from Buenos Ayres. The refuse of the manufacture, such as the tips of the horns and the scrapings, are used by turners, and also are employed for manure for the cultivation of olives and oranges. The produce of this industry at Milan serves to supply the whole of Italy, and the rest is exported to the Tyrol and to the Canton Tessin, in Switzerland.

Boiler Explosions.—The engineer's monthly report, presented to the Manchester Association, on Tuesday, the 28th January, says that "during the month 149 visits of inspection have been made, and 314 boilers examined, while, in addition, 3 have been tested by hydraulic pressure. In the boilers examined 133 defects have been discovered, 5 of them being dangerous, thus:—Furnaces out of shape, 5; cases of fracture, 14; blistered plates, 9; internal corrosion, 14 (1 dangerous); external corrosion, 28 (4 dangerous); internal grooving, 2; external grooving, 6. Feed apparatus out of order, 1; water gauges ditto, 3; blow-out apparatus, ditto, 7; fusible plugs ditto, 1; safety-valves ditto, 6; pressure-gauges ditto, 10; while 1 boiler was found without any pressure-gauge, 5 without any blow-out apparatus, 20 without feed back pressure valves, and 1 case of over pressure was met with. The members, as a rule, afford the officers of the association increased facilities for making satisfactory examinations, by having the boilers better prepared, and the flues more thoroughly swept than heretofore, while a great facility is afforded for examining the plates of those boilers resting on mid-feather walls, where the members have complied with the request of the association to plough out the brick-work at the transverse seams of rivets. A considerable number of boilers recently enrolled have proved very defective in their construction, many of them being stayed at the flat end-plates with weak diagonal rods, and encumbered with vertical and transverse bolt stays, which are perfectly useless. It is recommended in all cases that substantial gussets should be adopted for staying the flat end-plates of boilers, whether of the Lancashire or Cornish type. Only one steam boiler explosion to report, which occurred to a boiler not under the inspection of the association. In addition to this, three minor explosions occurred, two of which resulted fatally, the other in personal injury. The principal explosion occurred at a colliery, at about mid-day, on Monday, January 13th. The boiler was of the plain, cylindrical, egg-ended, externally-fired class, and set with a flash flue, so that the flames from the furnace passed off direct to the chimney without making any return. It was plated longitudinally, and measured about 27 feet in length by 5 feet in diameter, and three-eighths of an inch in the thickness of plates, while it was fitted with two safety-valves, loaded to a pressure of 40 lbs. It was twenty years old, while it had been removed from another pit and set to work in its new position about three weeks before it exploded, part of the top having been replated about eighteen months before that. The front end of the boiler was thrown to a distance of about 35 yards, and the back end 90 yards, while the junction-valve and part of the steam pipe were found 84 yards from their original seating, one of the safety-valves 170 yards, and a ball belonging to one of the floats 180 yards. This ball, which weighed 50 lbs., had passed over a cottage in its course, and buried itself in the ground to a depth of three feet. A portion of one of the hemispherical ends fell on to a cottage, at a distance of about 40 yards from its original position, and smashed in the roof. In another cottage, about 14 yards from the boiler, the roof was riddled with bricks. It is an unpleasant fact that many dwellings are constantly in jeopardy from being within the range of bad boilers. An examination of the plates showed that they were excessively brittle. They broke without any bending, just like a glass bottle, and presented a coarse-grained bright crystalline fracture, instead of a grey fibrous one, while one of the plates was found to have rent for a length of about 4ft. just at the edge of a longitudinal seam of rivets, not from rivet-hole to rivet-hole, but through the solid plate at the line of caulking at the edge of the overlap. Also, the way in which the boiler was fed was trying to it, as the water was pumped in cold and led

down by means of an internal pipe to within a few inches of the bottom, nearly midway in its length, and about 2ft. from the spot at which the primary rent appeared to have started. After some conjectures as to the cause of the explosion, the report says:—"All such boilers as the one under consideration are treacherous and dangerous to a greater or less degree; more especially so when the plates are of a brittle character; and the cold feed injudiciously impinged directly on to the plates at the bottom of the shell, as in the present instance. If boilers of this type are retained in use at all, they should be truly cylindrical, and not plated lengthways but circumferentially, with the longitudinal seams breaking joint and not in line from one end of the boiler to the other, while the hemispherical ends should be firmly lashed to one another by longitudinal stays, and the plates and workmanship throughout of first-rate quality. Also the feed-water should be heated if possible, and instead of being allowed to impinge directly on to the plates, it should be dispersed on its introduction to the boiler by means of a horizontal feed-pipe, carried near to the surface of the water, and perforated all the way along with small holes. The safer plan, however, is to give up these externally-fired boilers altogether, and adopt the double furnace externally-fired Lancashire boiler instead. This course is now being adopted by several members of this association who are large colliery proprietors, and they find it to be attended both with economy and safety."

Steam Washing without Special Utensils.—The washing of linen is carried on in France in a much more scientific and systematic manner than is usual in England, but where sufficient care is not taken much injury is done to the linen, first by the beaters or wooden bats, and second by the excessive quantity of *eau de Javel* employed. The following is an account of an improved system of washing, recommended in a little work on domestic economy, called *La Fermière*, for rural establishments:—The articles to be washed being sorted and counted, each parcel is weighed, the strength of the lessive requiring to be regulated by the quantity, the condition, and the nature of the linen. The lessive is prepared in a back or tub at the side of the larger one in which the washing is to be performed; it consists of rectified soda at 80°, a kilogramme (2¼lbs.) to 100 litres (22½ gallons), quantity sufficient for one cwt. of linen. These proportions are suitable for fine articles not very dirty; for heavier and dirtier things about double the quantity of soda is recommended, and when mixed, the strength to be moderated accordingly. Generally, the strength of the soda is less than it possesses theoretically, so that the lessive is also rather weaker than it should be, a fault which may be remedied; while if the lessive, on the contrary, be too strong, the linen will be injured. The writer recommends the addition of from ten to sixteen ounces of soft soap to the lessive; the soap increasing the effect of the lessive and diminishing any injurious action. Care must be taken that the ingredients are thoroughly mixed. This lessive may be prepared with cold water, but hot is preferable. When the lessive is ready, the linen is dipped in piece by piece, withdrawn and slightly wrung, then placed in the large tub or back without being pressed down. The dirtiest pieces should be placed at the bottom. The bottom of the tub or back is to be pierced with holes of various sizes in the following manner; one, of two or three inches in diameter, in the centre; four similar ones around and equi-distant from it and the sides of the tub; and a number of other holes about an inch in diameter and four inches from each other, and very close to the sides of the tub. Against the sides of the tub and between the holes of the outer circle, are placed laths about two inches by one in thickness, and in each of the five large holes are placed smooth, round, wooden plugs, thicker above than below, and reaching somewhat higher than the top of the tub; the object of these laths and plugs is to form a number of chimneys for the steam. The linen is packed in between them, and when the tub is nearly full they are all withdrawn; the spaces thus left are covered over with the rest of the linen; large sheets are then laid over all and carefully tucked in around the edge, and a wooden or zinc cover placed over all. The fire being lighted, the steam in about four hours will have completely done its work, and will issue all round the cover. The fire is then put out, and in a few hours the lessive will all have drained off, when the linen may be rinsed out, and, if necessary, rubbed in the usual way. The inventor says that this system is very economical, as the steam causes the soda to combine with the greasy matters in the linen and form soap, as the potash of the lees does in the old system, but that it possesses the great advantage of carrying off the soap by drainage, whereas in the old plan it remained in the linen. Clothes treated in this manner are said to be easily washed out, and to become of remarkable whiteness.

Commerce.

The Rice Trade in France.—The consumption of Piedmontese rice has become very general in France. There was a considerable increase in the imports of rice in 1867, as will be seen in the following statements:—

1865.	Received. Kilogs.	Consumption in France. Kilogs.
Spain	21,715	2,705
Italy	10,397,320	8,186,755
British India	139,626	139,586
Other countries	3,148	61,592
Total kils.	10,561,809	8,390,518

1866.	Received. Kilogs.	Consumption in France. Kilogs.
Spain	55,370	820
Italy	13,230,941	10,205,148
China	11,883	—
Other countries	11,676	14,798
Total kils.	13,309,870	10,220,766

1867.	Received. Kilogs.	Consumption in France. Kilogs.
England	162,446	4,926
Italy	19,085,452	13,188,340
Spain	1,251	970
British India	203,993	143
Other countries	21,858	19,643
Total kils.	19,475,000	13,509,023

Thus out of the 19,475,000 kils. which were received there were consumed in France 13,509,023 kils., which is an immense increase on the imports of 1862, which did not amount to more than 7,292,900 kils. The increase in the consumption is supplied almost entirely from Northern Italy, and it tends to take the place of Indian rice. In 1861 the imports of rice from British India were 13,738,872 kils., against 13,533,723 kils. from Northern Italy. In 1866 the imports of rice from India did not exceed 6,784,099 kils., whilst those from Italy were 17,381,277 kils. Last year the imports of rice from Italy amounted to not less than 24,405,100 kils., whilst that imported from British India did not exceed 5,725,200 kils. The trade in rice between France and Italy has nearly doubled within the last five years, while the trade with India is but limited.

Progress of the Suez Canal.—During the first month and half of the present year most satisfactory progress has been made with the works of excavation for the Suez Canal. The position of these works up to the 15th February, 1868, was as follows:—

	C. metres.
Total amount excavated up to 31st December, 1867	33,955,535
Total amount excavated from 1st January to 15th February, 1868	2,599,834
Total amount remaining to be excavated..........................	37,559,761
Total excavated in canal from Port Saïd to Suez (160 kilometres) ..	74,115,130

There is now every probability that these works will be completely terminated by the spring of next year. The piers at Port Saïd are likewise being pushed forward with great rapidity; on the 15th February there remained only 49,918 c. metres of artificial blocks out of the 250,000 c. metres to be immersed to complete the works. Towards the end of the present year the vast basins of Port Saïd will be thrown open to commerce. Upwards of 10,000 men are employed in this gigantic undertaking, and the steam power used is estimated at from 9 to 10,000 horse power.

The Manufacture of Butter and Cheese in Italy.—About one-half the produce of the cow, one quarter of that of the goat, and all the milk of the sheep, is used in Italy for making butter and cheese. The following is the annual average production of this important article of food:—

	Butter.	Cheese.	Amount.
	kils.	kils.	frs.
Lombardy	20,664,000	43,008,000	74,705,000
Venetia	1,456,000	6,216,000	9,270,000
Other Provinces....	..	100,000,000	120,000,000
Total	22,120,000	149,224,000	209,975,000

There is no return of the exact quantity of butter made in other provinces. The best quality of butter is made in Lombardy, and an extensive exportation is carried on with the neighbouring countries; the next best is that of Parma, and then that made in some of the Venetian provinces and Piedmont. The total exports of butter amount to upwards of 500,000 francs yearly. The following are the exports and imports of this article from 1863 to 1865:—

	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	kils.	frs.	kils.	frs.
1863	60,613	109,000	265,883	487,000
1864	73,740	133,000	430,734	775,000
1865	74,207	133,000	660,347	1,188,000
Average	69,520	125,000	452,305	817,000

The cheeses made in Italy are of various qualities, from cows', goats', and sheeps' milk, and it is needless to say that those made from cows' milk are the best. The cheese made in Lombardy is by far inferior to that made in other parts of Italy, and the best in Lombardy are made in the provinces of Pavia, Lodi, and Cremona, and are known in commerce by the name of "Parmesan cheeses." In Romagna, Piedmont, and Tuscany they have successfully produced the same quality of cheese. The milk of Modena and Parma is less rich than that of Lombardy, but cheeses have been made at some farms in those provinces which nearly equal those of Lombardy. Another excellent quality of cheese, called sbrintz, is also made, which resembles Swiss cheese in many respects. The cheeses of Naples and Sicily, called caciocavallo and incanestrato, are also well known. In many parts of Italy the production barely exceeds the consumption. The following are the exports and imports from 1862 to 1865:—

	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	kils.	frs.	kils.	frs.
1862	4,170,936	6,965,000	1,371,452	2,290,000
1863	4,616,227	7,709,000	1,907,675	3,126,000
1864	5,046,852	8,428,000	3,488,871	5,827,000
1865	5,872,775	9,838,000	3,196,664	5,338,000
Average	4,926,697	8,235,000	2,491,165	4,145,000

The exports are of considerable importance, particularly in Lombardy, and although, as in all the provinces of Italy, a great deal of Swiss cheese is imported, they export a considerable amount of Parmesan in return, which is a source of considerable annual revenue. The Parmesan cheeses, or as they are better known in Italy under the name of formaggio di grana, are made at two different seasons, called sorti, one commencing in April and ending in September; the cheeses made at this period are called maggenga; and the others are called invernenga, or those made from September to April. The annual production of this kind of cheese is estimated at from 15 to 16 million kilogrammes. Of this amount about four and a-half millions of kilogrammes are made in the province of Milan, and the remainder in the provinces of Lodi, Pavia, Cremona, and Mantua. It may be remarked that this is exclusively manufactured where the land is irrigated. The other provinces, viz., Bergamo, Sondrio, and Brescia, also produce a considerable quantity, viz., from six to seven millions of kilogrammes annually of a somewhat similar quality. Butter forms also an important product, and is estimated at 15 millions of kilogrammes. Another quality of cheese, the stracchino, is a speciality of the provinces of Milan, Pavia, and Lodi. The great consumption of this quality of cheese is in the country itself, but there is also a good deal exported to England, France, Austria, Germany, and Russia. The Lombard butter is sent in great quantities to Tuscany, Romagna, the Marches, and Umbria. The quantity of cheese exported from Lombardy is from one million to 1,200,000 kilogrammes, and of butter from 200 to 300,000 kilogrammes. The value of these exports of cheese, butter, and stracchino, may be estimated at about three millions of francs.

Colonies.

The Tea Plant in Jamaica.—*The Kingston* (Jamaica) *Morning Journal* of March 26 says:—"The Government received by last packet, from the royal gardens at Kew, a case of healthy tea plants, which are to be sent to the Chinchona Nursery in St. Andrew, and placed under the care of Mr. Thompson, the island botanist. The idea has been formed, we believe, on good scientific authority, that our soil and climate are so well adapted that the tea plant will flourish here."

Cloth Manufacture in Victoria.—The first piece of cloth ever manufactured in this colony has been produced at the Geelong Woollen and Cloth Manufactory. After many difficulties, among which were the want of skilled men, and the breaking of a portion of the machinery, the company have at last got everything connected with the manufactory into almost perfect order, and are now ready to commence operations on a large scale. For some time past the various machines have been at work preparing the wool for the looms, and one of the latter was set in motion, and a piece of grey-coloured cloth, about eight yards in length, was turned out. Several gentlemen connected with the cloth trade in Melbourne paid a visit to the factory, besides some of

the townsmen of Geelong, interested in its products, and all expressed a good opinion of the appearance of everything, and the quality of the cloth in the loom.

Land Sales in South Australia.—The quantity of land sold by private auction and private contract in 1867 was 142,784 acres, and the amount received £163,700. The largest sale by auction occurred at Gambier, where 16,343 acres were sold for £18,246, exclusive of improvements. This was the only sale that took place out of Adelaide; and, on the following day, 2,703 acres that had passed the hammer were taken up, making a total of 19,046 acres sold in the district, for £20,949.

Gold From Victoria.—The falling off in the yield of the gold-fields has been attributed to a decrease in the number of miners, who have embarked in other pursuits. The returns of the number of miners employed throughout the year 1867 would seem to bear out this view. In 1865 the number of miners employed throughout the year was 83,214; in 1866, 73,577; and in 1867, 65,877, a reduction as between 1865 and 1867 of 17,357. The decrease has been alike regular amongst miners employed in alluvial and quartz workings. In 1865 the number of alluvial miners was 62,131; in 1866, 55,916; and in 1867, 51,719. The number of quartz miners in 1865 was 17,326; in 1866, 14,878; and in 1867, 14,138. In 1860 the average annual earnings per man were, in round numbers £79, 1861, £74; 1862, £67-£70; 1864, £74; 1865, £74; 1866, £80; 1867, £80. There has been a gradual diminution in the export of gold since 1862. During that year the quantity of Victoria gold shipped was 1,658,285 oz.; in 1863, 1,627,066 oz.; in 1864, 1,545,450 oz.; in 1865, 1,556,088 oz.; in 1866, 1,480,597 oz.; and in 1867, 1,392,336 oz.

Notes.

Horticultural Exhibition in France.—The Imperial Society of Horticulture is organising an international exhibition in connection with the fine art *salon*, which opens on the first of May. The horse show having closed, the lower floor of the Palais de l'Industrie is now free, and the whole of the central portion will be converted by the society into a garden, as upon former occasions. The flower show proper will extend from the first to the eighth of May inclusive, but a partial exhibition will be maintained throughout the whole duration of the *salon;* the sculpture, it is hoped, will be placed in the garden, as formerly; last year it was put under the galleries, in consequence of the occupation of the central portion by the commission of the Universal Exhibition, and was not seen to advantage. The Emperor, Empress, and Prince Imperial, the lady patronesses of the Horticultural Society, Marshal Vaillant, president of the society, and several other donors, give gold medals, and a considerable number of medals of various classes are offered by the society itself.

Excavations at Pompeii. — The impression of a papyrus, the letters of which are in a perfect state of preservation, has recently been found in the excavations at Pompeii. The importance of this discovery cannot be overlooked, as it is the first papyrus which has been found at Pompeii.

Discovery of the Remains of a Roman House.—The remains of a Roman house have been recently discovered in the neighbourhood of Volterra, at a short distance from the sea, and at the foot of the hill on which stood the ancient feudal castle of Castagneto, belonging to the Counts of Gherardesca. These remains, which were found at a short depth from the surface, consist of the "impluvium" and the pavement of four rooms in mosaic, in the Pompeian style. The design and colours are of extraordinary beauty, and in excellent preservation. The Government have sent some experienced men to continue the works of excavation, and for the purpose of preserving the objects which have been discovered.

Collection of American Paper Money.—Prince Napoleon, who, not long since, presented a very fine collection of gold Ottoman coins to the Bibliothèque Imperiale of Paris, has now given to the same establishment a collection of American bank-notes, consisting of seventy-five specimens of notes of various kinds, and twenty-five proofs on India paper of engraved portraits and vignettes employed in the ornamentation of these notes.

Value of Houses and Ground in Paris.—The official return of the purchase of houses for the alterations now proceeding in Paris, during the month of February, has recently been published. The number of houses contained in the returns is only 17, but the purchase money amounts to 3,627,180 francs (£135,087); the highest amount awarded for one house was 968,000 francs (£38,720). As regards ground, the highest rate awarded was 750 francs, or £30 per square metre, and the lowest 12frs. 20c., or 9s. 9d.; the total of the awards amounts to 1,739,608 francs, or £69,584.

Correspondence.

Liquid Fuel.—Sir, — The comprehensive paper of Mr. Paul clears away much vagueness on the subject of liquid fuel, but does not, I think, make out a case against the use of it, or the pursuit of further applications by better methods. Cost per ton may be an element, but it is far from the only element. The real question is, how much of the steam-making heat can we obtain for twenty shillings, after paying for all the incidental expenses,—labour in shipment, dirt and cleaning up, paying stokers, and shortening their lives by half-roasting them, melting out fire-bars, destroying boilers, hoisting, and lifting, and wasting by imperfect combustion, saying nothing of general discomfort by smoke. Whatever fuel we may use for the production of heat, our first process must be to convert it into gas, even in burning a tallow candle, therefore the fuel most easily convertible into gas must be, *cæteris paribus*, the best. Anthracite is the most difficult, and there runs a story in New York that an anthracite proprietor in Rhode Island, on applying to a learned professor for a certificate as to the durability of his fuel, received one to the effect that the professor verily believed "that it would be the last thing consumed at the day of judgment." Combustion can only take place by the admixture of a given quantity of carbon or hydrogen with a given quantity of oxygen or atmospheric air, and this admixture can only take place in the gaseous form. Mr. Wye Williams set this all forth very clearly some years ago, and Mr. Paul has done the same in a mode that he who runs may read. For many years we threw away the hydrogen of our coal by converting it into coke for our locomotives, and when we took to coal, smoke and all, we were surprised to find we made steam more easily. Nevertheless the reason is a plain one. We were using a flaming fuel instead of mere red coke. Many of us have tried to boil a kettle at a picnic, but all our art could not succeed in effecting successful contact between the red embers and the kettle, the rush of air between the two keeping the surfaces cool. But on the application of a sheet of newspaper or brown paper the heat immediately passed through the metal to the water, and the boiling was effected. So in the locomotive boiler, we call the whole contents of the fire-box and tubes "heating surface," when the real heating surface is in fact confined to that portion in actual contact with the hot coke; the surface above it, and the upper surface and tubes only get the contact of insufficiently heated air and gases, from which the heat does not sufficiently permeate the metal to get access to the water, and, for ought we know to the contrary, in the intervals of the cylinder blast, cold air may get access to the tubes through the chimney, with a cooling down effect. There is no doubt that flaming fuel is the best, for, rightly managed, it may cover the whole of the heating surface,

both firebox and tubes with lambent flame, and therefore liquid fuel which is capable of doing this, apart from other considerations, is preferable to bituminous coal, which cakes together, or anthracite, or coke, which gives out little or no flame. And Mr. Paul is quite right in theory in preferring air blast to chimney draught, so far as we know the comparative results, because in this case we can exactly measure out the quantities of gas and air, and the air draught of our furnaces have not yet obtained the exactitude of our paraffin lamps. But before we have done we shall bring our steam furnaces, locomotives and others, to the condition of a huge paraffin lamp. We know that we can adjust our table lamps exactly, so as to produce no smoke, the heated hood serving as a gas retort, and the numerous small holes disseminating the air in exact quantity to the gas produced. And the heat which escapes at the chimney, because we do not wish to utilize it, would be a powerful steam producer, according to its quantity of air brought in contact with heating surfaces. Even supposing that the cost of blowing air into the furnace instead of using chimney draught, were quite as great, there would be an advantage in its greater regularity and its easy adjustment, especially in locomotives which have to ascend and descend inclines. In the ordinary mode with coal we urge the fire down hill in order to get up a head of steam wherewith to mount the ascent. With liquid fuel, like a large lamp, and with capacity for consuming it exactly as we want it, we should adjust it by turning a cock just as we might require it. In lamps we draw up the liquid fuel by the capillary action of the wick. In furnaces we cannot use wicks, and therefore we must apply the liquid fuel in the form of spray, in order that it may be readily converted into gas by the heat of a fire at the onset, and afterwards by the saturated heat of the furnace. This spray is induced by the action of steam on the present process, the steam drawing with it a body of air in a similar mode to the plan of Mr. D. K. Clark for consuming smoke. What the quantity of steam may be, or what percentage of the boiler capacity, we do not know, or whether the same consumption of steam would work an air-blowing pump, but assuredly the steam is not fuel. It may urge a fire incidentally by forcing air in, but it will not kindle a fire, nor add to the amount of the combustible; but it will heat up the material to the gas-producing point, and therefore it deals with what is called "dead oil." Mr. Paul states that the total production of petroleum is only equivalent to 5 per cent. of the total amount of coal used for our steam navigation, and appears to think that it is only a limited quantity which may be obtained, because oil wells in America have, in some cases, ceased to flow—and, in others, have been exhausted—by pumping. Surely, the same thing has occurred with water wells, and coal pits also have been dug out; but we still possess water and coal. I do not believe in the exhaustive school of philosophy, either in coal or petroleum. On the contrary, I think that petroleum is of older growth than coal, and, for what we know, it is just as likely that coal may be a product of petroleum as well as of timber or peat moss. We have extracted coal for centuries; we have only sought for petroleum for three or four years; but there never was a period in the world's history that petroleum, in one form or other, was unknown, and it has continued to well up in various parts of the world without ceasing, notably in Trinidad. Gas, petroleum, shale, bitumen, appear to be its successive metamorphoses, and probably our chemists, when they try the synthetical process, will be enabled to produce coal from gas, as our companies, on the larger scale, produce gas from coal. The earlier companies, who dealt in portable gas, ere pipes were laid in the streets, condensed it into copper globes, and, if they condensed it too far, reduced it to oil—no doubt, petroleum. If that oil were taken, and evaporated to dryness, it would become bitumen, and the bitumen, under powerful hydraulic pressure, might possibly be crystallised into coal, and made very difficult of combustion. We, with our limited means, cannot "set the Thames on fire;" but Nature, with her unlimited means and her huge central furnace, may convert water, on a large scale, into its constituent gases, extract carbon from lime, and do many more things by operations we cannot supervise, but which we know we can imitate on a small scale. It matters but little to us how, or through how many ages, Nature has worked to realise this globe we live on; but we know that the whole physical business of the world is production, destruction, and reproduction; that nothing disappears in one form but it comes forth again in another. We have lost the dodo, but we have the duck still, and the elephant replaces the megatherium. The large animals grow fewer in number, but smaller races multiply. The serpent that stopped the army of Regulus in Africa is no more, and the sea serpent is problematic; but the Cachalot whale still bursts in ships' sides in his ire, with his huge head, and volcanoes break forth and disappear, and, if later speculators do not err, boil the ocean into the Gulf Stream, and render northern countries habitable by the human race; and coral islands grow, and land replaces water, and water replaces land, in one ceaseless change. In all this it is difficult to understand that Nature filled her coal-cellars for man's use with a limited supply, and no more, wherewith, in this our England, to pay off our national mortgages, and there an end. The probabilities are, that petroleum was the earliest fuel, left in hoard as it was made from the gases, and taking other and solider forms through the ages, and that the produce is ever going on, unfailing as the tides and winds, and as trees follow trees in changing varieties in the forests. And, no doubt, when we bore deep enough, we shall tap the under springs in England, as has been done elsewhere; and it would be no slight gain could we get our fuel by pumping, instead of delving by human hands hundreds of yards below the surface, away from the light of heaven, to the deterioration of our strong men. To return to timber or peat for our fuel would diminish largely the numbers of our population, and render less safe as a refuge this home of the world's freedom. So we shall go on in our progress, and take the materials from which trees and plants are eliminated at first instead of second-hand. It will be strange, indeed, if our progress in this be less rapid than it has been with the antecedent—coal. Not the less valuable is the counsel of Mr. Paul to keep us to exactitude in our facts. He may not be in possession of all the facts, and of positive knowledge as to the future; but he knows all that chemistry has taught up to the present time, and one important essential in progress is the exact knowledge of what can be done in conformity with existing principles. The existing principles may be set aside by something quite new. We may, by some process yet unknown, separate the oxygen from the atmosphere in the act of feeding the furnace, and so multiply our results manyfold, and we may yet discover how to make the most perfect fuel—*i.e.*, the most easily inflamed—perfectly safe till the moment required for its ignition, generating its power only at the moment and in the quantity needed. But progress points to the liquid in preference to the solid. It would be a very awkward thing to make a gas lamp for a table with a coal instead of an oil supply in the reservoir, though, do doubt, our mechanists could solve the problem, as Mr. Siemens has done in his gas furnaces.—I am, &c., W. Bridges Adams.

Liquid Fuel.—Sir,—In my remarks on the above subject at the discussion of Mr. Paul's paper, on the 15th instant, I quoted Dr. Gesner as an authority for the quantity of oil produced from a ton of English coal, but, not having his work at hand, I could not give the exact particulars. Since the meeting I have referred to his work, and find the following given as the yield of the qualities of English coal named :—

1. Derbyshire......	82 gals.	yield of crude oil per ton.
2. Wigan cannel coal	74 ,,	
3. Liverpool	50 ,,	
4. Poole (shale)	50 ,,	
5. Newcastle	48 ,,	
	5)304	

Mean of the five coals 60 gallons per ton.

Mr. Paul, in his reply, stated that Dr. Gesner, as an "authority, was not to be trusted;" and goes on to remark that "the very best specimens" of cannel coal "would yield about 60 gallons per ton," which, it will be seen, does not agree with the results of Dr. Gesner's practise. Now, as Mr. Paul did not inform us by what means he arrived at the results he describes, and as Dr. Gesner states that his results were obtained from actual working, or the use of tons of the coal specified, I, as a practical man, am far more disposed to believe that the results obtained by theoretical gentlemen with the aid of a teaspoon, a gas jet, and a blow-pipe, are more decidedly of a character "not to be trusted" than those obtained from actual working.—I am, &c., Chas. F. Young, C.E., Mem. Soc. Engineers' Assoc., I.N.A.

7, Duke-street, Adelphi, W.C., April 18, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, 8½. 1. Despatches and Letters from Dr. Livingstone. 2. Mr. F. Whymper, "Journey on the Yukon River, Northern Alaska."
R. United Service Inst., 8½. Major Leahy, R.E., "Army Organisation: Our Infantry Forces and Infantry Reserves." A discussion on this and Major Bevan-Edwards' paper, entitled "An Organisation for the Army of England," will be taken afterwards.
Actuaries, 7. Mr. M. N. Adler, "On Insurance Business in Germany."
Medical, 8.
Philosophical Club, 6.

Tues ...R. Medical and Chirurgical, 8½.
Civil Engineers, 8. Discussion upon the papers "On Irrigation in India and in Spain."
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

Wed ...Society of Arts, 8. Mr. Lobb, "On Progress in Oyster Culture."
London Inst., 12. Annual Meeting.
Zoological, 1. Annual Meeting.

Thur ...Royal, 8½.
Antiquaries, 8½.
R. Society Club, 6.
Royal Inst., 3. Prof. Odling, "On Chemical Combination."
Society of Fine Arts, 8. Lecture by Mr. William Burges.

Fri.......Geologists' Assoc., 8.
Philological, 8.
Royal Inst., 2. Annual Meeting.
Royal Inst., 8. Mr. F. T. Palgrave, "How to form Good Taste in Art."
Archæological Inst., 4.

Sat ......Royal Inst., 3. Prof. Odling, "On Chemical Combination."

Patents.

From Commissioners of Patents' Journal, April 17.

Grants of Provisional Protection.

Air, heated, applying to various purposes—1082—A. B. Walker.
Axles—1140—T. Faucheux.
Axles, &c., metal for—1091—H. B. Woodcock.
Bags, reticules, &c., material for manufacturing—612—R. Nicolls.
Bread, aërated, apparatus for manufacturing—1099—A. Scatchard.
Buildings, lighting and ventilating—1094—J. H. Weston.
Buildings, &c., heating—936—J. E. Lane.
Camphor, refining—1124—C. D. Abel.
Cartridges—1107—G. Kynoch and W. Whitehill.
Cigars, &c.—946—J. G. Tatters, W. Keeble, and B. Newbery.
Coal tar, &c., utilising—176—E. Dorsett.
Commodes—1122—A. De Metz.
Cooking apparatus—1105—J. Norris and T. Quarm.
Cotton gins—1109—R. J. Morison.
Cotton seeds, cleaning—1142—F. A. E. G. de Massas.
Cramps, flooring, &c.—1106—J. Walker and J. Candlin.
Engines, &c., locomotive—766—J. B. Fell.
Fire-arms, breech-loading, and cartridges—968—R. G. Greenhow.
Fire-bars—1085—J. Jordan.
Furnaces for burning petroleum, &c.—1116—H. Lafone & J. Nicholas.
Grease, &c., utilising waste tarpaulin in the manufacture of—1126—J. McCulloch.
Iron and steel, &c.—1095—H. Bessemer.
Iron and steel, &c.—1130—J. H. Johnson.
Iron ore, preparing for smelting, &c.—910—W. E. Newton.
Iron, pig—1102—W. Smith.
Lamps—1134—J. G. Tongue.
Locks and latches—1144—R. Nabbs.
Matches, &c.—1086—W. Austin.
Motive-power, transmitting to potters' machinery—644—E. R. Walker.
Ores, &c., washing and separating—1146—G. Davies.
Pipe-joints—306—R. Wilson.
Propellers, screw—1089—J. Sinclair.
Pumps—1097—T. Couldrey, jun.
Railway carriages, fittings of—1087—F. Taylor.
Railway, moveable, for ordinary carriages—1113—E. Leahy.
Railway rails—768—H. Conybeare.
Sewing machines—1096—J. H. Johnson.
Tape measure cases—124—A. Cowling and W. Turner.
Telegraphs, electric—1132—G. Piggott.
Tobacco pipes—1136—H. C. Butcher.
Trousers, protecting from mud—1101—W. A. W. Sleigh and A. Pye.
Umbrellas, &c.—1114—T. Baker.
Velocipedes—1093—L. F. P. Rivière.
Ventilators, centrifugal—1104—G. Davies.

Invention with Complete Specification Filed.

Paper, &c., preparing or veneering—1212—S. W. Huntington.

Patents Sealed.

2892. M. Vogl and H. Van Dyk.
2894. T. H. Baker & T. Woodroffe.
2895. M. Samuelson.
2896. W. R. Lake.
2905. D. Pidgeon and W. Manwaring.
2908. M. Wilkin and J. Clark.
2914. L. Hamel.
2916. T. Bell and J. Richardson.
2918. J. Bannehr.
2920. W. Tredgold & J. McNeil.
2922. F. Prudencio, F. Cooper, and J. F. Cotterell.
2925. E. Casper.
2931. H. J. Bale.
2934. J. King.
2939. M. J. Matthews.
2941. W. R. Lake.
2943. L. Newton and J. Swailes.
2952. W. Crossley and T. C. Hutchinson.
2969. W. Beale.
3054. J. Maddocks.
3067. O. C. Evans.
3069. W. R. Lake.
3072. A. Chaplin.
3126. R. Leake and J. Beckett.
3180. C. B. Hodgetts.
3222. J. Morrison.
3285. T. H. Tilley.
3341. E. Townshend.
3570. W. Conisbee.
3685. J. Goodfellow.
397. J. A. Jones.
616. W. R. Lake.
647. A. V. Newton.
2923. H. W. Garrett and G. Holcroft.
2926. J. Hill and S. Shelley.
2948. M. W. Shove.
2949. R. Watkins.
2953. W. Barrett and C. Martin.
2956. J. Clapier.
2957. A. H. Brandon.
2958. C. Duncombe.
2960. W. R. Lake.
2961. J. Adams.
2976. T. Welton.
2994. S. Stackard.
3064. W. S. Dixon.
3122. W. E. Newton.
3665. S. and F. Lennard.
3715. C. G. Hill.
182. A. Bochkoltz.
540. W. Betts.

From Commissioners of Patents' Journal, April 21.

Patents Sealed.

2968. J. White.
2982. A. Chambers.
2986. R. W. Thomson.
2987. J. Ellison and J. Stirk.
2988. W. E. Gedge.
2990. J. Dodge.
2998. R. Weare.
3006. W. R. Lake.
3008. A. M. Clark.
3009. A. M. Clark.
3026. A. M. Clark.
3032. J. Young.
3035. J. Glover.
3038. W. Potts.
3047. W. Bishop and B. Burningham.
3051. G. Davies.
3063. W. Hall, J. Wren, and J. Brandwood.
3079. J. Gilmour.
3083. W. Darcey.
3148. J. F. Brinjes.
3152. T. Blackburn.
3153. C. Anderson.
3186. W. R. Lake.
3488. J. Rae and G. Miller.
3668. J. Lightfoot.
416. S. Read.
430. J. Howard and E. T. Bousfield.
438. W. T. Sugg.
610. J. Fordred, F. Lambe, and A. C. Sterry.
648. F. Lambe, A. C. Sterry, and J. Fordred.

Patents on which the Stamp Duty of £50 has been Paid.

1068. W. Clark.
1071. A. Henry.
1084. T. Whitehead & N. Nussey.
1092. G. T. Bousfield.
1106. W. Robinson.
1108. J. Y. Betts.
1117. W. Scarratt and W. Dean.
1193. R. Ferrie, J. Murray, and A. Wilson.
1086. J. E. H. Andrew.
1102. F. A. Abel.
1103. W. Hale.
1107. H. Caudwell.
1123. C. Hall.
1244. E. G. Smith.

Patent on which the Stamp Duty of £100 has been Paid.

980. R. A. Brooman.

Journal of the Society of Arts.

FRIDAY, MAY 1, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock :—

May 6.—"On a New Form of Ventilating Stove." By Captain Douglas Galton, F.R.S. On this evening Edwin Chadwick, Esq., C.B., will preside.

May 13.—"On the various Methods of Lighting Streets by Gas, with Proposals for the introduction of an Improved System." By S. Tucker, Esq.

May 20.—"On the Condition of the Agricultural Labourer." By J. Bailey Denton, Esq.

Conversazione.

The Council have arranged for a conversazione, at the South Kensington Museum, on Wednesday, the 3rd June, cards for which will shortly be issued.

Prizes for Art-Workmen.*

The Council of the Society of Arts hereby offer Prizes for Art-Workmanship, according to the following conditions :—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or, if sold previously to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit, additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed the candidates must be prepared, if called upon, to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Boná-fide* Art-workmen only can receive prizes; and medals may be substituted for money prizes of equivalent value at the option of any successful competitor.

VI. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

VIII. All the prizes are open to male and female competitors on equal terms; and, in addition, *special* prizes, on the same scale as to amounts, will be awarded, at the discretion of the judges, among female competitors; although the specimens exhibited by females may not be as good as those exhibited by males, not deemed worthy of reward.

IX. Any producer will be at liberty to exhibit, either in his own name or through his workmen, any work or works as specimens of good workmanship, in the various classes, provided that the work or works be accompanied with a statement of the name or names of the artisans who executed their respective portions; and if the work or works be sufficiently meritorious, extra prizes will be given to the artisans who have executed them.

X. Artisans may, if they think fit, exhibit works executed by them of a similar character to the prescribed subjects, although not exactly correspondent therewith. If the works be sufficiently meritorious extra prizes will be awarded.

XI. All articles for competition must be sent in to the Society's house on or before Saturday, the 19th of December, 1868, and must be delivered free of all charges. Each work sent in competition for a prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles a description for insertion in the catalogue should be sent. The works will be exhibited at the Society's House, and afterwards at the South Kensington Museum.

XII. Two or more Art-workmen may concur in the production of any article sent in for competition; but in that case the names of, and respective parts taken by, each must be specified when the article is sent in, together with a statement of the proportions in which they may have agreed, if successful, to divide any prize which may be awarded.

*** The Council are happy to announce that many of the works which received first prizes in the competitions of 1863, 1864, 1865, 1866, 1867, and 1868 have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

The Council of the Society of Arts, in framing the above conditions and preparing the subjoined detailed list of subjects for competition, have had under consideration the recommendations of the Society's judges, as set forth in their last report, together with the opinion expressed by the Art-workmen assembled on the recent occasion of the announcement of awards made in connection with the last competition.

The principles upon which their programmes for the last six years have been based, namely, using the competition as a means of testing the power of the Art-workman of the present day to re-produce choice models of ancient art-industries, are believed to have worked most successfully; and the Council are of opinion that, however fitting it may be at the present time to remodel their programme, it will be well to return, from year to year, or from time to time, to the programme which has proved so useful in the past. Instead of making partial changes in that programme, they have deemed it best to offer one of entire novelty, having for its special objects—Firstly, To encourage the revival of the practice of dormant or rarely used processes of handicraft, by which the field of Art-industry may be extended, and Art-workmen thereby be, in course of time, more adequately remunerated as a class; and, secondly, to exercise the artisan in the practical application, in accordance with recognised principles of good taste, of the art-processes so to be revived, to objects of ordinary use, hitherto for the most part undecorated.

In considering the apportionment of the money prizes to the respective subjects, attention has been paid to the probable expense to which any Art-workman must be put in each case who may enter upon the competition.

It will be observed that in the First Division, "Specimens of Art-workmanship in prescribed processes," the

* The Worshipful Company of Salters contribute ten guineas annually to this prize fund. The North London Exhibition prize consists of the interest of £167 7s. 3d., invested in the name of the Society of Arts, to be awarded by the Council "for the best specimens of skilled workmanship" at the Society's Exhibition of the works sent in for the prizes named above.

money prizes are in all cases of smaller amount than in the Second Division, "Specimens of the application to ordinary industry of prescribed Art-processes."

The reason for this difference consists in the fact that the Council look for minor specimens in the one case, involving the workman in little expense beyond the risk of the loss of his own time; against which he should set the value of the improvement he may derive from making the effort under any circumstances; while in the other they expect to see a finished article of a more elaborate nature fit for immediate use by any purchaser.

Art-workmen are earnestly recommended to pay due regard to simplicity and harmony, as well as richness and elaboration, in all their productions, since the judges will estimate no less highly purity of line and good balance of colour or of plain and enriched surfaces, than they will any merits of mechanical execution.

The taste exercised in the selection of objects for ornamentation will be considered in the adjudication of the prizes.

First Division.—Specimens of Art-workmanship in Prescribed Processes.

For the best specimen of:—

A.— Enamelling on sheet metal, in various colours, combined with gilding fluxed over.—One prize, £7 10s., for the best, and one of £5 for the second best.

B.—Enamelling on metal, the enamel filling incised lines and surfaces; both opaque and translucent enamels to be introduced on the same plâque.—One prize, £7 10s., for the best, and one of £5 for the second best.

C.—Enamelling on a metal base, the compartments for the enamels being formed by filigree, after the manner of Chinese, Japanese, or Byzantine enamel work. —One prize, £7 10s., for the best, and one of £5 for the second best.

D.—Painting with enamel colours and fired on earthenware slabs.—One prize, £7 10s., for the best, and one of £5 for the second best.

E.—Ditto, on curved or moulded surfaces of earthenware.—One prize, £10, for the best, and one of £5 for the second best.

F.—Ditto in transparent and opaque colours, combined with gilding, fluxed on clear glass.—One prize, £7 10s., for the best, and one of £5 for the second best.

G.—The execution of "filigrani" in glass, after the Venetian fashion.—One prize, £7 10s., for the best, and one of £5 for the second best.

H.—Painting and lacquering on wood or papier maché, after Persian and Indian methods.—One prize, £7 10s., for the best, and one of £5 for the second best.

I.—Damascening in gold, silver, and copper, on steel or iron.—One prize, £7 10s., for the best, and one of £5 for the second best.

J.—Ditto on silver in combination with niello. (The study of Japanese specimens is recommended.)—One prize, £10, for the best, and one of £5 for the second best.

K.—Ditto on brass or white metal.—One prize, £10, for the best, and one of £5 for the second best.

L.—Combination of marquetrie with carving in low relief. (The study of M. Fourdinois' cabinet at South Kensington is recommended.)—One prize, £10, for the best, and one of £5 for the second best.

M.—The combination of gilding or gilt-metal work, with incised ivory or hard wood.—One prize, £7 10s., for the best, and one of £5 for the second best.

N.—Inlay of hard woods, ivory or tortoiseshell; in softer woods or other substances in the solid.—One prize, £7 10s., for the best, and one of £5 for the second best.

O.—Combination of mosaic with carved marble.—One prize, £10, for the best, and one of £5 for the second best.

P.—Ditto and inlay with carved stone.—One prize, £7 10s., for the best, and one of £5 for the second best.

Q.—Carving, involving the combination of not less than three different woods.—One prize, £7 10s., for the best, and one of £5 for the second best.

Second Division. — Specimens of the Application to Ordinary Industry of Prescribed Art Processes.

For the best specimens of:—

A.—The most beautiful dial-face for a clock, not less than nine inches in diameter, in any metal or metals, the principal decoration being by painted enamel on the surface.—One prize of £15 for the best, and one of £10 for the second best.

B.—The most beautiful frame for a miniature; not less than five inches by three inches, in any metal or metals, the principal decorations being produced by enamelling on incised lines and surfaces (as per Process B., First Division).—One prize of £10 for the best, and one of £5 for the second best.

C.—The most beautiful small metal ring-tray for a lady's dressing-table, decorated with filigree enamel (Process C., First Division).—One prize of £10 for the best, and one of £5 for the second best.

D.—The most beautiful earthenware slab, not less than one foot by six inches, painted in enamel colours and fired, for insertion in the frieze of a stone or marble chimney-piece.—One prize of £15 for the best, and one of £10 for the second best.

E.—The most beautiful tablet in moulded or modelled earthenware, painted with enamel colours and fired, for monumental or commemorative purposes, or say for bearing the name of a street, or indicating sections of a museum.—One prize of £15 for the best, and one of £7 10s. for the second best.

F.—The most beautiful drinking-vessel of clear glass, decorated in colour, &c. (as per process F., First Division). —One prize of £7 10s. for the best, and one of £5 for the second best.

G.—A champagne glass, with filigrani in the cup, and stem, and foot.—One prize of £7 10s., for the best, and one of £5 for the second best. N.B.—Filigrani may be white or any colour.

H.—A pair of boards for book-covers, suitable for an octavo volume. Decorated within and without according to Process H., First Division.—One prize of £10 for the best, and one of £7 10s. for the second best.

I.—A set of fire-irons, enriched with damascening (as per Process I., First Division.)—One prize of £15 for the best, and one of £7 10s. for the second best.

J.—A silver drinking-cup, to hold not less than half a pint, decorated with damascening and niello (as per Process J., First Division.)—One prize of £15 for the best, and one of £7 10s. for the second best.

K.—A musical instrument, say trumpet, cornet, or saxe-horn, decorated with damascening (as per Process K., First Division.)—One prize of £15 for the best, and one of £10 for the second best. N.B.—It is indispensable that no process shall be used which shall diminish the tone or sonority of the instrument.

L.—An envelope-case, enriched with carving in low relief and marquetrie.—One prize of £15, and one of £7 10s. for the second best.

M.—The most beautiful flute, decorated with gilding, carving, gilt metal work, or incised ornament.—One prize of £15, for the best, and one of £7 10s. for the second best.

N.—A small musical instrument (as a violin or guitar), or any conspicuous or principal part of a large instrument (as a set of pianoforte or organ keys), decorated with inlay of hard woods, ivory, or tortoise-shell, in softer woods, or otherwise combined in the solid.—One prize of £20 for the best, and one of £10 for the second best. N.B.—It is indispensable that no process shall be used which shall diminish the tone or sonority of the instrument.

O.—A pedestal for a bust (less than life-size), forming a clock-case, with an aperture for the dial not less than six inches diameter, consisting of carved marble combined with mosaic.—One prize of £20 for the best, and one of £15 for the second best.

P.—A chimney-piece, suitable for a lady's boudoir; opening, three feet wide by three feet three inches high, in carved stone, enriched with mosaic and inlay.—One prize of £15 for the best, and one of £10 for the second best.

Q.—An occasional table, with a round top, say two feet six inches diameter, decorated with carving, involving the combination of not less than three different woods. —One prize of £15 for the best, and one of £10 for the second best.

R.—Ornamental ironwork for the balcony of a window, 3 feet 6 inches wide, height of balcony 1 foot, the work to be wrought; the specimen may be oiled but not painted. —One prize of £10 for the best, and one of £5 for the second best. N.B.—Extreme elegance is desired in this specimen rather than over-much work.

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The Committee met on Saturday, March 28. Present—Harry Chester, Esq. (in the chair), Captain Grant, Messrs. W. H. Michael, P. McLagan, M.P., C. S. Read, M.P.

Mr. CHAMPNEY—I farm about 510 acres of my own land, near Horley-station, on the Brighton line, on which I keep about 100 cows, more or less. I was led to embark in the enterprise of supplying the milk direct to the customer, because I found the price I obtained from the trade did not pay me; and when I asked a higher price they declined to give it. I then said I would go into the trade in London myself, and sell the finest milk at the lowest price; naturally expecting that I should get an immense amount of custom, but I believe I have had more to contend with in selling genuine milk than dairymen have in disposing of that which is adulterated to the extent of 75 per cent. The prejudices of the public, and the infatuation which they have for their dairymen, are incredible. I believe that three-fourths of my custom now is for extra milk, which people take in consequence of its being so good, still continuing to take their regular supply from their own dairymen. I have been made out all that is bad. Some have said they knew me in the Borough, a regular swindler; others that I had just come out from prison. They say also, quite coolly, that it is impossible for me to continue selling genuine milk at the price; and if I get any good customers who take two or three quarts a day, the dairymen will sell to them, at cost price, to upset my business. I have now seven shops opened; all in or near St. Giles's parish. I have no grand front, or anything of that kind—simply a place of sale. I have found, on opening a new shop, that a number of the people who have been dealing at the next nearest will flock to it and say they are so glad a new shop is opened, for the milk was got to be half water at the other one, and yet it is all the same milk; and I sometimes waste £1 or £2 worth in a day rather than not sell the best. The milk is tested four or five times a day; no cream is taken off; nor do I make any butter. The price is 4d. per quart, and 3d. to customers taking a quart. The dairymen have no certain price; if they think I am hurting their trade they will come down to 3d. or 3½d., or give double measure. The shops are all in poor neighbourhoods, but some people send two miles for it. Two or three send from the Marble Arch, and one from King's-cross; and clerks going home call for it in bottles. There is no chance of adulteration after leaving the shop, because it is in the purchaser's custody.

The CHAIRMAN—Have you thought at all of the feasibility of doing without shops at all, and sending the milk direct from the farm to customers' houses, to those who would take three or four quarts a day regularly.

Mr. CHAMPNEY—A gentleman mentioned it to me as being done in Holland that way, but it could not be done here on account of the railway carriage. At present they charge so much a gallon, but in such case they would charge for each can as a parcel. A gentleman who has a farm near me lives in London, and he sends his own milk up every night, but I reckon it costs him 9½d. or 10d. a quart, without reckoning anything for fetching it from the railway station. Milk, in my neighbourhood, is worth 1s. 3d. per barn gallon of 17 pints. Genuine milk can never be sent round under 6d. per quart, take the year round, to let the farmer and retail man live. My own opinion is that average milk is adulterated to the extent of 20 per cent. throughout London.

The CHAIRMAN—We have had evidence here to the effect that the milk supplied to what may be called gen-gentlemen's houses is very little adulterated, but that what is supplied to the poor is to a considerable extent. I have tested the milk supplied to me by the lactometer and found it perfectly pure.

Mr. CHAMPNEY—I believe most of the milk sold is adulterated at least 20 per cent. The lactometer will show you if water is put in, but not if the cream is taken off. I do not mean that 20 per cent. of water is always added; I mean the milk is reduced 20 per cent. in quality by water and cream taken off.

The CHAIRMAN—I have tried it in this way. I have found the the milk pure by the lactometer, and then on adulterating it with water I have found the lactometer show it exactly.

Mr. CHAMPNEY—Any milkman in London will show his milk to be pure by the lactometer, because the standard is twenty-eight, but good, genuine milk will average thirty-four. You cannot test it properly without analysing it. You may have genuine milk at twenty-eight if the cows are forced.

Mr. MICHAEL—You say that in your opinion there are twenty parts of water in one hundred of the best milk supplied in London. What do you say as to the supply in the poorest localities?

Mr. CHAMPNEY—The question is whether some of them can get milk at all. People have told me they have gone early in the morning to a milk shop, and have seen a man bring a kettle full of boiling water from the parlour, put it into something at the back of the counter, and then take a scoop of something, stir it all up, and serve it into the cups in farthingsworths or ha'porths, "warm from the cow," and yet these people, although they tell you this, will continue to deal at the same place if they get double measure for their money. That is what I was cautioned about before going into the business. A dairyman said to me, "If you go into poor parts you will find the people will rather have a bucketful of swill for a halfpenny than half the quantity of genuine milk for the same money." I have not examined any of these adulterations myself.

Mr. MICHAEL—According to the evidence before us there is no substance which can be mixed with milk for the purpose of adulteration. Sometimes a decoction of turnips or parsnips is used to sweeten it.

The CHAIRMAN—Is this plan of yours capable of further extension?

Mr. CHAMPNEY—I may probably open three or four more shops. They will be in the same neighbourhood, because it is more economical to keep them together, in order that they may assist each other according to the

demand, which is very uncertain. I keep one man to keep constantly going round and testing the milk. It is all sold at the shops. When I opened a new shop in Broad-street, a great many people came over from Regent-street, and asked us to send it out. I told the woman in charge to say that probably I might, but that it could not be sent out under 6d.; the usual response to that was that it was ridiculous; their milkman sent it out at 4d., and very good milk too. The milk comes up twice a day, and a van fetches it from Victoria-station and delivers a churn at each shop. The churns are locked, so that the only possible risk of fraud to the customer is that which might be committed by the person in charge of the shop. I have heard of instances in which, when a boy has been sent for a quart of my milk a dairyman has given the boy a penny and taken away the good milk and replaced it with bad in order to bring discredit on me. I have not yet hit on any means of utilising the milk which is left over, and which is thrown away. I reckon that, on an average, one-twentieth of the milk is wasted. The only means of disposing of the waste is to biscuit-bakers, who will only give a penny per quart, and do not care about it until it is sour. I generally pour it down the gutter. All dairymen have waste. I have given some to the Charing-cross Hospital, but in general the hospitals refuse it. For some time I gave the Middlesex Hospital about 18 or 20 gallons a day, but of course the quantity was uncertain, and when I called there they told me they were much obliged, but it really was a loss to them to receive it, because, if the supply fell short, they had to buy it at a higher price, whereas, if they made a contract by the year they could get it much cheaper. The demand is very irregular; one day there might be a lot over, and another not enough; and this may happen at all the shops together on the same day. I tried for a short time a small atmospheric churn, to convert into butter what was left, and then it was spread about directly that I was taking the cream from all the milk; therefore I discontinued to use it.

The Chairman—Do any of the better classes take the milk, and let it stand for cream?

Mr. Champney—Yes; and the poor do that also; and that is one reason for their dissatisfaction sometimes, because the milk is not always of the same richness. I mix all the milk together, so that the whole produce of the farm is uniform on the same day. As regards the management of the stock, I endeavour to have them calve as regularly as possible two calves a-week. There is another thing which increases my expenses. When you sell to the trade, they are not particular as to the supply being up or down a little, but if my cows drop ten gallons, I must keep up the supply, and have to buy cows at any price in order to do so, or else people may come and go away again, and that would not do. A dairyman always has a supply for counter customers, for he will keep on making until he closes his shop. I find no difficulty in getting trustworthy persons to sell the milk. I have always been very fortunate in getting good people about me. Some people say it is because I pay them well. They work from half-past six in the morning until half-past nine, and some of them are so eager to do business that they will keep open until nearly 12 o'clock. It would not do to go into better neighbourhoods, as the servants would not fetch it. I use the ordinary shaped churns for sending the milk in. There is a French invention, the merits of which is that it is air-tight; and a man who has one says that he has kept my milk in it for a month. I find the milk looks better when it arrives then when it leaves the farm, but I do not consider that an advantage. I always cool the milk down before I send it off. I believe the dairymen usually give good measure, because they give a "sip" over, and the poor people like that. I keep about 100 cows, of different kinds, and I do not think any are better managed. My farm is a clay soil. The cows are entirely stall-fed except in the summer; but I consider feeding the least important thing for a cow. I should think I am about the worst feeder anywhere, yet my cows look well. There are several things before feeding; one is kindness; that is very important; then cleanliness and regularity. The most important thing is, regularity in feeding. My cows are all fed to a minute, and milked to a minute. Then, again, the temperature is kept as regular as possible. Farmers are astonished when they see what my cows live on, and how well they look. They never have a handful of hay, either long or cut. I cannot afford to give cows hay. I sell over £1,000 worth in the year. I give them straw—either wheat or oat-straw, anything we have—and mangold, mixed together. The straw is made into chaff, of course, and the mangold is pulped; the proportion I leave to my foreman, but I think it is about half and half. I do not let it ferment. It is pulped at eleven o'clock in the morning; half of it they get at six the same evening, and the other half at seven in the morning. On Sunday it is kept a little longer, because we do double work on Saturday, and we do not get quite as much milk on Sundays. They have as much as they like to eat of this twice a day, and one meal of grains besides—about a bushel each. On an average each cow yields eleven or twelve quarts a day the whole year round. I give them no meal, cake, or anything of that kind, though I used to be a large consumer of cake. We begin with swedes, and when they are done we go on with the mangold, which lasts until the cows are turned out. The milk will never taste of the swedes, or anything else, if you feed after milking. I keep up the bushel of grains all the year through; in the summer the cows have nothing but the grass and grains, and sometimes part of the grains are wasted. I take them in as soon as the grass is done. I do not breed my cows; I buy them, any sort. I have only kept so many for about four years, and I have some now I began with. I sell the calves to a farmer who takes them by contract at 25s. each, three days old. I had some trouble before I could sell them, for butchers would come and bid me 5s. for them. I had to send for an axe, and chop their heads off, in order to show it was no use bidding me less than a fair price, before I could dispose of them. I lost none of my cows by the rinderpest; we had some within four miles, and I kept a strict quarantine. I use a shorthorn bull, but I am not particular; my bulls are very profitable. I buy a young bull, perhaps half-starved, for about £10; I keep him a year, and he eats all the refuse which the cows will not eat (he gets nothing else), and in February I may sell him for about £25. I do not think it would answer my purpose to get well-bred bulls in order to get more for the calves, because I might have to keep them longer, and a farmer will come and spend hours haggling over a shilling on the price of a calf; my main object is to keep up a regular supply of milk. I do not think I shall make much more profit the first six months than by selling to the trade, but I have had to pay for learning. I do not think the system could be carried out successfully on a very large scale.

Twentieth Ordinary Meeting.

Wednesday, April 29th, 1868; William Hawes, Esq., F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Brooke, William, Northgate-house, Huddersfield.

Waddington, John, 35, King William-street, E.C., and Hope-villa, Longton-grove, Sydenham, S.E.

The following candidates were balloted for, and duly elected members of the Society:—

Eyre, Major-General Sir Vincent, C.B., Athenæum Club, S.W.

Lawrence, Edwin, LL.B., B.A., 94, Westbourne-ter. W.
Scott, John, 21, Newton-road, Bayswater, W.
Solomon, Asher, 8, South-street, Finsbury, E.C.

The Paper read was—

THE PROGRESS OF OYSTER CULTURE DURING 1867.

By Harry Lobb, Esq.

In March, 1867, I had the honour of reading a paper to this Society, entitled, "Successful Oyster Culture," the Hon. Stephen Cave, the then Vice-President of the Board of Trade, being in the chair. A very interesting and instructive discussion resulted, in which that gentleman explained the views of the Government as to the legislation on this important subject, the nature of which I entirely disapproved. That you may clearly understand the paper of this evening, I must beg your indulgence whilst I give a very short *resumé* of that previous one.

For convenience, I may consider it under two heads—the new successful system of oyster culture, and the policy of the Board of Trade, under the régime of the present Government. As to our oyster fisheries, I stated my belief that the cause of the great dearth of oysters was owing to the greed of the dredgermen—that having exhausted local beds, they searched far and wide for others. When a new bed is discovered, the lucky man keeps it to himself as long as he can, but this is not long; the intelligence soon gets wind, when numbers of dredgers congregate, and working at every favourable season, they do not leave it whilst an oyster is left. Thus the goose is destroyed, and no more golden eggs are laid. This policy has been for years, and is now carried on in all our waters (except the Irish), for the dredgers from afar, having no local interest, do not care to preserve the bed, and the local men are obliged to take what they can, when they can, otherwise they would get none. I then showed that the French were in the same position as ourselves, but having recognised the fact, they had set about to find a remedy. M. Coste, encouraged by the Emperor, had devoted much time and energy to the science of oyster culture, and succeeded in demonstrating that, properly worked, oyster culture was remunerative beyond the most sanguine anticipation. I then described what had been done at the Isle de Ré—my own visit to Arcachon—followed by a description of the Hayling system, with its first year's success. In my strictures upon the policy pursued by the Board of Trade under the guidance of its vice-president, I stated my belief that the remedy for the oyster dearth was "the establishment of private breeding-beds, and the renovation of the natural beds by judicious legislation." In the discussion Mr. Cave recognised the value of my suggestions, but could not agree with me as to the necessity of granting exhausted natural beds to capitalists, that they might be re-stocked and rendered again prolific, his idea being that every dredgerman should have allotted to him a small area to cultivate and work for his own benefit.

In the paper of this evening I shall also consider the question under two heads, the results of private enterprise, and the Board of Trade policy. At Hayling the company had during the winter and spring of 1866 prepared thirty-eight acres for breeding purposes, two beds, of respectively eighteen and twelve acres at Langston, and eight acres at the Salterus, where, you may remember, the spat was obtained the previous year. On the 1st of July bed B, eighteen acres in extent, in which 12,000 hurdles had been laid, was found to be full of spat; every hurdle examined was found to be abundantly covered with young oysters, almost microscopic in size. Bed B is the most westerly, and was the last prepared. Bed A, only separated from it by a narrow embankment, contained no fixed spat. When first examined there were about 250 young oysters to the square inch on the majority of these hurdles, and each hurdle being 8 ft. long by 3 ft. broad, some idea of the prodigious numbers on the 12,000 hurdles, besides those fallen upon the shingle, may be imagined. The spat of 1866 passed through the winter uninjured by the very severe weather, and it is now tolerably certain that an annual spat may be anticipated at Hayling, and that the oysters secured will live through the winter.

Besides this large spat at Hayling, smaller spats have been secured in the Isle of Wight, and also in Exe-bight. Of these, however, I have not been able to obtain authentic information.

What, then, has the experience of 1867 added to our knowledge of the science of oyster culture? Some of the observations are somewhat puzzling. No spat was obtained in the pond in which it had appeared in 1866, although every care was taken; again in the 18-acre pond an immense spat was secured, whereas in the adjoining pond, under almost similar conditions, there was no result. These facts might cause some to doubt the value of this science, but when we come to examine more closely into the surrounding influences, and have several years' experience, I believe that oyster culture will be as certain as the cultivation of the hop, flax, or even the grapes; and when we consider that an abundant spat, carefully preserved, is sufficient to keep the oyster layer employed five years, and that an acre of breeding-ground, properly stocked with collectors and shingle, is sufficient to supply with young oysters during the first year, ten acres of growing beds; second year, thirty acres of layings; and the third, fourth, and fifth years fifty acres, there is nothing in the whole range of enterprise holding out such anticipation of enormous results as oyster culture based upon scientific principles. The above calculations are derived from the fact that upon every square inch of hurdle about 250 young oysters settle. Now, if these young oysters are separated one from another shortly after the spat has been secured, they will live; if, however, they are allowed to remain upon the collector, some grow much more rapidly than others, and these, gathering to themselves—by their superior size and strength—all the nourishment passing in the water over this space, the smaller are starved, and very soon die; so that, upon examining the hurdle that has been left too long unstripped, upon every square inch of surface perhaps six tolerably large oysters are found, with ten or a dozen smaller ones, and some 200 minute shells with the oysters dead and gone. If, therefore, we take 250 oysters to the square inch on the hurdles in the breeding pond, and consider that the full-grown oyster in its laying requires a square foot of ground to keep it healthy, I do not think that my calculation of the various areas is exaggerated, even allowing for a considerable loss from stripping, carriage, and other accidents incidental to their movement. At Hayling a still larger area is preparing for the breeding season of 1868, and there can be little doubt that, in one or more of these beds, as abundant a spat as that of 1867 will be secured.

Through the late financial panic, and want of public confidence in all joint-stock enterprise, however sound, no more oyster companies have obtained their capital, so that the result of private enterprise during 1867 (as far as I have been able to ascertain) is a very abundant spat upon eighteen acres of ground at Hayling, and two smaller at the Isle of Wight and Exe-bight, and this, for the whole of the United Kingdom; there has been no natural spat of any moment anywhere in British waters. In four years, therefore, allowing for loss, 30,000,000 oysters will be marketable, enough for one month's consumption for London during ordinary times of demand. It would therefore require an annual spat as abundant as that at Hayling over 216 acres of ground to supply London alone, not to mention the provincial and enormous export trade. In fact, if good marketable oysters could be supplied at fourpence a dozen retail, there is room for more than all our estuaries could supply, for it must not be forgotten that an oyster is four years old

at least when it comes to table. We want, therefore, 50 new oyster companies to be started at once, and *then* we shall not be able to bring down the price of oysters, or supply the market, for years.

And now let me consider the proceedings of the Board of Trade, guided by the policy of its vice-president, the Right Hon. Stephen Cave, member for Shoreham; and I trust that I may not be led away to express myself in too strong language upon this subject; for, when I consider the vast powers that the recent Act has conferred upon this Board, and the immense amount of benefit that might have been done, in contradistinction to the paltry results effected during 1867, I almost think that I have discovered the office dubbed by Mr. Dickens "Circumlocution."

"An Act to facilitate the establishment, improvement, and maintenance of oyster and mussel fisheries in Great Britain" having passed, several public companies, acting to the best of their abilities under the uncertain light shed by the Board of Trade, applied for grants of several fisheries. Some of these, perhaps, were rather extensive, and the Board refused them all without public inquiry, the fact being that they did not themselves know what they were about—no inspector had been appointed—and the safest course was refusal.

In my paper of last year I said—"The Board of Trade having taken upon itself the responsibility of legislation to facilitate the formation of private beds, to increase the supply, and, consequently, lower the price of oysters, the public are somewhat disappointed to find that, up to the present time, nothing has been done, and the price of oysters is steadily increasing. It is hoped that this session may not be allowed to pass without some orders under the Act being granted." Since the reading of my paper thirteen memorials have been addressed to the Board for grants of several fisheries. Mr. Cholmondeley Pennell was appointed inspector, and several important inquiries have been made. Being consulted as scientific witness in the largest and most important of these, I am in a position to give a brief history of this inquiry, showing the great labour, the immense expense, and the time lavished upon it, and the paltry result.

"Parturiunt montes nascetur ridiculus mus."

The Blackwater is the largest of the Essex estuaries' and runs from west to east; the Colne, an important oyster river, runs from north to south. These two rivers empty themselves at right angles over an area of sea-bottom termed the "Pont." This spot is the most prolific natural native oyster bed in England, and is the only one not quite exhausted; it is just worth the while of the local dredgermen occasionally to go out for a dredge. This bed, from time immemorial, has been the great nursery for native oysters. Here the Whitstable Company purchase the largest amount of "brood and ware" for laying, and the Essex oyster-layers obtain their stock. Upon the passing of the Oyster Fishery Act, I went to Maldon, and called a public meeting, with the idea of calling the attention of local capitalists to the importance of their river, hoping that the Blackwater might be re-stocked and worked. My efforts were crowned with success, a company already existing, but that had been in abeyance for some years, and two fresh companies, were established, the result being that three memorials were sent in to the Board of Trade. After some delay an inquiry was granted, and Mr. Pennell was sent down to Maldon to hear evidence for and against the grants.

The evidence may be considered under two heads, scientific and practical; the former, represented by Mr. Francis Francis, of the *Field*, Dr. Baird, and myself, was entirely in favour of the grant; the latter was conflicting. But it was clearly proved by all, that the upper part of the river had been for years abandoned by the dredgermen as completely worked out; that it was covered with sludge; and that, if a spat occurred, there was nothing for the young oysters to attach themselves to, the bottom being so foul. The middle portion of the river was better; a few oysters were left, but not in sufficient numbers to pay a man to dredge for them, the consequence being that this portion of the river was getting, and would soon become, as bad as the upper part. The lower division of the river was the cleanest, and there were more oysters there, and dredgermen going from Tollesbury, Mersea, &c., to the "Pont," put out dredges, and thus kept this portion of the river cleaner; consequently, should a spat fall, much of the cultch here would be fit to receive the spat.

The three companies formed for the purpose of cultivating the Blackwater had a nominal capital of £150,000, not a penny too much to do the thing properly, as from the foul condition of the bottom much labour would have to be expended before even the oysters for breeding purposes could be laid. Should a spat fall, the oysters would not be fit for market under three or four years, without a very large spat was secured, when some of the brood might be sold to layers, as has been always the custom on the Blackwater. Thus we see that no return upon the capital of the companies could have been anticipated under some years; still the influential Dengie farmers, the large millers and cornfactors of Maldon, and Essex gentry, did not object to risk their money in this pursuit. The opposition to the grants came principally from a local lord of the manor, proprietor of oyster layings, from the solicitor of the Colne dredgermen, and from the Whitstable Company. After an inquiry sitting at Maldon seven days—after 55 witnesses had been examined for and against—after hearing council for and against, Mr. Pennell sent in his report. The Board of Trade, intimidated by the opposition of the dredgermen, by the statements of the members for Essex, and by Mr. Cave's declared policy, refused all three orders, but, as a sop, a portion of the upper part of the river, so foul and bad as not even to have been applied for, was granted to one of the companies. What is the result? Is anybody satisfied? Not one person connected with the inquiry, for or against. First, the Board of Trade are forced to acknowledge that the Blackwater must be eventually yielded to capitalists; second, the local lord of the manor receives no rent for his layings; the dredgermen who incited him to oppose the grant, having no oysters to lay, pay no rent. On some future occasion we shall find this gentleman ranged on the side of the memorialists. The opposing dredgermen are actually starving, they cannot get a day's dredging in a week, and the oysters they obtain they are obliged to sell immediately as they cannot afford to lay. The Whitstable company, who have been accustomed to purchase large quantities of brood from the Blackwater, now that it is exhausted get none; and thus, having opposed its cultivation, the result is that native oysters are hardly to be purchased by the public, and at the few shops in London, where they have been attainable, the price has been 2s. 6d. a dozen; and, except in these few shops, no natives have been retailed in London since the 15th of March.

Now, let us look on the other side. Suppose these orders had been granted, what would have been the result? The local dredgermen would have obtained regular and remunerative employment; the lord of the manor would, in the course of a year or two, let his layings at a far higher price than he had ever previously obtained; and the Whitstable Company would have been able to purchase brood on better terms, and in any quantity. To prove these statements, let us hear what Mr. Pennell says as to the results of the Roach River Oyster Fishery:—"A vigorous opposition was offered to the enclosure of the Roach River Company's grounds on the part of local proprietors and dredgermen, but, according to the testimony of the manager of the fishery, corroborated on oath at the Blackwater Inquiry, all objections on the part of the latter had now ceased, and the dredgermen were favourable to the company, and glad to take service under them. Immediately on the passing of the act dredgermen's wages throughout the neighbourhood rose

15 per cent.; and the company already give regular employment to forty-three men, a number greatly in excess of those who previously eked out a precarious livelihood by dredging over the appropriated grounds." This is the report of the gentleman appointed by the Board of Trade to take evidence on the Blackwater, and yet, in spite of the evidence, the Board refuse all the grants. What would the Emperor of the French have done in a case like this? He would have sent down M. Coste, a man of science, yet a practical man, upon whose opinion he could rely. Upon his report the Blackwater would, by this time, have been under cultivation, stocked; and probably this year a spat would have been secured; and in the course of four or five years, it would have become a vast area of cultivated oyster grounds, with the Emperor's own bed leading the way, and showing what can be done, when science, energy, capital and labour are linked together in a good cause. Whereas, the Board of Trade have put local enterprise to an expense exceeding £2,000, without the slightest beneficial result; have disgusted everyone connected with the inquiry, and brought the Board into greater disrepute than it had already attained.

During the year 1867 thirteen memorials for several oyster fisheries were addressed to the Board of Trade. Of these only one grant has been made, namely, the river Hamble. This is a small river, running into Southampton Water, and not of the least importance, as it is only suited for layings, and does not produce a choice oyster.

Before I conclude my paper I must say a few words upon the new act now under consideration in the House of Lords—"The Sea Fisheries Act of 1868." I am not competent to give an opinion upon the sea fishery part of the bill, but the portion devoted to the oyster fisheries is enough to condemn it. The Oyster and Mussel Fishery Act has been modified and embodied in this bill, and appears to be the work of a confirmed oysterphobist, one who is determined that no fossil oyster shells shall be found by the geologists of the future in the British strata; that no British Sphinx shall ever be carved from stone containing oyster shells; for, should this Act become law, and the Board of Trade continue their declared policy of refusing all grants, as they have done, and the public refuse to find money for private enterprise, it is not possible that an oyster can be left in the course of a very few years. This bill would have been passed before the Easter recess had it not been for the courageous persistency of Mr. J. Redmond Barry, the Commissioner of Irish Oyster Fisheries. This gentleman has, by his representations, obtained from the Duke of Richmond, President of the Board, a postponement for further consideration. But let us see what the bill proposes. Firstly, there is to be no close time for the coasts of England, Scotland, and Wales, with the exception of the English Channel beyond the three-mile limit. The Irish waters within the three-mile limit will be under local regulations, but the deep-sea beds, and all waters outside, will be open to all the world all the year round. The French, as far superior in their regulations as they have been prompt in recognising the oyster dearth and its results, insist on the close time in the Channel, and this has been yielded by our Board of Trade. Secondly, by the new act, local corporations, large proprietors of foreshores, companies, &c., may by memorial obtain a hearing; an inspector will be appointed to take evidence; and if the opposition be sufficiently blatant, he will report this to the Board, who will consequently refuse to do anything, or, as the *Field* has tersely put it—"The dictum of the Board of Trade appears to be"—"you shall do nothing save through us, and you shall do nothing through us." If, on the other hand, the Board act differently, and grant every memorial sent in, what will be the result; every local corporation, proprietor, &c., may draw up their own regulations; we shall have any number of different close times, dredging periods, &c., so that confusion worse confounded will result.

If it were possible to do away with the whole act, with the exception of the clauses by which oysters are now recognised as property, their removal from private beds or several fishery being felony, we should be well rid of it. Hear what the Irish Board of Works say of the draft bill:—"They feel it their duty now to express their decided opinion that if the proposed legislation for doing away with all close season in the seas around the British Isles, the English Channel excepted, was carried into effect, the Irish public oyster fisheries, now so great a source of profitable employment to a numerous class of men, would in a very few years be utterly annihilated." For it must not be forgotten that the Irish have put a stop to that system of "reckless dredging" which has cost us all so dear.

Allow me, in conclusion, to recapitulate the principal points in my paper, as follows:—

The proved success of the private breeding beds.

The absolute necessity of largely increasing them.

The complete failure of the Board of Trade in its attempt to renovate the exhausted natural oyster beds by legislation.

The inadequacy of the proposed "Sea Fisheries" Bill to grapple with the subject.

DISCUSSION.

Mr. A. J. PENNELL said Mr. Lobb appeared to complain of the Bill now before Parliament, on the ground that it abolished the regulations which had hitherto existed on the subject of oyster-fishing, but he believed that, in 1866, an Act was passed which removed all regulations affecting oyster culture, and the present Act would repeal that one, and it would still be in the power of the Board of Trade to make bye-laws regulating the catch, establishing close seasons, and also placing limits on the size of the oysters which might be taken. Then, again, Mr. Lobb said he wished the Board would act as the Emperor of the French would do, and consult such an authority as M. Coste as to the fisheries in the Blackwater; but the Board of Trade had selected Mr. Cholmondeley Pennell as the person in their opinion best fitted to advise them on the subject, and he believed they had acted entirely in accordance with that gentleman's report. He had himself had a good deal of experience in the artificial culture of oysters, and he must say that he could not endorse Mr. Lobb's very flattering account of its success, especially in regard to the removal of the young oysters from the hurdles, which was a matter of great difficulty. As he understood, Mr. Lobb recommended their removal very young, but the shell was then so fragile that it was almost impossible to accomplish the removal without breaking the shell adhering to the hurdle, and so destroying the young oyster. Indeed, he believed that Mr. Hart, the manager of the Hayling Island Company, had lost seventy-five per cent. of the young oysters from this cause alone, which was a matter of very serious consideration.

Mr. A. W. DIGBY thought Mr. Lobb had, perhaps, taken rather too unfavourable a view of the action of the Board of Trade, though he (Mr. Digby) might, perhaps, be unduly prejudiced the other way, as he represented the only one of the three companies which had been successful. He and his friends took a great deal of interest in the breeding and fattening of the oyster, and they had formed "The Fish and Oyster Breeding Company," their ground being in the upper part of the river Blackwater, which Mr. Lobb thought not so good as the lower part, but which, from local inquiries, they (the company) thought was superior. He believed Mr. Cholmondeley Pennell went down, quite unprejudiced in favour of any one company, and that his feeling was for making grants to all the three; but when the claims of some 1,000 or 1,500 dredgermen had to be considered, the Board of Trade naturally felt

somewhat alarmed as to the extent to which these men would be thrown out of employment. However, his company had obtained a grant of 350 acres, and it would be now their duty to see what they could do with it. The had commissioned Mr. Francis, of the *Field*, to go over the ground, and he had shown them how they might expect to realise a profit, not only at the end of three or four years' operations, but almost immediately, by bringing oysters from other parts, and laying them down to fatten. There appeared to be no doubt that oysters laid down in some parts would take something like three years to fatten; whilst, under other circumstances, they would fatten in almost as many weeks. The great success of an oyster lay appeared to depend principally upon a due admixture of fresh and salt water, and this they believed they had obtained in their ground. Mr. Francis, in his report, said there were two ways of collecting the spat, naturally and artificially. The former only required the cleansing of the ground in suitable places for the deposit, and then, wherever there were breeding oysters, spat would be deposited, though, of course, there might be exceptional years of famine, as there were of abundance. As a rule, however, it might be calculated that if the ground were favourable, the spat would fall upon it; and he thought that, with so many natural advantages as they possessed at Blackwater, it would be better to trust to nature than to artificial culture.

Mr. Bailey Denton said the reader of the paper had expressed his approbation of the proceedings of the French Emperor and of M. Coste, but he (Mr. Denton) knew enough of Englishmen to know that what would suit France would not suit this country. Englishmen were fond of looking to the debtor and creditor aspect of affairs; and if Mr. Lobb could inform the meeting that the Hayling Fishery had been successful in a pecuniary sense, he felt sure that all would be gratified with the intelligence.

Mr. Philip Palmer would also like to ask Mr. Lobb whether he thought the establishment of the forty or fifty companies he had mentioned would tend to restore anything like the old state of things with regard to oysters. That very day his fishmonger had told him that he had bought oysters at 30s. a bushel, whereas he had now to pay something like £8 or £9. They all remembered when oysters could be purchased at 5s. a barrel, but they now had to pay from 17s. to a guinea. He should like to know the mode of culture adopted at Hayling Island. He had supplied some time ago glass tiles for another oyster fishery, and he believed they were still at the bottom of the sea, but he was not quite certain what was the exact purpose to which they were applied. He had never received any order for those glass tiles for Hayling Island, and should therefore like to know if they were successful where they were in use.

Mr. Henry Brooks had had an opportunity on several occasions of going over the oyster fisheries at Hayling Island, and could therefore inform the last speaker that the plan of throwing down tiles for the spat to adhere to had been abolished for some time. With respect to what had been said by Mr. Pennell as to the destruction of 75 per cent. of the young oysters, Mr. Hart, the manager, had informed him that that arose from removing the young oysters from the hurdles, on which they were clustered so thickly as to occasion surprise at the enormous power of reproduction possessed by this fish. They had got over this difficulty now, however, in a very ingenious way, and he believed there were not 25, or even 15 per cent. destroyed in that way at present. The plan adopted now, instead of attempting with a knife or in any such violent way to detach the young oysters, was to break up the hurdle into small pieces, from which the bark was then detached, and, being supple, it expanded, so as to loosen the hold of the fish, which were then taken off (still on the bark) to the feeding-bed on the other side of the island, where they were allowed to float about, and they throve very rapidly. There was such an enormous quantity of spat deposited that unless the young oysters were removed in this way there would be no chance of their being reared. He had seen them at four months old when they were about the size of a fourpenny piece, and some as large as a sixpence. He was not connected in any way with the company, but from what he had seen of its operations he thought there could be no doubt of their ultimate success. So young a company, however, could not be expected to show a pecuniary return as yet, especially when it was remembered that oysters did not come to maturity for three or four years. With respect to the quality of the oysters those he had seen thrown in to breed from were very large, and were principally brought, he believed, from the coast of Ireland. They were very abundant and he had every reason to expect that those who had invested capital in the enterprise would have no cause to regret it.

Mr. Botly said that acccording to Mr. Lobb's paper, the French Government were giving every encouragement to oyster culture, and the complaint against our Government was that they threw impediments in the way of persons embarking skill and capital in this enterprise, and this certainly was an evil. Every aid should be given by our Government to such an important branch of industry.

Mr. Blackie asked at what period the young oyster detached itself from the old one. He thought nature would provide in the best way for this operation, and that very probably evil resulted from forcibly detaching the young oysters too soon.

Mr. Lobb, in replying to the observations which had been made, said that when, two years ago, he wrote a pamphlet on oyster culture, he stated in the preface that his object was to see oysters at 4d. a dozen, which was their legitimate price. That was still what he was aiming at, and not at any pecuniary advantage to himself; and indeed at present the result had been rather the other way. His object was to get oysters plentiful and cheap, for they were the most nutritious food that could be eaten, and in consumption and some other diseases there was nothing the stomach of the patient could bear so well as oysters in an uncooked state. Mr. Pennell stated that the Board of Trade had power to do certain things, and this no doubt was true, but they did not use that power, and never had done so. Again he said the Board acted on Mr. Cholmondeley Pennell's report, but he had reason to know that they did not do so. As Mr. Digby had stated, Mr. C. Pennell was decidedly in favour of the grants being made to capitalists, and he had already declared these views in his report on the roach river fishery. The next question was, as to Mr. Hart's losing 75 per cent. of his young oysters. That might have occurred in the first year from want of skill, but the loss was now very small indeed, and could not be more than 20 per cent., if so much; but Mr. Hopkins, the engineer of the company, was present, and would be able to give more recent information. He thought Mr. Digby must have misunderstood what he said as to the upper and lower part of the river Blackwater. No doubt the upper part, furthest from the sea, was very well adapted for laying, but it was not well adapted for breeding, and the two things were quite distinct; that which was good for breeding in was bad for laying, and *vice versâ*. Laying was not the purpose for which these companies were started; they were started as breeding companies, because there was plenty of laying ground already. The Whitstable Company had the most magnificent laying in the world. At Milton, and all along the south coast of the Thames, there was capital laying ground; and also in the estuaries of many rivers, the Roach, and even in the Blackwater, the natural layings were very fine, but they had not an oyster in them. It had been said that his leaning was towards artificial culture; but that was not so; but if they could not get oysters by natural means, they must try what could be done artificially. All the natural beds were exhausted, and could not be restored by natural means.

They could not breed in the sea, but only in the estuaries, by artificial means, and, therefore, they wanted the help of the Board of Trade. He had much rather do without artificial means if they could in any other way restore the former state of things, when, as Mr. Palmer said, oysters could be bought at 30s. a bushel. The glass tiles were not used, as might perhaps be supposed, to act as a sort of greenhouse for the sun to come down and warm the oyster, but simply for the spat to be deposited upon. When they began operations at Hayling Island they tried the French system of tiles, but this was not so successful here as in France. They tried every form of tile, brick, chimney-pot, and slate, and only got one oyster about the size of a penny on the whole lot. The had now adopted hurdles, and had 12,000 wattled hazel hurdles in one pond all covered with spat. The French were very successful with tiles, but not so much so as the Hayling Company had been with the hurdles, for where they had a thousand the French had not more than ten young oysters. The tiles, however, were better adapted for the French waters, where the tide washed over them; while at Hayling the hurdles were embanked so as not to be reached by the tide. The tiles were placed in the form of *ruches*, or hives, one above another, with intervals between through which the water washed. That was the French system, which had not answered here whereever he had seen it tried. He was much obliged to Mr. Brooks for his statement, which was perfectly correct, and he must compliment him on being a most accurate observer. The only mistake he made was as to the breeding oysters, none of which came from Ireland, but from the Channel, near Dunkirk.

The CHAIRMAN, in proposing a vote of thanks to Mr. Lobb, said, that when he heard the paper he could hardly understand whether it advocated Government interference in oyster fisheries or not, for Mr. Lobb certainly expressed himself very strongly in opposition to the action of the Board of Trade. He was sorry that he had not given more information as to the causes of the remarkable scarcity of oysters during the last three or four years. As Mr. Lobb must be aware, opinions, quite different from those which he entertained, as to the cause of this deficiency, were held by high authorities, who maintained that the scarcity had nothing to do with the dredging or the other causes referred to in the paper, but was owing to circumstances over which they had no control, and which also affected agricultural products, viz., the peculiar fluctuations of the seasons. It was alleged that for the last three or four years there had been a concurrence of exceedingly cold weather just at the period of the deposition of the oyster spat, which destroyed it, and that to that cause, rather than to any question of dredging, or to any restrictions or conditions imposed by the Board of Trade, the scarcity was owing. He thought it a pity that Mr. Lobb had not alluded to these opinions. They had only had one side brought before them on the present occasion, and although he (the Chairman) did not profess much knowledge on the subject, he had read the evidence given before the Food Committee, from which he found that there were gentlemen, very distinguished in all matters relating to pisciculture, who differed very materially from the views entertained by Mr. Lobb. Passing on to the question of Government interference, he understood that the object of the powers given to the Board of Trade was to enable them to make grants to companies for the use of portions of estuaries, which were really Crown property, and which could not be used without such grants. The Board had power to make these grants, but before doing so it was absolutely necessary that they should thoroughly investigate the rights of all parties, and see that the privilege asked for by these companies did not materially interfere with existing rights. That was, as he understood, the duty of the Board of Trade, and he had not yet heard that its powers had been exercised capriciously. It might be, however, as he believed was the case at all times when Government dabbled in trade and endeavoured to regulate it, that they produced a bad result. The usual system of Government was to discourage all early steps in the way of progress, and as soon as an enterprise had been established, in spite of all Government discouragements and delays, and was at all successful, then they stepped in, as they now wished to do, both in the case of railways and telegraphs, and took the "oyster" when it had been well fattened, and applied the profits for the benefit of the state. He hoped that would not be the case with the oyster fisheries. He trusted the fishermen would be left to take the risks and responsibilities of their undertaking, and that when they had succeeded in making profits Government would not step in and take them for themselves. They must all have been much interested in the description of the mode by which the young oysters were separated from the hurdles, which was exceedingly ingenious; and, notwithstanding all the praise which had been passed on the French Emperor, in having sent M. Coste round to the various oyster fisheries, it did not appear that this very ingenious method had been hit upon by our neighbours. M. Coste had recommended tiles, and all sorts of things; but he had not recommended the hurdles, which seemed, at any rate in England, to excel them all, and still less had he arrived at this mode of dealing with the hurdle with the young oysters upon it, by which from the altered shape of the bark when removed, the oyster was loosened and allowed to free itself, and to grow more rapidly to maturity. He hoped that the attention which had been drawn to this subject by Mr. Lobb and others would produce good results, and, indeed, it could hardly be otherwise, for whether they adopted the views of Mr. Lobb, Mr. Buckland, or of other authorities, they must all agree that when such men applied themselves perseveringly to an object of that nature, they must ultimately be successful, and the public, in the end, could not fail to benefit by their labours. He was sure they would feel that Mr. Lobb was entitled to their thanks for his paper.

The vote of thanks having been passed,

Mr. HOPKINS asked leave to make one remark as to the loss of the spat by removal from the hurdles. He had been surprised at hearing such a statement made, because, in truth, the loss had arisen from non-removal. Where they had been removed they had thriven very well. The loss had arisen from such a large number of hurdles being covered with spat, that, being pressed for time, they had not succeeded in removing it all. He wished to correct the statement that had been made, because he should be very sorry that the notion should get abroad that a loss of anything like 75 per cent. was sustained. As Mr. Lobb had said, 20 per cent. would be very much nearer the mark.

Mr. GEO. W. HART writes:—"I have read the interesting evidence on oyster culture by Mr. Buckland before your Food Committee, and published in the *Journal* of the Society of Arts of 17th April, with much pleasure, as possibly, from the subject being kept before the eyes of the public, we may hope some day our Government will consider it to be worthy of further attention than it has yet received. Truly, when we see the efforts made by the French to provide cheap food for the nation, and have witnessed the great results of their endeavours, we must feel ourselves to be wanting in that energy usually inherent in Englishmen if we do not bestir ourselves to bring a like blessing within reach of our poorer classes. Inertness in a matter of such great importance is not only a sin, but a folly, which will assuredly bring its own punishment. The first step is to obtain trustworthy information; this should be the business of men who are not only naturalists, but also practically acquainted with the working details of the subject. Pure theorists overlook actual difficulties, whilst on the other hand so-called practical men only follow their noses, ignorant of causes, and

knowing only the results; both are necessary, and should be associated on such an inquiry. The evidence given before the Sea Fisheries Commission, although valuable as a collection of matter and opinions, requires carefully sifting by those personally knowing the localities it refers to, before the truth can be gleaned from such a mass of contradictory and self-interested and prejudiced statements. In one point both Mr. Buckland and myself agree, which is, that at the present moment we know absolutely nothing at all of the subject: each has a theory based on very insufficient data, and therefore one constantly overthrown by some new fact. Mr. Buckland's theory is "temperature" pure and simple, and this he thinks accounts satisfactorily for the failure generally of the oyster beds both at home and abroad. I admit temperature does play an important part in the matter, but I shall adduce a few facts which will I think prove that a low temperature alone is not the cause of the oyster famine. For the past two years I have a record of the temperature, both of the air and water, in our oyster ponds, taken here daily so as to give six readings during the twenty-four hours; last year also I added another column, showing the temperature of open harbour water, together with the force and direction of wind, cloudiness of sky, &c. These observations certainly favour the idea of a warm summer being favourable for a spat, but no more than this; and the following will, I think, be admitted to oppose strong arguments against the "temperature pure and simple" theory. First, in 1866, I had two breeding ponds, in Chichester harbour, close together, supplied directly from the same channel; temperature in both equal, yet one pond produced a good spat, the other failed. Again in 1867, the same anomaly occurred; two breeding ponds side by side, separated only by a two-foot bank, presented similar results, one produced an immense spat, the other so little that it did not bear the least comparison with the other; there was a reason, but it could not be difference of temperature; besides which, the temperature of the open harbour water was, during the spatting, equally high, or nearly so as that of the ponds, and yet there was no spat there. Again, although the temperature in Essex may be lower than that at Hayling, yet a Suffolk farmer obtained a spat last year in a river, where he took the proper steps. Now, there cannot be any argument for the temperature theory here. Perhaps Mr. Buckland is not aware that a very great portion of oyster spat, when emitted, is unfertile, unimpregnated. The microscope revealed this fact last year, and I shall anxiously examine spat this season to see if it occurs again, because, if this should be generally noticed, it is a point that will bear most importantly upon the success or failure of oyster culture. Again, Mr. Buckland says oysters require cold water to fatten. This, also, is an error. Oysters fatten in warm water perhaps better than in cold. Certainly in winter they get thin and poor, and recover themselves on the approach of summer. Dr. Kemmerer, who is no mean authority in these matters, states that an oyster, to fatten, requires warmth and quiet—here, again, "where doctors differ," &c. The fact is, scarcely any theory is set up to account for the failure of spat that cannot be demolished by facts tending to prove directly the opposite, whether the theory relates to the right and best way of either breeding, growing or fattening oysters; the circumstances vary with the locality. Instead of putting up theories, let us set about collecting facts, from which something tangible may be afterwards evolved. With regard to the habits of other salt-water fish, I may add that the south of England (not the Hayling Island) Oyster Company's grounds are extended over upwards of 100 acres, and some of their ponds, ranging from 7 to 28 acres, afford a good opportunity for the study, and that if any plan can be hit upon by which information can be acquired in this branch of pisciculture, both the directors and myself as manager, will be happy to do anything to further an object of so much public importance. One fact in particular I should like to impress on the Food Committee of the Society is, that, last winter, sprats were sold here 12 gallons for 4d., at a time when the East-end of London was famishing for want of food. Surely, before next winter arrives some plan can be hit upon by which the sin and shame of using fish for manure, in times when there is so much distress, may be henceforth avoided.

Hayling, 24th April, 1868.

Proceedings of Institutions.

Hull Young People's Christian and Literary Institute.—The decision as to the merits of the essays sent in competition for the prize of ten guineas, offered by James Clay, Esq., M.P., to the members of the Young People's Christian and Literary Institute, for the best essay on National Education, and the two supplementary prizes of five and two guineas, offered by the committee of the Institute, has just been made known by the examiners. The prizes were offered at the end of October, and the essays sent in at the end of February. Nine essays were submitted, several others intended by their authors for competition being unfinished owing to shortness of time. The gentlemen who, at the request of the committee, kindly undertook the office of examiners are Charles Neate, Esq., M.A., M.P. for Oxford, and J. D. Morell, Esq., M.A., LL.D., one of her Majesty's Inspectors of Schools. It is satisfactory to the friends of the Institute that all the essays are considered very creditable. The award is as follows:—"The examiners concur in stating that the first prize is due to the essay bearing a Greek motto. This one distances all the rest so greatly that there never could be the smallest question as to its relative superiority. It is altogether a very remarkable production. The one we think should hold the second position is 'Meliora Sequor,' and the third 'Fiat Justitia.' We may also add, in justice to the author of 'Interea Loci,' that we think it very little inferior to the two above mentioned." The author of the prize essay (Mr. Clay's) is Mr. A. B. Greenwood, 4, Mount-place, Hessle-road; of the second, Mr. Henry Best, 20, Leonard-street; and of the third, Miss Harriet Hill, 27, Francis-street West.

EMPLOYERS AND WORKMEN IN FRANCE.

The constitution of the Conseils des Prud'hommes, and of other institutions affecting the relations of employers and workmen, is being seriously considered in France at the present moment. The subject was discussed the other day in the Corps Legislatif, on a motion made by M. Jules Simon. Still more recently the report of M. Devinck, the president of the commission for organising the visits of working men to the late Exhibition, has appeared, and the following are the principal points of the recommendations of the ouvriers relating to the institution in question:—

The first point is the formation of Chambres Syndicales. The delegates declare such chambers to be valuable as contributing to prevent strikes, the plagues of industry, which injure working men even more than employers. In their opinion, when a difficulty occurs it should be met by methods of conciliation, and a syndical chamber of the trade should be immediately placed in communication with that of the masters. The workmen add, that as employers have established such chambers, they think they should be permitted to do so likewise. Such conferences, they say, already exist in Prussia. In Paris there is a class of superior workmen, who receive pupils, and give them lessons at very trifling cost. The report of M. Devinck proposes to authorise and generalise such arrangements.

As regards the Conseils des Prud'hommes, the ouvriers are almost unanimous in their expressions. They propose the augmentation of the number of these

councils, and a new classification of the industries which compose them. They complain that they are compelled to deposit their votes in their respective districts, and have not sufficient means of consulting respecting the choice of their representatives; they propose also that all the members of these councils, whether masters or workmen, shall receive a fixed allowance for their attendance. They demand that changes be made in the Code Napoleon and the law of 1854 respecting the livret, or workman's passport, and also in the article of the law which makes the mere affirmation of the master sufficient as regards the amount of wages, the payment of salaries for the past year, and the balances due on the current year. One of the grievances respecting the *livret*, which every workman in France is supposed to possess, and which contains entries, under the employer's hand, of the dates at which the ouvrier entered and left his employment, is, that the little masters, that is to say, workmen who work on their own account or to order, have no such books, and thus are excluded from voting for the members of the Conseils des Prud'hommes.

The subject of gratuitous and obligatory instruction is considered in many of the reports; in Paris the supply of gratuitous education may be said to be nearly complete, and fresh schools are opened wherever a necessity appears for them, but many of the workmen object to instruction being obligatory, as infringing the liberty of the individual.

Lastly, the delegates recommend the formation of cooperative associations, as one of the means of improving the condition of the working classes.

The general conclusion of the reports in question is in favour of the following principles:—Equality before the law; liberty of contract; the right of discussing business questions; the desire of arriving peaceably and progressively at the realisation of these views.

Upon these reports the Minister of Agriculture and Commerce has presented a report to the Emperor, which has been approved by His Majesty. In this latter document it is stated that many of the propositions of the *ouvrier* delegates are already under consideration, and will shortly receive solution. Amongst others, the arrangements respecting technical education and courses of professional study. This is now before the legislature. The Conseil d'Etat is now occupied with the subject of infant labour and apprenticeship. The views of the delegates have been carried out since the Exhibition, by the extension of the same rules to syndical chambers of workmen and of employers.

The law of France has not yet recognised the existence of syndical chambers except in the case of agens de change and other special professions; only the chambers of commerce and the consultative chambers of arts and manufactures are yet officially recognised, but a great number of free syndical chambers have been formed—there are more than eighty at present in Paris—and the chambers of commerce have often commissioned them to give their advice in cases of litigation, or to arbitrate between the parties. Acting on the same principles with respect to the syndical chambers of workmen as to those of employers, the State will not interfere in the matter, unless the law is infringed by any interference with the liberty of commerce and industry, or by the turning of such chambers into political assemblies. With respect to mixed chambers of employers and workmen, opinions are divided, and the government, therefore, declines to enter into the consideration of the subject.

With respect to the regulations respecting the ouvriers' *livrets*, and the relative privileges of employers and men, mentioned above in connection with the Conseils des Prud'hommes, and fixed by the Code Napoleon, the Minister says that the progress of education and improvement in manners render revision necessary, and recommends that the whole subject be referred to a special commission, who shall take evidence upon the subject. In addition to this, it is stated that the Minister of Justice has been instructed to lay before the Conseil d'Etat a plan for such alterations as may be necessary, in order to establish equality between employers and workmen on these heads.

Fine Arts.

SALE OF THE SAN DONATO GALLERY.—The sale of the pictures collected by Prince Demidoff, and which formed the famous gallery of San Donato, in Florence, created immense excitement recently in Paris; the works were only twenty-three in number, but every one had a high reputation, and many presented the choicest known examples of the artists' works. The picture which fetched the largest sum, namely, 182,000 francs, was "The Congress of Munster," by Terburg, but the great historical interest of the work had much to do with this result. The works whose artistic value only were the most highly esteemed, were gems by Cuyp, Paul Potter, Hobbema (2), Isaac Ostade, and Teniers. The twenty-three works sold for 1,363,650 francs, or, on an average, nearly £2,400 each. Representatives of the authorities of the Louvre and of the National Gallery were present, but neither purchased anything.

MONUMENT ERECTED OVER THE SOURCE OF THE SEINE.—The municipal authorities of Paris have caused to be erected, in the Valley of Saint Germain, in the Côte d'Or, Burgundy, where the Seine takes its rise, a handsome ornamental edifice; the waters from the various sources are brought together in an artificial cave and fall from the rockwork into a small basin, whence they take their natural course, and form with their confluents the well-known river which enlivens Paris, and in Normandy become a grand stream covered with the ships of all nations. Over the entrance of the cave is the recumbent figure of a nymph, with the traditional urn, the work of Mr. Jouffroy, the eminent sculptor. A square, or public garden, has been formed around the source. This monument replaces a very old one, supposed to be of the Roman period, which stood on the same spot, and of which some remains, including a statue in bronze, were discovered some time since.

Manufactures.

EXTRACTION OF SULPHUR FROM THE ORE.—The process by which sulphur is extracted from the ore is carried on in Italy in a most primitive and wasteful manner. In Sicily the ore from the mines is put into a kind of kiln, with a slanting floor, and is covered with earth outside. This is called a *calcarone*. It is then set fire to at the top, and burns downward. When it has been burnt for a fortnight it is tapped at the bottom, and the sulphur is run out into moulds of wood. It will be easily understood that this system is most wasteful, as a large percentage of the sulphur contained in the ore must be burnt in the process, and the damage to vegetation in the neighbourhood must be considerable from sulphurous vapour given off. In Romagna the sulphur is extracted from the gravel and earths with which it is found in the following manner:—Ten or more earthen pots, about 3 ft. in height, and holding about 4½ gallons, are arranged round a furnace called a gallery. The pots are filled with lumps of sulphur ore; the tops are closed with earthenware lids, from which proceeds a pipe about 2 in. in diameter, which enters another covered pot, standing in a tub filled with water. On applying heat to the gallery the sulphur melts and volatilises, and runs down in a liquid state into the tubs, where it congeals. The defect of both these systems is the necessity of carrying the temperature to a high degree, which is very liable to cause a chemical combination of part of the sulphur with the lime or other matter of which the *gangue* is composed. On analysing the residue of the fusion by either of these methods a composition of

sulphate of lime will be found. In the *calcarone* a further loss of sulphur is sustained, by being converted into sulphurous acid by contact with the fire, and which has most injurious effects on the atmosphere and the vegetation in the neighbourhood. The following is an analysis of the average sulphur ore of Romagna :—

Sulphur	30·60
Lime	26·80
Alumina, Silica	41·20
Water	1·40
	100

From this ore, which contains 30 per cent. of sulphur, not more than 10 per cent. on the average is produced, the other 20 per cent. being wasted in the process. In this ore the sulphur is not found in chemical combination with any other substance, but is disseminated through layers of tertiary and contemporaneous formation. To melt the sulphur it is only necessary to raise the temperature to 232° Fahr., and at this temperature it is as liquid as water, and may even be filtered. If the temperature be raised the sulphur is very liable to combine with the other substances, and thus occasion a serious loss, as with the existing systems in use at the present time in Italy, namely, the "Calcaroni" in Sicily, and the distillation in earthen pots, as in Romagna; moreover, the sulphur thus obtained has to undergo another process of refining to fit it for commerce. A most important invention, whereby no loss is sustained, and every particle of the sulphur is extracted from the ore, is now being worked by a Milanese company, who have obtained the right of working it in Italy. The principle upon which this apparatus is constructed is the exposing of the ore in a closed vessel, and subjecting it to the action of the heat of steam at a pressure equal to about three atmospheres (274° Fahr.); it being well known that sulphur will melt at 232°, and at this temperature is as fluid as water, and were this temperature raised the sulphur would become thicker and thicker. The apparatus consists of a vessel in the form of a truncated cone, made of boiler plate, which is filled with pieces of ore. The principal dimensions are 1·20 met. diameter at bottom, 0·70met. diameter at top, and 2·50met. height. It is fitted with a grating at bottom, to prevent the ore falling into the receiver, which is placed below; under this grating there is a strainer, made of sheet-iron, pierced with small holes. Up the centre, passing from top to bottom, is a pipe communicating with the steam boiler; this pipe is perforated with small holes, so as to allow the diffusion of the steam amongst the pieces of sulphur ore. The receptacle for the ore, after being filled, is closed with a lid, which is screwed down with a steam-tight joint. A cylindrical vessel or receiver, mounted on four wheels, which run on a tram-road under the apparatus, is then wheeled into place, and securely attached to the former by means of bolts. This receiver consists of a double casing of boiler plates, forming a steam jacket, which is filled with steam from the boiler, for the purpose of keeping the melted sulphur in a liquid state. It should be added that the vessel which contains the ore and the receiver are both covered with a lagging of wood to prevent the radiation of heat. After the ore has been exposed for a short time to the action of the steam, the sulphur which it contains begins to melt, and passes through the grating and strainer into the receiver beneath, and is there kept in a liquid state until all has been collected by the heat of the steam surrounding it. A cock is then opened, and the liquid sulphur is run out into moulds. An immense saving of time is effected in this manner as compared with the old system, which, as we have said before, occupies not less than fourteen days, and often, in bad weather, a month or more. Some interesting experiments have lately been made at Milan with this apparatus, at the "Elvetica Iron Works," and have given most satisfactory results. At this trial 4,000 kils. of ore were put into the apparatus, and in two hours 1,500 kils. of sulphur was produced, which was of such excellent quality as to require no refining. The consumption of fuel for producing the steam was $4\frac{1}{4}$ quintals, but the average consumption would be considerably less, as the steam was generated under unfavourable circumstances from the boilers of two portable engines, and there was also a considerable loss of heat by radiation for a length of naked steam-pipes. Neither can the yield of sulphur be said to be the maximum, as, on examining the residuum in the apparatus, the gangue still contained a certain amount of sulphur, which would all have been run off had the operation been continued another half-hour. The mineral which was experimented on at Milan was Lercara ore, which would yield by the ordinary means 20 per cent. of sulphur; by this apparatus it produced $37\frac{1}{2}$ per cent., and had the operation been continued for sufficient time the produce would have been at least 40 per cent., or exactly double that which would have been obtained by treating the mineral in the ordinary manner. The following is the classification of Sicilian sulphur, by M. Cussy :—

No. 1. Extraordinary ore, that which yields			25 per cent.	
,, 2. Rich	,,	,,	20	,,
,, 3. Good	,,	,,	15	,,
,, 4. Middling	,,	,,	8	,,

By the use of this apparatus it will be seen that this yield might be doubled, and that it is called to play an important part in the sulphur industry in Italy.

PARAFFINE WATERPROOF CLOTH.—The following is an extract of a letter from Dr. Livingstone to James Young, Esq., Limefield, West Calder, Scotland :—"Country of the Chipeta, February 1st, 1867.—I am sorry that I never could write to Dr. Stenhouse about his invention. The sheet his agent gave me to place on the ground beneath my bed has been invaluable as a tent overhead. He offered me a covering of a lighter kind, and I regret exceedingly not having accepted it. The Mackintosh sheets I have tried are not to be mentioned in comparison. This black sheet is lighter, and lasts wonderfully; while the india-rubber sheet so glues itself together that you soon tear it to pieces in drawing the folds asunder. The first pair of boots have lasted during a five-hundred mile tramp, often over a rough stony soil, and in the driest, hottest season. I gave away the first pair, not because the uppers were broken, or the soles worn out, but because the inner seam had given way at the toes, and the heels were gone. I ought to have had a pair not Stenhoused to try against the others. I am now putting a second pair to a severe test, daily wet outside and in, and then exposed to a broiling sun. If they last long at this I shall let the doctor know. I think his invention really very valuable, and I wish you would give him this extract as a sort of acknowledgment for kindly providing that 'brick' of a sheet."

MANUFACTURE OF STARCH IN ITALY.—The principal centres of this manufacture are Venice, Ravenna, and Genoa, and in most large towns there are manufactories of this article, but the production is not sufficient to supply the wants of the country. At Genoa there are seven manufactories of starch, employing about fifty workmen. The average annual imports of this substance amount to 84,000 kils., of the value of 76,000 francs; whilst the average exports do not exceed 35,800 kils., amounting in value to 32,000 francs.

Commerce.

FURTHER TELEGRAPHIC REFORM IN FRANCE.—The draft of an act respecting the tariff of telegraphic dispatches has just been presented to the Corps Legislatif. The following are the new rates proposed by this bill:—For a dispatch of not more than twenty words, sent between two stations of the same department, 50

centimes, from any part of France to another, beyond the same deparment, one franc. In the case of Corsica a second franc is added for the Italian transit, there being at present no direct communication between continental France and Corsica. The above rates to be increased at the rate of 50 per cent. for every ten words in addition.

Colonies.

Imports and Exports of Victoria.—A private circular, dated Melbourne, March 3rd, says:—A statement of exports and imports from and into the colony for the year 1867 has been officially published, and we are enabled to ascertain the effect of the change in the tariff during 1867. The following table gives a comparative view of the principal branches of the import trade at three different periods:—

Imports into Victoria, specifying Ten Principal Articles, in 1859, 1866, and 1867.

	1859.	1866.	1867.
	£	£	£
App. and Slops....	588,654	517,157	373,825
Beer and Cider....	666,470	300,878	297,103
Flour	720,660	259,034	43,091
Grain	1,237,824	1,172,400	509,095
Haberdashery and Drapery	1,505,920	674,524	275,062
Hardware	311,438	259,661	94,814
Leather, Boots and Shoes	626,253	397,927	292,209
Spirits	718,991	380,644	420,525
Timber	466,331	341,203	217,744
Wine	342,613	241,132	163,154
Other articles	442,737	10,227,151	8,987,458
Total......	15,662,891	14,771,711	11,674,080

From the above table it will be seen that a very marked change has taken place in the import trade. Judging from the falling off in the import of such articles as flour and grain, it might have been expected that there would have been an increase in the import of merchandise which cannot be produced in the colony. But it will be observed from the above table that there is almost as great a decrease in the import of haberdashery and hardware as in that of flour and grain. On the other hand, the chief imports during the last two years are as follows:—

Exports from Victoria, specifying the Principal Articles of Colonial Produce (Estimated Value in 1866 and 1867).

	1866.		1867.
Bones..............	£1,609	....	£1,336
Gold	5,909,987	....	5,738,993
Hides	42,715	....	26,755
Horns and Hoofs	1,355	....	434
Horses and Cattle....	44,821	....	—
Sheep	23,437	....	—
Skins	11,056	....	2,503
Provisions	33,014	....	49,953
Tallow	6,599	....	34,968
Wool	3,196,471	....	3,813,347
All other articles....	3,618,482	....	3,056,118
	£12,889,546		£12,724,427

From the tables of imports and exports it appears that while the colony is now nearly supplying itself with breadstuffs, and while there is a very slight decrease in the production of gold, there is a large increase in the export of wool and a considerable increase in the export of provisions and tallow. It will be observed that the value of exports exceeds that of imports. Consequently there must be funds at the credit of the colonists in the countries to which our produce is shipped, and it is natural to expect that these will be invested in merchandise suitable for the colony. An increase in imports may therefore be fairly anticipated in the current year.

Colonial Railways.—It has been proposed to construct a railway from Burketown, in the Gulf of Carpentaria, to Melbourne. This seems a large undertaking, but one, considering all the advantages that would accrue from it, that might be fairly expected (says the *Port Denison Times*) to pay a large interest on the outlay. This railway would take the place of the navigable rivers of America, and if the Canadas have been able to make a railway absolutely in competition with such magnificent water communication as they have, the colonists ought surely to be able to make this line, which would command the whole traffic. An enormous amount of country would then be opened up, and great encouragement would be given to the rapid development of mineral resources. A grant of land along the line—say two miles wide, or an equivalent amount in blocks of the regulation shape, laid off at a sufficient interval along it, would go some way towards paying for the construction of the line, as a great proportion, if not the whole of the land on either side, and within a reasonable distance, would soon acquire considerable value. The length of the line would probably be 1,200 miles.

New Productions of Victoria.—Amongst the new industries recently developed in Gipp's Land are the production of brimstone, which is abundant at Buchan, near the north-end of the lakes; and slate, for roofing, which has been quarried at Glenmaggie, and is apparently plentiful. A ton was sent to Melbourne, and approved of. In a very short time an important manufactory will be added to the numerous list of colonial industries that have sprung into existence recently. The first paper mill in the colony is now being erected. A few months since the necessary buildings were commenced, and have since been continued with such vigour that within a very short time papermaking will have commenced. An experienced foreman has been engaged; and the machinery, all of which is highly finished, and furnished with the latest improvements, was made in Edinburgh. The entire outlay will be about £20,000.

Revenue of Queensland.—The revenue of the colony of Queensland during the years 1866 and 1867 was for the former £617,672, and for the latter £686,582. These figures show that the revenue is steadily progressing, and in a sound and healthy state. The increase of the customs is very large, the collection for 1867 being £283,666, against £223,684 in 1866. It appears, however, that the additional duties are the cause of this increase, as the imports are very much less than they were in 1866. The duty on the gold exported for 1866 was £1,686, and for 1867 was £3,582. The total receipts of the land revenue, under the Leasing Act, amounted to £17,812, representing 2s. 6d. an acre on 1,442,496 acres of land already taken up.

Notes.

Embellishment of Paris.—Demolition and construction continue to proceed in Paris without stint. An important undertaking is now under hand, namely, the piercing of two streets, from the junction of the Rue de la Paix with the Boulevard des Capucines. One of these streets will run from the Boulevard to the Théâtre Français, and form a broad and direct line to the Louvre and its neighbourhood; this street will be about 2,600 feet long. The other, starting from the same point, will pass to the Bourse, and be afterwards continued to the Boulevard Sebastopol, and will be about twice as long as

the former. One effect, and a very fine one, will be the formation of a handsome open space opposite the Place of the New Opera-house. One of the new streets is exactly in the line of the centre of the Opera, while the other will form the same angle with it as the Rue de la Paix, so that the New Opera will be seen and approached by three of the finest streets in Paris, converging symetrically from it. The value of the property between the Boulevard and the Bourse is very great, and the total cost of the new streets must be large, but the value of the new sites thus formed must make this change a very profitable one, while the new street which ends opposite the Théâtre Français will demolish one of the most unsightly and least reputable quarters in the city. The other works set down for the present year include the completion of the New Boulevards of St. Marcel and St. Jaques, the formation of the New Park of Montsouris (which is carried on with vigour), the completion of the great central markets (two more sections of which have just been finished, leaving only two semicircular buildings to be erected to complete the plan, and unite the whole with the great rotunda of the old corn market), the rebuilding of the college Rollin, and the college Chaptal, the construction of a magnificent fountain on the site of the old fountain of the lions on the Place du Chateau d'Eau, and the completion of the new Boulevard St. Germain. This is a long list, but there is do doubt the greater portion of it will be exhausted before the year is out.

Population of the Zollverein.—The general result of the census taken throughout the Zollverein on the 3rd December last, is now known. The increase of the population has slackened during the last few years, but not so much as was thought. The total population of Germany, without Austria, is 38,697,344 souls, or half a million more than that of France, as shown by the last census. That of Prussia is at present 24,013,765. The increase during the last three years has been 423,126, or an average of 141,042 annually. The mean increase between the years 1855 and 1864 was 233,000; the diminution is more marked in some states than in others. Thus, in Bavaria, the population of which country was shown to be 4,823,606, the annual augmentation has fallen from 29,000 to 5,400. The number of inhabitants in Saxony is 2,426,193, and the increase has been 27,000 instead of 36,000 as formerly. The population in Mecklenburg, which was 552,612 in 1864, has now increased to 560,732.

Railways in Belgium.—The receipts of the Belgian railways belonging to the state amounted, in the month of February last, to 2,747,737frs., being 103,892frs. more than in the corresponding month of 1867. During the first two months of 1868 the receipts were 5,431,261frs., being 175,487frs. more than in the similar period of 1867. The revenue of the telegraphic service has also progressed; in January and February last it amounted to 184,041 frs., being an increase over the first two months of 1867, of 32,276frs.

Public Instruction in Italy.—During the course of the years 1866-1867 the number of students whose names were entered for the terms at the fifteen Government universities, namely, at Bologna, Cagliari, Catania, Genoa, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Pisa, Sassari, Sienna, and Turin, was as follows:—2,751 students of law; 1,985 of medicine; 1,299 mathematics; 115 literature and philosophy, and 633 pharmacy. The regular attendance of the students was:—Bologna, 380; Cagliari, 85; Catania, 157; Genoa, 167; Messina, 135; Modena, 296; Naples, 1,427; Padua, 1,487; Palermo, 173; Parma, 61; Pavia, 742; Pisa, 366; Sassari, 53; Sienna, 91; Turin, 1,124. The degrees obtained by the students were 456 in law; 204 in medicine; 196 in mathematics; 20 in literature and philosophy; 51 obtained a diploma as notary; and 161 in pharmacy. In the above, the students at the Schools of Engineering at Turin, Milan, and Naples, and the School of Medicine at Florence are not comprised. In the Venetian provinces the laureat is still obligatory for the profession of notary. In the 79 Government lyceums, 3,446 pupils were entered for the triennial course of studies. The 101 Government gymnasiums numbered 8,759 pupils for a quinquennial course. In the above, the lyceums and gymnasiums supported by incorporated bodies, and such like, are not included. The Government technical schools are 81 in number, in Upper Italy, Umbria, and the Marches, and were attended by 3,563 pupils. In Sicily and Naples, where in 1864-65 there were only 49 technical schools, there are now 55, and the number of pupils amounts to 1,233. In Tuscany and the Neapolitan provinces, the technical schools are supported by the communes; on the other hand, in Sicily they are entirely supported by the State; whilst in Upper Italy, Umbria, and the Marches, the expenses are borne half by the state and half by the communes. Besides the above-mentioned, there are various private technical schools. There are 26 government industrial boys' schools, with 1,608 pupils. The provincial and communal industrial schools numbered 972 pupils. For 1867, throughout the kingdom, with the exception of the Venetian provinces, the sum of 513,986 frs. was paid in Government subsidies to 8,808 masters of evening schools. In the Venetian provinces there were 583 masters of evening schools who received from Government 39,480 frs. The sum of 42,980 frs., in subsidies, was paid by Government to 51 societies for promoting public instruction. 57 infant-schools received subsidies from Government to the amount of 21,470 frs.

The New Reading Rooms of the Bibliotheque Imperiale of Paris.—The old reading room of this famous library was closed to the public on the 6th April, as usual, for the Easter holydays, and will shortly be replaced by two new rooms, one absolutely public, as of old, and open every day in the week, Sunday included, and supplied with a collection of classical, technical, and professional works of general interest and utility; the other is to be devoted to students and others who can bring evidence of serious literary occupation. This latter room will contain 328 numbered places, arranged nearly in the manner of the reading room of the British Museum, and the whole contents of the great library will be at the disposition of its readers. At one end of this room is a semi-circular enclosure for the librarians and attendants attached to this portion of the establishment. The day of opening is not yet published. The officers of the library are now occupied in arranging the library of printed books on the shelves of the new rooms and the adjoining apartments; and it is said that the total length of the shelves to be covered is about fifty-five kilomètres, or between thirty-four and thirty-five English miles. The entrances to the public and students' reading-rooms will be entirely distinct from each other. It is to be hoped that when these rooms are opened the practice of allowing eminent authors to carry books out of the library will be strictly prohibited; and, also, that the work of cataloguing will be vigorously carried on, for at present reference is extremely difficult, and for strangers almost impossible. Such a magnificent collection of books as that contained in the Bibliothèque Impériale deserves to be supplied with the best means of reference; and, we believe, that the learned and able directors of the establishment are as anxious as anybody to see these conditions fulfilled. Those who have watched the progress of the British Museum library can alone form any idea of the magnitude and difficulties of such arrangements.

Correspondence.

Beet Sugar.—Sir,—In the discussion on this subject, on Wednesday, the 22nd, Mr. Pearsall characterised my statistics as unreliable, and the conclusion drawn from them as "absolutely incorrect." As I quite agree with that gentleman that it is wrong to quote figures at

random, and to found upon such random calculations either conclusions or objections, I forebore to defend my figures until I could verify them by referring once more to the Board of Trade returns, from which they were taken. I have now done so, and beg to enclose you an official copy, by which it will be evident to your readers that, in 1866, the imports from the colonies were in round numbers 9½ million cwts., and from the Continent 1½ million cwts., which was all that I stated on that subject. Now, if we reduce the 28,000,000 lbs. (which Mr. Pearsall asserts to have been the quantity imported in 1867) to cwts., we obtain only 250,000, *i.e.* a quarter of a million; this, therefore, instead of showing such an "enormous increase" for 1867 compared with 1866, as to render my conclusions "absolutely incorrect," will show (if Mr. Pearsall's figures are reliable) a most astounding decrease, and thus would leave my question still unanswered, as to whether our colonies have much to fear from continental competition. Mr. Pearsall did not, however explain to us whether the 28 million lbs. included the whole imports into this country or those from the Continent only, or (if the latter) what proportion those 28 millions from the Continent bore to the colonial imports. Now it is precisely and solely upon that proportion, that the whole question turns, and I hope, therefore, he will oblige us with some further statistics on the subject.—I am, &c., WILLIAM A. GIBBS.

Gillwell Park, Sewardstone, Woodford, N.E.

SUGAR IMPORTED INTO THE UNITED KINGDOM IN 1866.

Total of Raw.

	cwts.
Prussia	17,800
Hamburg	221,949
Bremen	35,235
Holland	10,686
Belgium	184,187
France	551,047
Philippine Islands	524,563
Cuba	1,672,512
Porto Rico	167,417
Dutch Guiana	49,555
Central America	10,573
Brazil	1,333,296
British Possessions in South Africa	31,414
Mauritius	1,006,237
British India: Bombay and Sinde	42
Madras	269,093
Bengal and Pegu	73,625
Singapore and Eastern Straits	15,984
British West India Islands	3,177,047
British Guiana	1,233,720
Other parts	53,073
Total	10,639,085

Refined.

	cwts.
Holland	420,061
Belgium	66,577
France	167,598
Cuba	1,273
Other parts	4,875
Total	660,384

MEETINGS FOR THE ENSUING WEEK.

MON......Royal Inst., 2. General Monthly Meeting.
R. United Service Inst., 8½. Mr. James Mackay, "The Mackay Gun and Projectiles." (Commander P. H. Colomb, R.N., and Capt. Bolton will exhibit their new Signal Lights.)
Society of Engineers, 7½. M. de Merritens, "The Marseilles Docks."
Social Science Assoc., 8. Dr. Lankester, "On the Mode of Election and Jurisdiction of Coroners."
Farmers' Club, 5½.
Entomological, 7.
British Architects, 8. Annual Meeting.
Victoria Inst., 8.

TUES ...Civil Engineers, 8. Continued discussion on "Irrigation in India and in Spain."
Pathological, 8.
Anthropological, 8.
Syro-Egyptian, 7½.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

WED ...Society of Arts, 8. Capt. Douglas Galton, "On a New Form of Ventilating Stove."
Geological, 8. 1. Mr. Alfred Tylor, "On the Quaternary Gravels of England." 2. Mr. S. V. Wood, jun., "On the Pebble-beds of Middlesex, Essex, and Herts." 3. Dr. J. Schmidt, "On the Eruption of the Kaimeni of Santorin." (Communicated by Sir R. I. Murchison.)
R. Society of Literature, 4½.
Obstetrical, 8.

THUR ...R. United Service Inst., 8½. Adjourned discussion on Major Leahy's and Major Bevan Edwards's papers on "Army Organisation."
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Dr. Shortt, "On the chief Enemies to the Coffee Plant." 2. Dr. Hance, "On the Silk-worm Oaks of Northern China." 3. Mr. McLachlan, "On some new Caddis-worms from New Zealand."
Chemical, 8. Mr. C. W. Siemens, "On the Regenerative Gas Furnace as applied to the production of Cast Steel."
R. Society Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Bain, "On Popular Errors."
Society of Fine Arts, 8. Mr. H. Ottley, "Notes on the London Art Season."

FRI.......Astronomical, 8.
Royal Inst., 8. Mr. C. Greville Williams, "On the Artificial Formation of Organic Bodies."
R. United Service Inst., 3. Mr. Hyde Clarke, "The Military Value of a continuous Railway Communication between England and India."

SAT ......Royal Inst., 3. Prof. Bain, "On Popular Errors."
R. Botanic, 3¾.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 4th April, 1868.

78. Bill—Boundary.
151. Trade Accounts (Foreign Countries).
167. Navy (Distribution of Forces)—Return.
Manufactures, Commerce, &c.—Reports by Secretaries of Embassy, &c. (No. 1, 1868).
Public Petitions—Thirteenth Report.

Delivered on 6th April, 1868.

183. Government Insurances and Annuities—Accounts.

Delivered on 7th April, 1868.

Ecclesiastical Commission—Appendix to Twentieth Report.

Delivered on 8th April, 1868.

126. (II.) Committee of Selection—Third Report.
190. Queen's College (Galway)—Returns.

Delivered on 9th April, 1868.

83. Bill—Peerage (Ireland).
85. ,, Metropolis Gas (amended in Committee).
87. ,, Legitimacy Declaration (Ireland).
181. Storm Warnings—Correspondence.

SESSION 1867.

534. Stamp Distributors—Returns.

Delivered on 11th April, 1868.

84. Bill—County General Assessment (Scotland).
Schools Inquiry Commission—Vol. VII. General Reports.

Delivered on 16th April, 1868.

140. Army (Staff Appointments)—Return.
174. Abyssinian Expedition—Return.
175. Savings Banks—Return.
194. Whitworth Scholarships—Minute.
199. Ecclesiastical Appeals—Return.

Delivered on 17th April, 1868.

163. Treasury Chest—Account.
172. Metropolitan Board of Works, &c.—Return.
184. Paris Exhibition—Return.
187. Greenwich Hospital—Account.
192. Rangoon and Western China—Replies to Memorials.
200. East India (Uncovenanted Service)—Return.
202. Electric Telegraphs—Return.
204. Quarantine (Island of St. Vincent)—Extracts of Communications.

SESSION 1867.

560. Navy (ships sold)—Return.

Delivered on 18th April, 1868.

84. Revenue Departments—Corrected Pages.
86. Army—Corrected Pages.
133. East India (Bombay Banks)—Return.

165. Coventry Election—Minutes of Evidence.
185. Post-office Savings Banks—Return.
186. Post-office Savings Banks—Account.
189. Durham Records—Letter.
197. Army (India and the Colonies)—Report.
203. (I.) Railways Abandonment—Warrant.
203. (II.) Railways Abandonment—Warrant.

Delivered on 21st April, 1868.

193. Scientific Instruction—Minute.
195. Grand Juries (Ireland)—Return.
Colonial Possessions—Reports (Part II.).

SESSION 1867.

546. Tax Collectors (Great Britain)—Return.

Delivered on 22nd April, 1868.

168. Education—Return.
171. Court of Probate (Ireland)—Account.
196. Small Pox (Ireland)—Circulars.
Public General Acts—Cap. 8 to 15.

Delivered on 23rd April, 1868.

151. (I.) Trade Accounts (Foreign Countries), (Belgium, Holland, and France)—Accounts (31st January, 1868).
176. Increase and Diminution (Public Offices)—Abstract of Accounts.
179. East India (Oudh)—Despatch.
205. Poor Law (Walsall Workhouse)—Special Report.
212. Sir Robert Peel's School (Tamworth)—Letter.

Delivered on 24th April, 1868.

208. Immigrants and Liberated Africans—Return.
Education—Translations of Reports of the Imperial Commission on Technical Instruction in Europe.

SESSION 1867.

431. (A X.) Poor Rates and Pauperism—Return (A) (February, 1867 and 1868).

Delivered on 25th April, 1868.

88. Bill—Artisans and Labourers' Dwellings (amended in Committee).
90. ,, Broughty Ferry Provisional Order Confirmation.
93. ,, Petroleum Act Amendment.
177. Superannuations (Public Offices)—Account.
218. Naval Reserve—Return.
Diplomatic Service—Circulars.
Schools Inquiry—Reports, Vol. VIII.
Public Petitions—Fourteenth Report.

Delivered on 27th April, 1868.

126. (III.) Committee of Selection—Fourth Report.
130. (I.) Railway and Canal Bills—Second Report.

Patents.

From Commissioners of Patents' Journal, April 24.

GRANTS OF PROVISIONAL PROTECTION.

Anchors—1162—A. V. Newton.
Beverages, alcoholic, with tea, coffee, &c.—1048—A. Scott.
Beverages, carbonated—1214—M. A. F. Mennons.
Beverages, machine for adding sweetening and other ingredients to aërated, &c.—656—R. A. Hope.
Boat-detaching apparatus—1169—E. H. Newby.
Bonnet shapes—1129—A. Martin.
Braiding machines—1115—A. Jackson and J. Hartley.
Buildings, fireproof—1204—J. Marsden.
Cartridges—1180—J. J. Chaudun and J. J. Dexant.
Ceramic tesseræ—1230—E. P. H. Vaughan.
Corsets—1224—E. Richardson.
Cotton, &c., spinning and doubling—1160—T. Holt and H. Spencer.
Dies and taps, cutting—1198—G. T. Bousfield.
Engines, steam—1123—J. S. Crosland.
Engines, &c., pumping—1153—R. Moreland, jun., and D. Thomson.
Fabrics, textile, &c., finishing—1174—R. G. Lowndes.
Feathers, &c., bleaching, &c.—1218—B. J. B. Mills.
Fire-arms and cartridges—1200—W. E. Newton.
Flax, &c., preparing—1188—E. Brasier and J. E. Hodgkin.
Floor cloths, &c.—1177—D. Lane.
Fringes, purl edgings, &c.—1186—C. G. Hill.
Furnaces, blast—1137—H. Cochrane.
Furnaces, gas—1172—C. W. Siemens.
Garden engines—1196—W. B. Robins.
Gas—504—J. A. Hogg.
Gas—1195—A. H. Still and D. Lane.
Grain, washing and drying—1179—J. Bedford.
Harrows—1175—J. Armstrong.
India-rubber, gutta-percha, &c.—1222—T. Forster.
Iron and steel—1157—J. Radcliffe.
Iron, manufacturing into semi-steel or steel—1181—J. James and T. Jones.
Iron, rolling sheets of—1171—F. Simpson and S. Hardwick.
Lamps—1173—I. Sherwood.
Lead, producing white pigments from—1117—J. G. Dale & E. Milner.
Leather, &c., apparatus for skiving—1191—W. Chapman.
Liquids, measuring—1151—E. Hay.
Looms—1150—D. Crichton, W. Donbavand, and D. Crighton.
Matches, holding and igniting—1168—W. Nall.
Motive-power, obtaining—1156—J. M. Plessner.
Mowing and reaping apparatus—1228—E. Foden.
Ordnance—1189—T. Hunt.
Organs, &c.—1149—H. and J. Bryceson and T. H. Morten.
Paper-hangings—1135—T. Row and S. Scott.
Photography—1206—C. E. Brooman.
Potatoes, digging—1125—J. Wallace.
Printing machines, lithographic, &c.—1154—C. H. Gardner and J. Bickerton.
Railway switches, points, and signals—1112—J. Saxby.
Railway wheels, &c.—1194—J. Rae and G. Miller.
Railways, preventing accidents at facing points on—1165—R. Holiday.
Rocks, &c., cutting and working—1183—W. R. Lake.
Satin, &c., pipings and folds of—1232—H. Hughes.
Sewing machines—1127—J. Harwood.
Ships, propelling—1147—D. C. MacIvor.
Ships, propelling and steering—1059—W. W. Hughes.
Ships, steering—1119—J. Napier.
Shoes, bathing—1161—A. V. Newton.
Shutters, coiling or revolving—904—H. H. Hazard.
Smoke, consuming—1166—H. J. Ditmars.
Soda, salts of—1184—W. E. Newton.
Steel—1187—V. Gallet.
Taps, screw, and fixing same—1164—E. Watteeu.
Targets, arrows, &c.—1143—F. H. Greenstreet.
Tea-pots, &c., handles of—1170—H. Fisher.
Tin plates, &c.—1133—W. Williams.
Tubes, metallic—1131—J. V. Jones and G. J. Williams.
Turbine apparatus for obtaining power from a fall of water—998—F. W. Crohn.
Wheels, cutting the teeth of—1190—C. Douglas.
Wood, machinery for planing—1163—J. Casson.
Yarns, folding—1141—A. and H. Illingworth.
Yarns, &c., warping—1121—J. and T. Walmsley.

PATENTS SEALED.

3000. W. and D. Fisken.
3010. P. Love.
3011. B. Cooper.
3014. G. and E. Dorsett and J. B. Blythe.
3015. W. E. Wiley.
3020. J. J. Perry.
3023. W. Kendall.
3027. W. Payne & A. B. Fraser.
3028. J. de Silva.
3029. G. Smith.
3034. A. J., W. B., and S. H. Waterlow.
3030. H. A. Bonneville.
3036. M. Henry.
3037. T. Bennett.
3055. J. B. Fenby.
3057. F. Piercy.
3061. C. and J. Jobson.
3070. I. Kendrick.
3086. W. E. Gedge.
3117. C. E. Brooman.
818. W. R. Lake.

From Commissioners of Patents' Journal, April 28.

PATENTS SEALED.

3045. E. T. Hughes.
3049. W. P. Savage.
3050. L. Perkins.
3052. W. H. A. Bowhay.
3056. T. E. Symonds.
3060. A. V. Newton.
3062. R. Clegg.
3065. E. Donner.
3075. R. B. Roden.
3076. J. Sturgeon.
3080. S. Parr and A. Strong.
3081. J. Wright and M. B. Nairn.
3085. A. G. Avenell.
3089. J. J. Hicks.
3101. H. Hebden.
3112. T. Wingate, jun.
3119. A. M. Clark.
3124. A. McDougall.
3127. E. C. Prentice.
3131. R. Newton.
3137. A. M. Clark.
3140. T. J. Baker.
3208. A. F. Gaidan.
3258. W. R. Lake.
3368. W. Palmer.
3563. E. H. Bentall.
3647. C. J. Adams.
224. C. R. Broadbent.
726. J. Dewar.
808. C. D. Abel.
865. C. R. Broadbent.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1113. E. Wilson.
1122. R. Canham.
1150. T. Waker.
1127. J. H. Wilson.
1155. J. Wilkinson, jun.
1277. P. Welch.
1143. J. J. Parkes.
1178. H. W. Wood.
1213. J. C. Davis.
1239. W. Clark.
1251. J. Lilley.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1085. F. J. Bramwell and W. Owen.
1041. J. S. Templeton.
1106. P. Wright.

Registered Designs.

4939—March 21—Tap—J. Coubey, Walsall.
4940—March 21—Cigarette or cigar case, with tinder, tube, and match box—H. W. and L. Dee, 8, Sherwood-street.
4941—March 25—Coffee-pot, to be called "The Kaffeekanne"—H. C. Ash, 315, Oxford-street.
4942—April 1—Embellished collar stud—W. F. Brown, 5, Wedgate-street, Gloucester.
4943—April 6—Hat brim wire—E. Gaunt and T. Eddison, Leeds.
4944—April 6—An improved mallet—Atkin and Son, Rea-street, Birmingham

Journal of the Society of Arts.

FRIDAY, MAY 8, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock:—

May 13.—"On the various Methods of Lighting Streets by Gas, with Proposals for the introduction of an Improved System." By S. Tucker, Esq. On this evening Thomas Hawksley, Esq., C.E., will preside.

May 20.—"On the Condition of the Agricultural Labourer." By J. Bailey Denton, Esq. On this evening William Hawes, Esq., F.G.S., Chairman of the Council, will preside.

Conversazione.

The Council have arranged for a conversazione, at the South Kensington Museum, on Wednesday, the 3rd June, cards for which will shortly be issued.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, April 1st. Present — B. Shaw, Esq. (in the chair); Mr. Harry Chester, Captain Grant, Mr. W. H. Michael, Mr. G. F. Wilson, F.R.S., Mr. Neville Lubbock, Mr. E. Wilson, Mr. S. Gurney, M.P., Sir Chas. Nicholson, Bart., Mr. C. Wren Hoskyns.

Mr. George Manning attended and gave information respecting Poultry Culture as follows:—

In looking for new sources and for the further development of the old means of animal food, I cannot but think that poultry claims our attention before many others, as having once formed an important part of our meat supply, as being simple and inexpensive in culture, and everywhere ready to hand. Of late years, however, poultry has fallen into neglect; and this kind of meat can now be procured at such prices only as to render it an expensive luxury rather than a reasonable portion of daily food. The farm-yard seems to be the proper home of the rasorial order of birds; yet it is here that the neglect is most evident, whilst farmers for the most part deny the usefulness of this portion of stock, and tolerate it only from habit. It is not only the farmer, however, who raises objections to this kind of food. The consumer has certain prejudices. On the part of the farmer it is said:—

1. That poultry stock does not pay.
2. That even if it did pay it is too unimportant to engage his attention.
3. That it damages the stack-yard.
4. That it is injurious to the crops.

On the part of the consumer it is urged:—

1. That the retail price of poultry is such as to place it out of the list of daily foods.
2. That, even if it can be produced at reasonable prices, it is a poor substitute for butchers' meat, and does not contain sufficient animal nourishment.

If poultry keeping does not pay, and under existing circumstances, in the majority of cases, it probably does not, the reasons are to be found in the following facts:—

1. That no attention is paid to the choice and management of stock.
2. That food is irregularly and wastefully administered to it.
3. That no regard is had to the roosting, and particularly to the laying, plans of hens.
4. That the demand is restricted by the market system.
5. That farmers' wives have ceased to be hen-wives.

With regard to the choice management of stock in poultry, we find on farms generally, mongrel bred birds, which, from continued in-breeding, have deteriorated in size and stamina. The barn-door fowl of the olden time has changed, particularly within the last few years, becoming continually less useful for food. It is true that the barn-door fowl was always a mongrel; but when farm-yards were the nurseries of fighting cocks, where landlords, by covenant inserted in the leases, required the tenants to "walk" a game cock, or number of cockerels, and tenant farmers bred birds for the pit on their own account, there was a continued infusion of new and vigorous blood into the progeny of the hens that stocked the yard. That custom has happily nearly passed away. The deterioration, however, begun by the loss of these high-bred cock birds, was completed shortly after the Cochin China mania, when, by the introduction of cock birds of this variety (valuable as the hen birds are for certain purposes), a race of spare-breasted, leggy birds has been the result, wanting the chief merits of a table fowl. Again, when the flail and a careless system of farming made the barn-door a golden feeding-ground, chickens had opportunities of growth which they now have not, and which must be supplied to them more economically and judiciously by hand if rearing poultry is to be profitable. This plan, however, has been neglected, for poultry, unlike other farm stock, has not only not advanced, but has gone back in value, and consequently in estimation. The average weight of barn-door fowls sold from farm-yards is 3½lbs. From this must be deducted 3 oz. for feathers and 12 oz. for offal before they become food. The game-cock, as bred for the pit, rarely exceeded 4½ lbs.; but by crossing with the Malay they may be brought to 6 lbs. or 7 lbs. in weight. Dorkings, when not inbred, but well and carefully fed as chickens, will reach to 7½ lbs. as pullets, and to 9 lbs. as cockerels; higher weights, such as 10 lbs. for hens, and 12 lbs. for cocks, can be obtained, but these are exceptional. Dorkings, however, are not suited for cold clays and damp soils. Of food birds, besides Dorkings, the game and the large Surrey and Sussex fowls (which last always command a high price), there are the Brahmapootra fowl and the Houdan, or French Dorking, well adapted for use. Of these the Dorking and Surrey fowls are beyond all question the best for the table, in delicacy and weight of flesh; the game the most savoury, although deficient in size; the Brahmapootra not so delicate in flavour as the others, but hardy, weighty, and easily fattened; the Houdan having the good without the bad qualities of the Dorking—precocious and small-boned, being non-sitters, and almost uninterrupted layers of large eggs The Brahmapootra seems to be a useful stock on which

to build other varieties. Of these, the cross with the Dorking is most strongly recommended; and a cross with the Houdan produces table chickens of a fine size. At the last Chelmsford and Essex Poultry Show, the birds which took the first and second prizes for dead poultry, trussed as by poulterers, but not drawn, were, the one 13 lbs. 12 oz., the other, 13 lbs. 10 oz., the pair at five months old. They were the direct offspring of a Brahmapootra cock bird and Dorking hens. For stock it would be a better plan to put a Dorking cock with Brahmapootra hens, and the pullets of this union with Dorking cocks in no way related to the ancestors of the pullets. Very hardy and weighty table birds may thus be produced. By answers to inquiries, and by reference to the books of a farm, including the last six years, I find that the average price paid by higglers for barn-door fowls of the average weights first mentioned is 2s. for coop-fed, and 1s. 8d. for yard-fed birds. The cost of feeding and rearing the prize birds at Chelmsford was probably very little, if at all, more than that of raising the others. With regard to feeding, our system of leaving chickens to shift for themselves until such time as they are ready or wanted for the coop is all wrong. No attempt at after-fattening will increase frame if the feeding of infancy has been disregarded. Again, the indiscriminate emptying of apronfuls or sievefuls of grain in a heap on the ground, whilst it serves to gorge the powerful, leaves chickens and weaker birds to starve, picking up here and there a grain, whilst sparrows and small birds have a large share in the feast. I see that Mr. Mechi published last month the results of an experiment in the cost of feeding a single hen, shut up and without access to any food but that which was given by hand. The result shows that 5lbs. of barley at the average of 1d. per lb. (or 40s. the quarter) will make 1lb. live weight of poultry food, worth 9d. per lb. I say it is quite practicable to feed poultry more cheaply, and consequently to sell them cheaper than shown by this method—that is supposing them to be at large; but I am sure Mr. Mechi will pardon me for saying that I think this statement of feeding in confinement is rather low, a circumstance which may arise from the fact that the bird pined at first. I have tried the same experiment with two pens of birds, consisting of a cock and two hens, confined for a long time to separate but very small wired pens. I tried it in March last year, and in the month just ended, and I found that my birds consumed about $3\frac{1}{3}$ pints to his $2\frac{1}{2}$ pints in the week; but then I dare say the barley I used was of foreign growth, and of much lighter bulk. Birds having a free run would cost very considerably less. I must not occupy your valuable time with the details of what is necessary for the housing of birds, and for their places of laying and incubation. It will be enough to say that they should be, what they are seldom in farm-yards, namely, cleanly, convenient, and attractive.

Captain Grant—Do you think a hen's nest should be high or low?

Mr. Manning—It should be on the ground, if there is no danger from rats, for laying and also for hatching; and the roost should be low, particularly when they are heavy birds. I believe the sore and injured feet which are not unusual in large poultry are often caused by their jumping down almost perpendicularly from a high roost. Fowls will always choose the highest perch, probably because it is the warmest, and when this is in a large open shed, as a cartlodge, they have room for some length of flight before reaching the ground, but in a small poultry-house they come down very heavily. If the perches are arranged in steps one above the other they will jump them one at a time until they reach the highest, but they will not come down that way. I do not approve of artificially warming the fowl-house; it should be well built, and brick is better than wood, being warmer, and more easily cleaned; but I think if the introduction of hot-air pipes is allowed it must produce such a warmth that on going out into the cold air the fowls are apt to get chilled, and to have an attack of the "roup."

Mr. Hoskyns—I have a small flue passing through my fowl-house, and I find that it tends to improve the regularity of laying, and does not produce any ill effects.

Mr. Manning—It may be useful if very judiciously employed, but I am always afraid of it. It would depend, too, on the breed; the Bramahpootra and Cochin China are very hardy, whilst the Dorking is very delicate. On the point that the demand for poultry is restricted by the market system, I would call attention to the fact that poultry produce stands at a costly rate to the consumer, and at a poorly remunerative one to the producer, by reason of the irresponsible middle men through whose hands it passes before it reaches the retail seller. Again, in its perishable nature the producer is liable to much loss in a dull or a glutted market. In this matter I would venture to suggest the establishment in London, and the great towns of the United Kingdom, of wholesale markets, either apart from or in connection with the meat markets, subject to police and other regulations, to have sales by auction, so that no part of the consignment need be returned to the producer, or destroyed as unfit for food; to extend the same principles of markets and sales to other towns in the kingdom on their market days. One of the reasons already given for the neglect of poultry stock was, that farmers' wives have ceased to be hen-wives. Perhaps in the altered state of society it is unavoidable. It is however to be regretted. But poultry-growing, as a part of farm stock, and an item of our daily food, will need hen-masters rather than hen-wives. I mean that if it were carried on by the husband as a regular part of his business, he would feed his poultry the same as he does his horses and his stock, but when it is left to the wife, there is often a complaint of the quantity of food required for the poultry, and a little sly barn robbery the result of waste.

Mr. C. W. Hoskyns—But part of the economy of poultry keeping consists in the fact that the wife is able to attend to it.

Mr. Manning—Oh! yes; and it should be so. There is nothing in the management of poultry which goes beyond an ordinary woman's capabilities; the only thing is to see that they have food enough without waste, and that chickens are carefully reared.

Mr. Hoskyns—Are there not many oleaginous seeds which might be used with advantage in feeding?

Mr. Manning—Yes; I have tried brank or buckwheat, which is very good, and so is Indian corn. Cheapen a necessary of life, and a demand follows instantly; this is a maxim illustrated every day. Simplify the market system and improve the means of production; you will then remove the consumer's first objection, viz., price. The second objection as to nutriment is answered by the fact that, as a flesh-forming food, poultry is more nutritious than beef. It is only inferior to beef as being less fattening, for it contains a little less water, a fraction per cent. less albuminous matter, and a greater proportion of salts. To the remaining objections urged by the farmers, that poultry damage the stack-yard, I have little hesitation in saying that this is a mistake where stacks are set upon frames, and birds regularly and judiciously fed. The other, namely, that poultry damage the crops, will, I think, receive a conclusive and practical answer from Mr. Mechi. Mr. Mechi keeps 300 head of poultry, which have free access to the fields near the homestead, and he finds that they do more good than harm. With regard to the system of sales by auction, this plan has already been adopted by Messrs. Broome and Co., meat and poultry salesmen in Newgate-market. Their manager, Mr. Brooke, has been in Normandy and the other poultry districts of France, to ascertain the French methods of feeding, and of poultry management generally, which appear to be more systematic and economical than our own. Messrs. Broome have kindly

consented that their manager should attend before you, if desired, to give any information that may be of value. Taken in connection with the statements of the weight and the cost of rearing barn-door fowls, it may be useful to place side by side the prices quoted in Newgate and Leadenhall Markets at two periods of the year, which will represent plenty and scarcity of produce.

	Sept. 21, 1867.		Mar. 27, 1868.
Surrey fowls, per couple	10s. to 12s.	..	10s. to 12s.
,, chickens ,,	5s. 6d. to 7s.	..	6s. to 8s.
Barn-door fowls ,,	4s. 6d. to 6s.	..	5s. to 7s.

Mr. Mechi is now getting 7s. 6d. a pair wholesale for chickens. It is impossible at present to procure any reliable information with regard to the home produce and the consumption of birds and eggs in this country. It has been variously and vaguely estimated. The story of our imports, however, tells a startling tale:—

In 1849	we imported	98,000,000 of eggs.
In 1866	,,	438,878,880 ,,
In 1867	,,	397,934,520 ,,

The cause of this reduction in last year's imports I am not prepared to give. The price of English eggs per hundred in Newgate and Leadenhall Markets varies from 6s. 6d. to 13s. ordinarily in the seasons; the difference between the prices of English and French eggs being, for the most part, 1s. per hundred. The Custom-house return of eggs and poultry imported in 1866 (the totals, except in the case of eggs, not being yet made for 1867) gives the following details:—

Eggs.

Imported from	Great hundred.
Hamburgh	16,630
Belgium	151,733
France	3,359,302
Spain	80,055
Channel Islands	31,840
Other parts	17,764
	3,657,324 hundreds.
Long hundred	120
	438,878,880 eggs.

Poultry.

Imported from	Value.
Holland	£16,815
Belgium	97,082
France	56,210
Other parts	4,864
	£174,971

Value of eggs (at 6s. 6d. per 120), £1,188,630; total value of eggs and poultry imported in 1866, £1,263,601 If the foreigner can undersell us in our own markets in eggs, and can send a very large amount in value of poultry into this country; if our own eggs, in spite of this competition, maintain invariably a higher price, it is beyond question that there is—at all events, in our own production—a demand unsatisfied, and a profitable source of food neglected. I have made several inquiries into the matter of artificial hatching, and I am not satisfied with the results. The great difficulty is in rearing the chickens when they are hatched. We have no evidence to show whether the cultivation of poultry is increasing; there are no returns of the quantity sent into the market, and it is impossible to get accurate information from the farmers to a sufficient extent to form an opinion. If you took the railway returns you would probably be unable to separate the home-bred from the foreign poultry.

The Chairman—Before proceeding any further with the discussion I will read a letter which we have received from Mr. Mechi, which is as follows:—

"Tiptree Hall, near Kelvedon, Essex, March 21st, 1868.

"My Dear Mr. Foster,—I am not often in town, but hope to be so in a week or ten days, and will endeavour to meet the committee. My experience teaches me, 1st, that there is an abundant demand for poultry in our markets, even at the present extravagant prices; that while poultry sells at fully 9d. per lb. live weight, the best beef and mutton only sell at 4½d. per lb. live weight (5s. per stone of 8 lbs. net dead weight); that it costs no more to produce 1 lb. of poultry than 1 lb. of meat; that poultry are the farmers' best friends, consuming no end of insects and utilizing and economizing all waste grain; that they should have free access to pasture and to our other fields near the homestead; that care should be taken as to their breeds, as in sheep, bullocks, and pigs; that first crosses, having regard to the demands in the market, are advantageous; that the manure from poultry is of first-rate quality. My poultry (about 300) have free access to my corn-fields at almost every period of the year. Of course, poultry, like sheep, bullocks, or pigs, must be well and properly fed if they are to be well developed in size and condition. I don't know that I could say more than this to the committee.—Yours faithfully, J. J. Mechi.

"P. Le Neve Foster, Esq."

Mr. Chester—There is no doubt that in France there are a great many more eggs and poultry produced than in England, compared with the population. I should like to know what is the reason of that; and whether we could, by putting out any practical suggestions, increase the supply. We shall not see the price reduced or the distribution improved until the number produced is increased.

Mr. Wilson—I think the cottier system, which is so prevalent in France, is very favourable to the production of poultry. Have you ever tried the experiment, which I belive has been tried in France, of having a movable poultry house, which can be taken from field to field.

Mr. Manning—I have not tried it, but I should think it would be very successful. The only objection is that the poultry are left unprotected. My attention has been principally directed to poultry kept in small places, and I don't think it can be carried on profitably in that way, because all the food must be purchased; you must then sell at fancy prices. If a considerable number are kept in a confined place, there must be some arrangement for changing the soil, which in most cases would occasion a difficulty. I kept three Cochin China fowls for about three months in a small space about 4 ft. × 4 ft., with a little hut behind for roosting; but then I had the droppings continually removed and the soil constantly dug up. The prices paid to the producer by the higgler are 2s. for a coop-fed, or 1s. 8d. for a running fowl, weighing on an average 3½lbs. I see no reason why poultry should not be sold by weight; I think it would be a very great improvement if all provisions were required by law to be sold by weight. The size and weight of the eggs from a Spanish and a Hambro' fowl, are very different, but they are all sold at so many for a shilling; and a retail dealer told me that he allowed a good customer to pick out which he liked. I have used Indian corn for fowls, and it answers very well, but just at present it is very dear. You cannot always keep to the same kind of food, whatever it is. In Sussex they use a good deal of bruised oats; I have used a mixture of bruised oats, rice, and toppings, with success. I doubt the advantage of feeding fowls with meat; the kind of flesh which a fowl picks up naturally, is very different to anything we could give them. I have seen the reports of the large poultry farm in France, and I know them to be wholly untrue. I am certain that no experiments have been made on a large scale in this country to feed poultry on horseflesh mixed with farinaceous food, but I cannot say what has been done abroad. Graves and other animal food have been

given to force the laying of hens, but I believe the tendency is to wear out the hen very quickly.

Mr. Wilson—Would it not answer to do that? To get all the eggs you can, and then fatten the fowl for table?

Mr. Manning—Perhaps it might. An old hen may be made to eat very well by boiling it first, and then roasting it. I keep breeding fowls about three years, then I sell or eat them. The eggs are not so good for breeding from the first year as the second and third; in the fourth year they begin to fail again, according to the constitution of the bird. The best breed for cold clay soils is the Brahmapootra or the French sort, the Houdan. I think a cross between the Brahmapootra and the Dorking gives the most useful bird for farmyard purposes. The Brahma has a good deal of the Cochin China in it; it lacks breast a little, but not so much as the Cochin; and when crossed with the Dorking it produces a very fine bird, with all the hardihood of the Brahmapootra and the meat properties of the Dorking. If the soil is good, no bird would answer better for a cottage than the Dorking. Lime must be supplied, of course, if it is not naturally present in the soil where birds are in confinement. I have had no experience with ducks, geese, or turkeys. I think poultry keeping would be carried on more successfully on a large scale than by individual cottagers.

Mr. Wilson—Is there not a great tendency to epidemics amongst poultry kept together in large numbers?

Mr. Manning—I think Mr. Mechi would answer that by saying, not if the yards are kept well supplied with lime and salt. If the fowls were free to run in the fields it would be a long time indeed before the ground became tainted. It would be almost an impossibility.

Mr. Wilson—Should you feel inclined to go into the speculation to the extent of thousands?

Mr. Manning—I think Mr. Mechi could answer that question better than I can. He has 300. I think the great difficulty with small farmers would be in finding a good and ready market. The large breeder has a salesman in town, to whom he sends his produce, but the cottager and small farmer might not have those opportunities; they must depend on the middleman or higgler. I do not think it would answer for the small farmer or cottager to breed fowls for his own use.

Mr. Wilson—Would not a goose or a duck forage for itself until it was time to fatten it?

Mr. Manning—I do not know about that; but the farmer would not like to see the cottagers' geese wandering over his fields.

Mr. Chester—Do you think it better to adhere to a pure breed, a specific sort, or to let all sorts run together, and trust to nature to produce the best result?

Mr. Manning—On a light soil I should prefer a pure Dorking, taking care not to inbreed; if it were not a light soil I would have a cross between the Brahmapootra and the Dorking; in all cases I would have the Dorking, either pure or crossed. If you require only eggs, you may dispense with a cock-bird altogether; for breeding you should not have more than eight hens to a cock, and if breeding for exhibition or fancy purposes the number should be still further reduced. I don't think the eggs are quite so palatable where the hens run alone. I think it would be well if in poultry exhibitions there were more classes for farmyard poultry, and if, as has been done at Chelmsford, dead poultry were included. The Hambros, Spanish, and French varieties produce most eggs, but they never sit. I believe the most delicate-flavoured bird of any for the table is the Dorking. I can quite imagine that there may be an impression in France that the Houdan is superior, but I should attribute that to a national feeling. The Houdan produces very early chickens; but the earliest are the Cochins; they are very hardy, and can be reared even in the snow. I cannot say exactly why cheap poultry are always bad, but a fowl that has been fattened will keep longer than one that has not. I have not experimented on artificial hatching, and speak only from observation and information on that question. The difficulty is in rearing the chickens. I believe Mr. Schroeder, at Rickmansworth, is trying it on a large scale. Colonel Stuart Wortley has invented a new incubator. The great difficulty is in rearing chickens from them fit for the market. This is the opinion of the salesmen.

Twenty-first Ordinary Meeting.

Wednesday, May 6th, 1868; Edwin Chadwick, Esq., C.B., Member of Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Compton, William, 68, Prince's-square, Bayswater, W.
King, John, 10, Hyde-park-gate south, W.
Price, Hugh Powell, Castle Madoc, Brecon.
Ward, William Augustus Hardcastle, 49, Pall-mall, S.W.

The following candidates were balloted for, and duly elected members of the Society:—

Powell, Evan, St. Mary's-villa, Newtown, Montgomeryshire.
Welshman, Richard Nash, Dean-street, Soho, W.
Wilson, John, 159, New Bond-street, W.

The Chairman said that at the International Exhibition at Paris, we were glad to see officers of our corps of Engineers, very prominent amongst others as examiners and reporters on the progress of scientific works, and, in some instances, as successful contributors by their inventions. Amongst other of these inventions was a grate with a chimney, by Capt. Douglas Galton, of that corps, to which his (the chairman's) colleague of the Institute, Gen. Morin (the president of the Ecole des Arts-et-Métiers) belonged, who had paid a more competent attention to the subject of the ventilation of buildings, private and public, than any other man of science in Europe. The General had pointed out this grate, as an apparatus for house ventilation, as the greatest advance of any that had yet been made, and thought so highly of it that he had made a series of experiments upon the invention, which showed that by means of it, with proper adjustments, the air of any living room might be changed three times an hour with pure air warmed, and that more than half the heat now sent up the chimney unapplied might be saved. This appeared to be of such high sanitary and economical importance that the Council had asked Captain Galton to be so good as to give the Society an account of the principle of the invention, which he would now read.

The Paper read was—

ON A NEW FORM OF VENTILATING STOVE IN USE FOR BARRACKS AND MILITARY BUILDINGS.

By Douglas Galton, Esq., C.B., F.R.S.

The fire-place about to be described dates from 1859-60. It was designed to meet the conditions for barrack-room ventilation laid down by the Barrack and Hospital Improvement Committee, presided over by the late Lord Herbert of Lea, which were stated to be as follow:—

"In a building consisting of a number of rooms, generally entered from common passages or staircases, sometimes directly from the outer air, and each having an open fireplace, which it is essential in every instance to retain, how to supply, at all seasons and temperatures, and by day and night, each room by itself, and independent of every other room, with a sufficiency of air to keep the room healthy, and at the same time to prevent the temperature from falling below what is required for

the comfort of the men. To do this with the least possible interference with the structure of the rooms, on a plan not easily deranged, and at a minimum of cost."

The committee arranged that the renewal of air should be effected by means of the combined action of the chimney and of ventilating shafts in other parts of the room; the object in employing the open fire-place being its cheerfulness, as well as its efficiency as an engine for renewing the air.

The large quantity of air which has to be renewed every hour renders it impossible for any ordinary open fireplace, which acts by radiation only, to furnish the necessary heat to keep a room in winter, in which great change of air is taking place, at a proper temperature; and it is owing to the influx of the large quantity of cold air to replace that which passes up the chimney, that houses not warmed artificially are so subject to draughts in cold weather. To prevent such draughts, and to maintain an adequate heat, it is necessary that some, if not all, the air supplied should come in at a raised temperature.

In order to make each room self-contained as regards its ventilation, the committee decided to use some of the heat which otherwise is wasted up the chimney, for warming the fresh air to be poured into the room. They were not quite satisfied with the forms of grate which had been already invented for this purpose, and they consequently adopted the fireplace of which the following is a description; and in this description it is not proposed to enter into the general principles of ventilation adopted by the committee, but to restrict the remarks in this paper to the fire-places which they adopted.

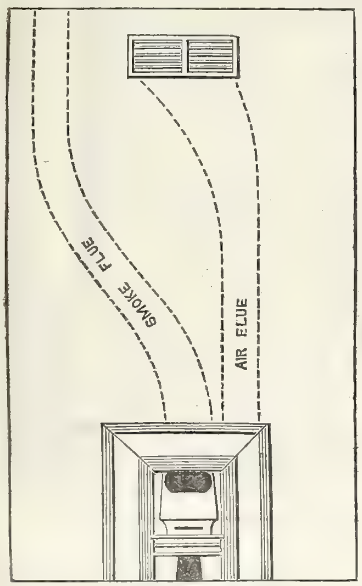
The stove is the best cast-iron, and is manufactured for the War Department, by Messrs. Kennard, of Upper Thames-street, but is not patented. It consists of three pieces, properly connected by screws. The first piece forms the moulded projecting frame; the second, the body of the grate; and the third, the nozzle or connection with the smoke-flue, the bottom flange of which is bolted to the back of the grate.

The stoves are of three sizes:—

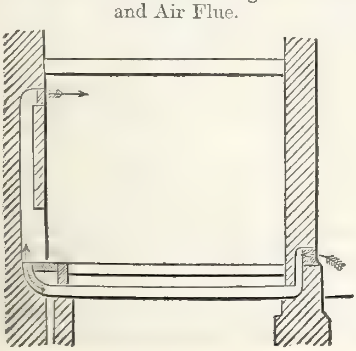
The largest has an opening for fire of 1ft. 9in. wide, and was intended for rooms containing from 8,000 to 12,000 cubic feet; it weighs about 3cwt. 1qr. 10lbs. The second, or medium size, has an opening for fire 1ft. 5in. wide, and was intended for rooms containing from 3,600 to 8,400 cubic feet; it weighs about 2cwt. 3qrs. 5lbs. The third, or smallest size, has an opening for fire 1ft. 3in. wide, and was intended for rooms containing 3,600 cubic feet and under; it weighs about 2cwt. 2qrs.

The sketches appended show an elevation, section, and plan of the second or medium-size stove, the extreme

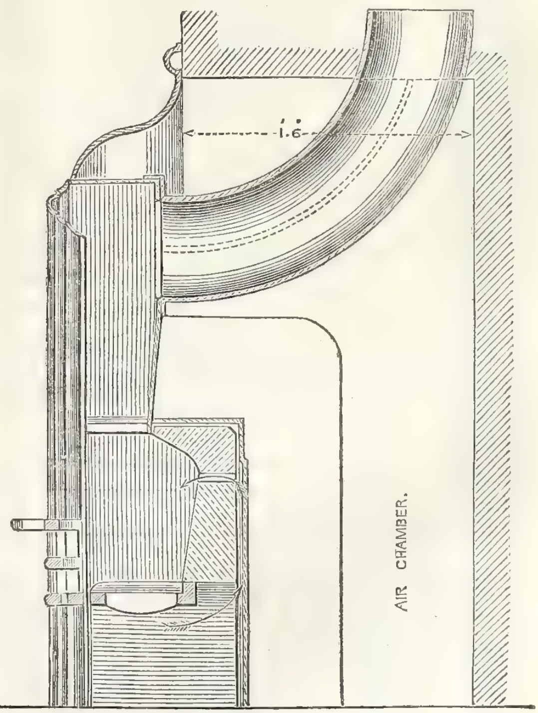
Elevation showing Air and Smoke Flues.



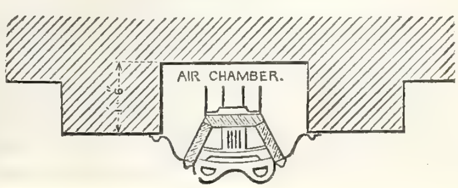
Section of a Room showing Air Duct and Air Flue.



Section of Grate.



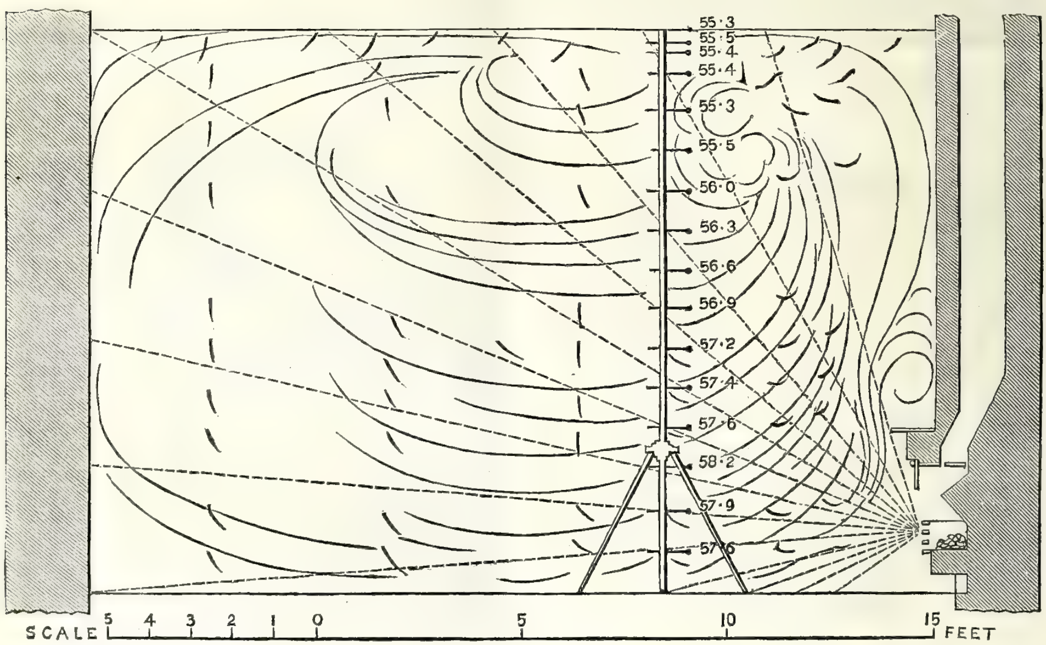
Plan of Grate and Air Chamber.



dimensions of which are 40 inches wide by 42 inches high; the projecting moulded frame enables the stove to be applied to any existing chimney opening.

The fire-place has a lining of fire-lumps in five pieces; two sides, one back-piece, and two bottom pieces, moulded to the form shown in the woodcut. The bottom is partly solid, being made of two fire-lumps placed one on each side, and supporting an intermediate cast-iron fire-grating, which occupies about one-third of the bottom of the grate; by this means, whilst the draught is checked and the consumption of fuel reduced, a sufficient supply of air for combustion at the bottom to secure a cheerful fire is obtained. A clear space, half an inch deep, is formed between the back lump and iron back to receive a supply of air through the ash-pit under the grate, which passes through a slit in the fire lump immediately above the fire. The air thus brought into contact with the heated coal is received at a high temperature, in consequence of passing through the heated fire-lump, and is forced into contact with the gases from the coal by means of the piece of fire-lump which projects over the fire at the back of the grate, and thus a more perfect combustion of the smoke is effected than with an ordinary grate; in fact, with care, almost perfect combustion of the fuel, and consequent utilisation of the heat can be obtained.

The flame, heated gases from combustion, and such small amount of smoke as exists, are compelled, by the form of the back of the grate and the iron part of the smoke flue, to impinge upon a large heating surface, so as to subtract as much heat as possible out of them before they pass into the chimney, and the heat thus extracted is employed to warm air taken directly from the outer air. This air is warmed by the iron back of the stove and smoke-flue, upon both of which broad flanges are cast, so as to obtain a large surface of metal to give off the heat. This giving-off surface (amounting in the case of No. 1 grate to 13·5 square feet) is sufficient to prevent the fire in the grate from ever rendering the back so hot as to burn the air it is employed to heat. The fresh air, after it has been warmed, is passed into the room near the ceiling by the flue shown in the drawing. In a room furnished with an ordinary open fire-place with closed doors and windows, the experiments made by Mr. Campbell for the Board of Health in 1857 (see accompanying sketch) showed that the circulation of air proceeds as



follows:—The air is drawn along the floor towards the grate, it is then warmed by the radiating heat of the fire, and part is carried up the chimney with the smoke, whilst the remainder flows upwards near the chimney breast to the ceiling. It passes along the ceiling, and as it cools in its progress towards the opposite wall, descends to the floor to be again drawn towards the fire-place. It follows from this that the best position in which to deliver the fresh warm air required to take the place of that which has passed up the chimney, is at some convenient point in the chimney-breast, between the chimney-piece and the top of the room, for the air thus falls consequently into the current and mixes with the air of the room without perceptible disturbance.

The flue which has been adopted for barracks is carried up by the side of the smoke-flue in the chimney-breast. It will be seen from the drawing that there is in the air chamber of No. 1 grate a heating surface for warming the air of about 13·5 square feet. The area of the grate is 84 square inches, of which 58 inches are solid, and 26 afford space in the centre for the passing of air. The front is open, and air is passed on to the coal from the back in the manner already described. The grate will contain about 18 to 20 lbs. of coal; when the fire is maintained for from twelve to fifteen hours, a total consumption of about 2·5 lbs. per hour, or 40 lbs. for sixteen hours, will suffice to maintain a good fire. For soldier's rooms the daily allowance in winter with No. 1 grate is nearly 46 lbs. per diem.

In new buildings it would be possible, and indeed desirable, to extend this heating surface considerably by carrying up the smoke flue inside the warm-air flue. This plan has been adopted in the fire-places for the wards of the Herbert Hospital, where the fire-place is in the centre of the ward, and the chimney consequently passes under the floor; and by this means a heating surface for the fresh air, of above 36 square feet additional to that of each fire-place, has been obtained. The

limit to which the heat from the fire can be so utilised will be the point at which it cools down the chimney, so as to check the draught and combustion of the fuel. With respect to the application of the grate to existing buildings, the recess in which an ordinary fire-grate would be fixed, forms the chamber in which the air is warmed.

In order to afford facilities for the occasional cleansing of this chamber, and those parts of the air channels connected with it, the front of the stove is secured by screws, so that it can be easily removed, thus rendering the air-chamber accessible.

The stove was designed with the object of being applied to existing chimney openings. In so applying it the air-chamber is to be left as large as possible, thoroughly cleansed from all old soot, and rendered clean with cement, and lime-whited. Should the fire-place be deeper than 1ft. 6in., which is the depth required for the curved iron smoke-flue, then a lining of brickwork is to be built up at the back, to reduce it to that dimension. The chimney bars, if too high, must be lowered to suit the height of the stove, or to a height above the hearth of 3 feet 3 inches; they must also be straightened, to receive the covering of the air-chambers. These coverings should be of 3-inch York or other flagging, cut out to receive the curved iron smoke-flue, and also to form the bottom of the warm-air flue in the chimney-breast. In new buildings the air chambers may be rectangular; they must be 4 inches narrower than the extreme dimensions of the moulded frame of the stove, so as to give a margin of 2 inches in width all round for a bedding of hair mortar.

Numerous experiments have been made at different times upon these grates, both as regards the quantity of air supplied and the temperature maintained. The general results show that the air is admitted into the rooms at a temperature of from 20° to 30° Fah. above that of the outer air. The design of the grate was intended to preclude the possibility of such a temperature as would in any way injure the air introduced, and the following table of some experiments made by Dr. Parkes in a hospital ward at Chatham, illustrates the hygrometric effect with the grate in use:—

TABLE I.

DATE.	External Air. Mean of three observations daily.				Air in Ward. Mean of seven observations daily.			
	Dry bulb.	Wet bulb.	Difference.	Humidity. Saturation = 100.	Dry bulb.	Wet bulb.	Difference.	Humidity. Saturation = 100.
	deg.	deg.	eg.		deg.	deg.	deg.	
April 17	50·0	43·5	6·5	60	58·0	50·6	8·0	60
,, 18	51·5	47·0	4·5	72	56·6	51·2	5·0	71
,, 19	54·0	50·0	4·0	74	59·6	54·7	4·9	71
,, 20	54·0	51·5	2·5	83	59·1	54·2	4·9	71
,, 21	54·6	51·5	3·1	80	59·6	54·3	5·3	71

The greatest difference between the dry and wet bulbs in the ward was—

	Degrees.
On the 17th	8·5
,, 18th	6·0
,, 19th	5·5
,, 20th	6·5
,, 21st	5·0

On examining the record of the dry and wet bulbs during these days, no evidence can be seen at any time of any unusual or improper dryness of the atmosphere. The difference between the two bulbs was certainly always greater in the ward, but it was not material.

The temperature of the rooms was invariably found to be so equable that when the grate was in full action, and the windows and other means of ventilation closed, thermometers placed in different parts of the room, near the ceiling and floor, in corners furthest from the fire, and on the side nearest to it, but sheltered from the radiating effect of the fire, did not vary more than about 1° Fahr. The variation of temperature in a room warmed by a fire by radiation, without the action of warmed air, will be found to be from 4° to 6° Fahr., and sometimes even much more in cold weather.

Instead, however, of citing the experiments made in this country, it will be more satisfactory to cite those which have been made by General Morin, at the Conservatoire des Arts-et-Metiers at Paris, because they will at any rate be free from all imputation of partiality.

The following is an exact translation of General Morin's paper upon his experiments, published in the *Annales des Conservatoires* for the year 1864-65, retaining the French measures and weights. The experiments were made in a room 17·32 feet long, 13·27 feet broad, and 15 feet high, containing therefore 3,189 cubic feet. The fresh warm air was admitted to the room through an opening close to the ceiling. The section of the chimney was 85·25 square inches, and the volume of air driven up it by the fire was 18,117 cubic feet per hour, therefore the mean velocity of air in passing up the chimney was $8\frac{1}{2}$ feet per second.

EXTRACT SHOWING RESULT OF THE EXPERIMENTS.

The experiments were carried out on the 4th, 5th, and 6th of October, 1864, with the temperature in the open air at 13° or 14° centigrade (54° to 57° Fahrenheit), and the wind pretty strong from the north. At each of the three meetings, the fire was lit with the greatest ease, and the draught at once commenced. The temperature of the air that entered the chamber varied from 30° to 36° centigrade, thus being from 17° to 22° higher than that of the air outside; which would be sufficient even for very cold weather. The temperature of the room was, without stirring the fire, easily maintained at 19° or 20°, that is, 6° higher than that of the outer air, notwithstanding that the means used to measure the quantity of air expelled in a great measure prevented the emission of heat radiating from the fire-place, which otherwise is in this respect very conveniently arranged. We will not here report the whole of the results of these experiments, and will content ourselves with enunciating principles and their consequences.

The object of the trials made on the 4th of October was, by preliminary experiments, to verify the proper working of the apparatus; we shall pass them over in silence, because they have [merely] suggested to us an alteration of the orifice for the entrance of the outer air (*prise d'air*). On the 5th of October the fire was lit at 10·30 a.m., and the observations were continued until 10·15 p.m. The quantity of coal employed was ten kilogrammes (22·06 lbs.); the supply was in small portions, and terminated at 4·25 p.m., that is, after the fire had been lit 6 hours and 5 minutes. But the combustion was not fully over till 9·25 p.m., when the temperature of the chamber was still about 18°. The discharge of foul air attained from 11 a.m. a very satisfactory regularity. The maximum discharged per hour was 562 cubic metres, and the minimum 466, the mean volume, between 11 a.m. and 4·25 p.m. being 513·74 cubic metres per hour. The entrance of air increased by degrees from 11 a.m. till noon, according as the apparatus got heated. From 12·30 to 4·25 p.m. the mean was 412·30 cubic metres per hour, say 80 per cent. of the volume of air discharged (*evacué*). After 5 p.m., that is, 35 minutes after the last supply of coal, the volume of air admitted gradually diminished; but at 8·45 p.m. it had fallen only to 289·94 cubic metres, and at 10·15 the volume per hour entering was still 151·62 cubic metres.

The whole of the results of these observations will be found stated in the table annexed.

TABLE II.

EXPERIMENTS MADE WITH A BARRACK CHIMNEY IN THE CONSERVATOIRE DES ARTS-ET-MÉTIERS, 5TH OCT., 1864.

Hours of observation.	Temperature in open air.	Temperature in room heated.	Temperature of hot air on entering room.	Temperature in chimney at 6·004 yds. height (5·49 m.)	Temperature in chimney at 12·981 yds. height (11·87 m.)	Volume of fresh air "regularly" let in per hour.	Volume of hot air withdrawn per hour.	Doors and windows of room shut, but not air-tight. Orifice for admission of cold air enlarged, its section being 0·088655 sq. yds. (0·074125 sq.m.) Section of flue placed in front of chimney, 0·161781 sq. yds. (0·135265 sq. m.) Equation of anemometer used (No. 22): V = 0·14 + 0·0948 N. The jalousie-grate for admission of air has four orifices 25·985 inches wide, and ·944 inches of clear orifice. Surface of passage, 4 × 0·66 m. × 0·024 m. = 0·634 sq. m. (= ·075 sq. yds.)
h. m.	Degrees.	Degrees.	Degrees.	Degrees.	Degrees at 11h. 40m.	Cubic metres.	Cubic metres.	
10 30	..	16·	..	..	36	..	..	Fire lighted—Total surface of grate=0·0206 sq. m.
11 0	12·25	..	22·	..	51	288·36	552·96	Clear do. 0·0058 sq. m.
11 30	12·50	..	24·	..	56	293·04	495·72	
12 0	..	..	..	..	48	294·12	523·90	
12 30	14·	19·	27·5	..	45	399·00	554·04	
1 0	14 30	..	29·	77	59	446·88	562·30	
1 30	14·5	..	30·	62	52	422·94	526·82	
2 0	14·75	..	30·	63	50	542·64	520·02	
2 30	15·75	..	30·2	60	52	433·58	499·12	
3 0	15·50	20·25	29·25	53	46	314·52	466·56	
3 30	15·75	20·25	29·50	55	48	385·70	478·28	
4 0	..	..	..	50	50	..	..	
4 25	14·75	20·5	30·	..	..	353·78	471·42	Last supply of coal.
Mean	14·	20·	29·3	66	..	412·30	513·74	
4 30	..	..	..	50	47	..	..	
5 0	13·75	20·*	..	58	48	319·20	471·42	* Temperature at 0·20 m. above floor of room.
5 30	..	20·75†	..	61	50	..	..	† Ditto about 0·20 m. beneath ceiling.
6 10	12·5	..	29·5	..	at 6h. 48	292·60	447·12	
6 50	..	..	28·5	45	..	..	..	
7 0	11·75	20·‡	28·5	..	..	263·34	388·80	‡ Thermometer placed on a chair.
8 15	..	18·5	23·5	..	..	..	398·52	Ditto ditto.
8 45	9·8	..	..	..	..	289·94	..	A great quantity of fuel still left.
9 25	9·	..	22·	..	..	199·50	439·92	Fire goes out.
10 15	8·25	..	19·	..	..	151·62	311·04	

During the experiments there was a consumption of 22·06 lbs. (10 kilos.) of coal, of which there remained unconsumed or in cinders 4·90 lbs. (2·220 kilos.) Some of these experiments were made in the pipe (conduit) of cold air immediately the door of the room was shut, which explains the few eddies which may have taken place in this pipe; but the same effect is produced whenever gusts of wind arise to cause eddies at the orifice where the outer air enters (à l'entrée de la prise d'air).

The 10 kilogrammes were consumed in 9 hours 45 minutes, excepting the 2·22 kilogrammes of cinders.

Conclusion Drawn from the Result of the Experiments of October 5, 1862.

In this experiment the total consumption [of coal] was 10 kilogrammes (22·06 lbs.) of which there remained 2·22 kilogrammes of cinders and unburnt coal at most equivalent to one kilogramme of coal. The consumption therefore was nine kilogrammes (19·854 lbs.)

The last supply of coal was put on at 4·25 p.m., that is, after the fire had been lit six hours, and we may reckon that the nine kilogrammes were consumed in at least seven hours. The hourly consumption was therefore 9-7ths, equal to 1·30 at most.

The mean volume of air discharged (*evacué*) [from the room] between 11 a.m. and 4·30 p.m. was 513·74 cubic mètres per hour, first received in the chamber at 10° and raised in the flue, in its upper part, to 66°. Its temperature was therefore increased by 46°, and it gained (*emporté*)

cubic meters.		kils.						units of heat.
513·74	×	1·209	×	46°	×	0·237	=	6879*

* The units of heat are derived from multiplying the number of cubic mètres of air into the weight of cubic mètres of air, into temperature, and into the calorific capacity of the air—*i.e.* quantity of heat necessary to raise one cubic mètre of air 1° centigrade.

The volume of air introduced averaged 412·30 cubic mètres per hour, or 80 per cent. of the quantity discharged. The volume of air entering by the doors and windows was thus only 20 per cent of the amount discharged.

The injected air having come in at a temperature averaging 29·3°, while the outer air was only at 14°, there was therefore an increase of 15·3° in its temperature.

The units of specific heat gained were therefore :—

cub. met.		kils.						
412·30	×	1·234	×	15·30°	×	0·237	=	1837 units (*calories*).

Consequently the total heat absorbed by the air was :—

For air evacuated and loss in heating the apparatus	6,879 units.
For air introduced, and to credit of heating apparatus	1,837 ,,
Total per hour	8,716 ,,

The consumption of coal per hour was 1·30k., developing about 1·3 × 8,000 = 10,400 units (calories). Of this number of units of heat the air evacuated would have carried off

$$\left.\begin{array}{l} \frac{6879}{10400} = 0{\cdot}66 \\ \text{the air introduced would have brought} \\ \frac{1837}{10400} = 0{\cdot}18 \\ \text{the remainder} \ldots\ldots\ 0{\cdot}16 \end{array}\right\} 1{\cdot}00$$

would have been absorbed by the walls or brought in by radiation.

If we recollect that in experiments made with an ordinary chimney, set up under similar conditions, in the cabinet of the Direction du Conservatoire, the quantity of heat carried off by the air evacuated was 6794 units (calories) per kilogramme of coal consumed, or $\frac{6794}{8008} = 0{\cdot}84$ of the total heat developed, we shall see that in the experiments made with Mr. Douglas Galton's chimney, the circulation of the air has absorbed the same total proportion of heat developed by the fuel, while the loss through evacuation in the process of heating is only 0·66, and the fresh air introduced has forced 0·18 of it into the room. It should also be observed that this introduced air had a temperature of 29·30°, and that its volume being 80 per cent. of that evacuated by the chimney, the doors and windows of the room have let in only 20 per cent of the latter, or about 101·4 cubic metres of air at 14°, which, mixing with the warm air introduced, has been raised to the temperature of the chamber, viz., 20°, thus borrowing from the heating apparatus 101·4 cubic metres $\times$ 1·234 $\times$ 6° $\times$ 0·237 $=$ 177·6 units, whilst if the supply of fresh air had, as usual, come through the doors and windows, the whole volume of air introduced would have been at 14°; this, in order to be raised to 20°, would have necessitated a radiation of heat from the fuel amounting to 513·74 cubic metres $\times$ 1·234 $\times$ 6 $\times$ 0·237 $=$ 634 units.

The construction of the English chimney produces therefore, as regards the warming of the air, an economy of 456 units of specific heat; but it has the advantage, besides, of diminishing, to a very considerable extent, draughts and currents of air from outside, often so troublesome with ordinary chimneys.

* * * * *

Finally, another result of this system is, that two adjoining rooms may be made to communicate through an open door, without the draught up their chimneys being affected; provided, of course, that the pipes have the requisite height and proportions. This was proved on the 7th of October, in the following way: in one of the two rooms, which has an ordinary chimney, a good fire was lit at 7 a.m., and at 9 a.m., after the fire had attained full force, the door communicating with the adjoining room was opened, and a fire lit in the English chimney [of the latter]. In spite of these clearly unfavourable conditions, the draught up this chimney was nowise impeded by the action of the chimney in the next room, and the fire burnt up exceedingly well.

Proportions of orifice for admission of outer air.

For the first experiments made on the 4th of October, the orifice for the admission of the outer air had been made too small by the masons, having been only ·0182 square mètres, notwithstanding the instruction given to them. The apparatus worked well, but the mean volume of air admitted was only 260·4 cubic mètres per hour, so long as the wind did not affect the supply (appel), and this air entered the apartment at an average temperature of 33°.

The supply aperture having been enlarged, and raised to ·0741 square mètres, that is more than quadrupled, the volume of introduced air was doubled, while its temperature fell only 4°; it sank to an average of 29·3°, which is still quite sufficient for the purpose. The outlet formed by the jalousie grating, which lets the air into the room towards the ceiling, has a clear opening of ·0634 square mètres. It would, then, be useless to enlarge the aperture for the admission of the outer air. On the other hand, as the mean volume of air introduced per hour amounted to 412·30 cubic metres, or ·115 per second, it follows that the rate at which this air flowed in towards the ceiling was about 1·80 metres per second; this is far higher than that of 50 mètres to 60 metres, the limit I had ventured to indicate; but when the fire burns low, or goes out, this rate diminishes greatly.

Temperature and Circulation of the Warm Air introduced (d'air affluent).

Moreover, in the experiments made on the 5th October, this air flowed in at 29·3°, while the temperature of the air outside was 14°; difference, 15·3°. The temperature of the apartment was 20°. The air entering the room was, therefore, 9·3° higher; a fortunate circumstance, which proves that in winter, when the temperature outside is at zero, or even lower, it would still be easy to bring in a supply of fresh air from the outside at a temperature high enough for comfort. It would, besides, be warmer than that entering directly from outside through the joints of the doors and windows.

Finally, the arrangement of the jalousies in the opening above, by which the introduced air is directed towards the ceiling, and the draught formed at the bottom by the chimney, caused such a perfect circulation of air in the apartment, that light balls, filled with hydrogen gas, when left near the opening at the top, were blown along the whole length of the ceiling towards the opposite walls, down the corners of which they descended to the ground, thus indicating the general flow of the air. Moreover, a thermometer, placed at different heights, gave :—

m.		Degrees.
At 0·20	from the ground............	20
„ 0·60	„	20
„ 4·96	„	20

a further proof of the complete intermingling of the air in the chamber and the warm air which is brought in.

Observations as to the Volume of Warm Air introduced.

It will be observed that in the trials made on the 5th of October, the volume of fresh air brought in by the apparatus was 412·30 cubic mètres, at the moderate temperature of 29·3°; whereas our studies on the subject of ventilation have practically shown that each single stove (*bouche de chaleur*) of Fondet's system, even with a hot fire, gives only 19 cubic mètres of fresh [warm] air per hour, at a temperature of 130° centigrade (246° Fahr.), intolerable considering the proximity of the stove.

Another experiment made with the air-pipe (*bouche de chaleur*) of a hot-air stove (*calorifère*) had proved that this air-pipe of ·0324 square metres gave only 133·2 cubic metres per hour, when the temperature of this air was at 45°; but that if the amount often rose to 150 cubic metres or 160 cubic metres per hour, this never happened except when the temperature of the air rose to 70° or even 100°. It is evident, then, as regards volume and moderateness of temperature, the English chimney presents a marked superiority as compared with ordinarily-constructed stoves. This is, of course, owing to the large size of the apertures for the admission and circulation of the air. The size of the apartment in which the experiment was made was 90·327 cubic mètres. As the volume of air evacuated per hour while the fire was in was 513·74 cubic mètres, it follows that the air of this room was renewed $\frac{513{\cdot}74}{90{\cdot}327} = 5{\cdot}69$ times per hour; a ventilation quite sufficient for an apartment 3·94 mètres by 5·14 metres horizontally $=$ 20·25 square mètres in area; for, supposing as many even as twenty persons in it, each one would be allowed a renewal of more than 25 cubic metres of air.

Consumption of Fuel.

The consumption of fuel averaged 1·30 kilogramme per hour; and, as the total surface of the grate is ·0206,

and ·0058 square mètres is clear surface for the passage of the air, it is evident that in a chimney of this kind, and with a moderate draught, as was the case during our experiments, the consumption of coal per square metre of the grate's superficies was

$$\frac{1{\cdot}30\text{k.}}{0{\cdot}0206} = 63{\cdot}1\text{k.}; \text{ and } \frac{1{\cdot}30\text{k}}{0{\cdot}0058} = 224{\cdot}1\text{k.}$$

of coal per square metre of clear superficies.—*End of Extract.*

In 1865 General Morin made some further experiments, which he published in the "Annales" of 1865-6. In these he altered the proportions of the flues for the admission of warm air from his former experiments, and made use, to some extent, of the smoke flues for assisting in warming the air.

Without giving all the details of the experiments, which will be found in the volume of the "Annales" referred to, it will here suffice to state that whilst with an ordinary fire-place the heat which is utilised in a room is only $\frac{1}{8}$ of the heat given off by the coal, or ·125, in these experiments the heat utilised in the room was ·355 of the heat given off by the coal, or $\frac{1}{3}$; therefore, to produce the same degree of warmth in a room, this grate requires but little more than one-third of the quantity of coal required by an ordinary grate. The ventilation was effected by passing a volume of air through the room in one hour equal to five times the cubic contents of the room.

The following table shows the equable nature of the temperature maintained during the experiment. Moreover, there were no perceptible draughts, as, although the doors fitted badly, scarcely any air was drawn in through the crevices.

TABLE III.

Hours.		Temperature of inflowing air at the ceiling.	Temperature within the Room. Height of thermometer above the floor.						Remarks.
			1 ft. 7·68 in.	4 ft. 10·05 in.	7 ft. 2·61 in.	10 ft. 11 88 in.	13 ft. 1·48 in.	16 ft. 10 75 in.	
h.	m.	Fahr. deg.	Fahr. deg.	Fahr. deg.	Fahr. deg.	Fahr. deg.	Fahr. deg.	Fahr. deg.	
10	10	79·50	61·75	61·30	59·00	62·30	62·60	63·25	The thermometers were placed at a distance of 23 feet from the fire-place, and protected from the effects of radiation from the fire.
10	55	83·50	64·40	63·25	62·00	65·00	64·40	66·20	
11	30	86·00	66·00	65·50	63·75	66·50	66·20	68·00	
12	15	91·40	66·20	66·75	65·50	68·10	68·00	69·80	
1	15	95·00	67·25	66·50	66·50	69·40	69·25	71·30	
2	15	89·60	66·20	67·75	66·20	70·25	70·60	71·60	
3	10	91·40	67·75	68·00	67·75	70·60	70·30	72·25	
4	10	87·00	66·50	68·00	67·80	70·50	70·25	72·00	
4	40	82·40	66·20	68·00	67·25	70·60	70·60	72·25	
6	25	82·40	65·50	67·25	66·20	69·40	69·40	71·00	
8	10	78·80	64·40	66·25	64·50	68·00	68·00	69·25	
Means ..		87·00	65·60	66·10	65·00	68·50	68·10	69·40	

The thermometer was placed at the opposite end of the room, and twenty-three feet from the fire-place, and sheltered from its rays. Observations taken at the end of the room, near to the fire-place, equally sheltered from the rays, at four feet from the ground, showed an excess of 1° Fahrenheit, whilst a thermometer placed six feet from the fire-place, in front of it and exposed to its rays, and two feet from the ground, showed an excess of 16° Fahrenheit.

In the ventilation of barrack-rooms it was not intended that the fresh air warmed by the grate should be the whole supply of fresh air, nor that the chimney should be the sole means employed for the removal of the air to be extracted. In ordinary houses, however, the grate, if adopted, might be used in such a manner as to perform the whole functions of ventilation. In this case it is of course necessary to remember that the ventilating power is a fixed quantity, and that in originally settling the size of grate for a particular room it will be necessary to bear in mind the general object for which the room is to be employed and the number of persons by whom it is required to be occupied with efficient ventilation, because all experiments show that no room can be considered even tolerably ventilated unless at least 1,000 cubic feet of air per occupant are renewed per hour; consequently a room 20 feet long by 15 feet wide and 10 feet high (*i. e.*, with 3,000 cubic feet of space) with three people in it, would not require the air to be changed much more than once an hour; whilst, if occupied by twelve or fourteen people, it would require change five times an hour. Of course if the normal use of the room was for three people it would not be worth while to provide for the extra number by which it might be occupied, as their wants in such a temporary case could be met by open windows.

General Morin, with the object of utilising the grate as the sole means of ventilation for a room, lays down the principle that the whole of the air shall be renewed five times in an hour. To perform this effectually it is necessary that the area of the top of the chimney shall afford about one square inch of area for every 100 cubic feet of content of the room, and that the area of the fresh air inlet should afford about 14 square inches for every 100 cubic feet of content of the room. I believe that, on an average this quantity of air is more than is necessary. The Barrack and Hospital Improvement Committee's proposal would resolve itself into this, viz., that the air in barrack-rooms should be completely changed about twice in an hour, inasmuch as they required a cubic space of 600 cubic feet per man, and that for all ordinary purposes this would probably suffice; as, however, this proposal was based on the number of occupants, with a more crowded room the amount must be increased.

In order to utilise a greater amount of heat, General Morin has proposed, as has been already observed, to carry the smoke-flue inside the hot-air flue up to the opening of the flue into the room. By this means he obtains an additional heating surface, beyond that of the stove, of from 20 to 30 square feet, or even more, according to the size of the chimney and height of the room; but it is not quite clear, from his published statement, whether, in his latter experiments, he operated with the exact form of grate here described—and which obtains great heating power from the peculiar construction of the cradle which holds the fire, and insures very perfect combustion—or whether he has adopted a more ordinary form for the part which holds the fire.

The principle of these arrangements, for utilizing to a greater extent the heat in the chimney, has been adopted for barracks in the case of grates for married soldiers;

these would be useful as cottage grates. These grates have a small oven, and an open fire; warmed air is introduced into the room by means of an iron flue carried up from the fire-brick lining of the stove inside the chimney, and introduced into the room near the ceiling through a louvred opening; by this means the heat of the smoke is utilized. This description of grate was devised for the purpose of combining a power of cooking for a cottage with great compulsory economy of fuel. It must, however, always be observed that in proportion as the heat is removed from the chimney, so is the draught, *i.e.*, the effect of the chimney as a pumping engine to remove the air, diminished, and the combustion of the fuel to some extent checked.

There is one point connected with the flue which must be carefully attended to, viz., the fresh air should be taken from places where impurities cannot affect it, and the flue must be so arranged and constructed as to afford easy means of being periodically thoroughly examined and cleaned. In barracks the rule is that such cleansing should take place at least once a year.

Now that the question of economy of fuel is becoming daily of more importance, it is desirable that we should adopt every means for utilising, to the fullest practical extent, the fuel which we burn. If this was done in all households the saving of fuel to the country, and of money to individuals, would be considerable.

In conclusion, the merits which are claimed for this fire-place are:—

1. That it ventilates the room.
2. That it maintains an equable temperature in all parts of the room, and prevents all draughts.
3. That the heat from radiation is thrown into the room better than from other grates.
4. That the fire-brick lining prevents the fire from going out, even when left untouched for a long time, and prevents the rapid changes of temperature which occur in rooms in cold weather from that cause.
5. That it economises fuel partly by making use of the spare heat, which otherwise would all pass up the chimney, and partly by ensuring by its construction a more complete combustion, and thereby diminishing smoke.
6. That it prevents smoky chimneys by the ample supply of warmed air to the room, and by the draught created in the neck of the chimney.

I believe that the principles adopted in these fire-places are sound; they have been largely applied to military buildings, such as barracks and hospitals, and they have been recommended for introduction into workhouse wards. I commend them to the attention of architects and builders, and I have the less hesitation in doing so, as there is no patent in question, and there is no one can claim any pecuniary interest in the manufacture of the grate.

DISCUSSION.

Mr. WARRINER said that, having had great experience of these stoves, perhaps more even than the inventor himself, he might be allowed to express his opinion upon them. He had seen some hundreds in use, and although there was some prejudice against them when first introduced, from the idea that the only object was to diminish the amount of coal supplied to the soldiers, that was very soon removed. If Captain Galton went into a barrack he would probably be accompanied by the staff, and the men would be called to "attention," and he would not really be able to arrive at their genuine views. In the position, however, which he (Mr. Warriner) held under the War Department, he had to mix with the men, and had been able to arrive at the truth, and he could assure the meeting that he had seen eighteen or twenty men sitting round the fire in a guard-room, all comfortably warm, whereas, formerly, they would have been roasted in front and frozen behind. This was a great advantage which the men fully appreciated, so that the prejudices which they at first entertained had now entirely died out. Independently of any sanitary considerations—which had no weight whatever with the men, who would, indeed, counteract any attempt to introduce fresh air, by stopping up the holes through which it entered—and, looking only to their own comfort, they were now of opinion that this was the best stove they had ever had; notwithstanding that the saving in coal was very great. It would occasionally happen that failure or dissatisfaction arose, but he believed in every case this resulted from attempts made by the clerk of the works, or somebody or other, to improve upon the invention. With these exceptions, he believed the stove had given universal satisfaction in the army, and he had no doubt in time it would come into general use, and be greatly valued by the public.

The CHAIRMAN said he might add to this testimony the fact that the same principle had been applied to American hospitals; and there it had been so far extended that casings had been fixed round the stove, so as to increase the heating surface. He had received very strong testimony from some of the American physicians as to the successful working of this system, and he had also been informed in Paris that it was in course of application to hospitals in Germany. There was one case in which he believed it would be of singular value, viz., in blocks like the Peabody buildings, where, at present, each room was ventilated from the common staircase, which led, perhaps, from a cellar where the air was anything but pure, and was, in fact, almost an aerial common sewer. By such an arrangement as Captain Galton's each room might be ventilated from without, independently of any common stair or passage.

Mr. BENHAM said the system had been applied by him with great success to cooking stoves for the use of married soldiers. Of late years, happily, it had been decided that the married men should have separate rooms; but the great difficulty was how, in these separate rooms, provision could be made for cooking without a too large expenditure of fuel. Under the direction of Captain Galton, and the Sanitary Committee, this principle had been applied to small ranges, including an oven, which should supply sufficient means of cooking, and, at the same time, keep the rooms properly ventilated. Without troubling the meeting with all the details, he might say that the result had been entirely successful; all the cooking necessary for a man and his wife, and sometimes two or three children, might be done with one of these stoves with an expenditure of about 16 lbs. of coal a day—far less than was allowed by the War Department. This, at first, was made an objection, as the men thought the only object was the saving of coal; but, as in other cases, experience had soon overcome these prejudices, and the men—and still more the women—valued these stoves very much indeed, for they found they had all the comforts of an open fire, perfect ventilation, and sufficient means of cooking. Soon afterwards the same principle was applied to guard rooms, where a larger stove was required, not only for the purpose of warming the room, but also of keeping the men's dinners hot; the guard-room stove was merely an enlarged form of the married soldiers' range; in both the external air passed through holes in the lump of fire-clay, and was discharged by louvred openings near the ceiling. This enlarged form also answered extremely well, and he believed the principle only required to be known to be extensively applied to private buildings. It was only fair to say that in one or two cases where he had known them applied to almshouses and some such places, prejudice was victorious, and the holes through which the air entered were stopped up, in order to prevent a draught, as was said, so that the thing was a complete failure. It was necessary, therefore, to bear in mind in such cases, that the holes should be put in some position where they would be beyond the reach of tampering by any prejudiced person. In the stoves which he had made the warm air was taken up a round pipe inside

the ordinary flue. In these cases the principle was applied to ordinary fire-places.

The Chairman said he should imagine that in the cases Mr. Benham had referred to there must have been some defective adjustment which produced the effect of a current of cold air.

Mr. Benham said the objections were made before the stove was fairly fixed; but there was also this foundation for the prejudice, that during the night the passage was still open to the cold air, which passed through the room and chilled it. There was not sufficient heat retained in the fire-lump to prevent the feeling of cold air passing through the room, and although this might be beneficial to health, the inmates felt quite sure it was not, and having first closed the inlets surreptitiously, they afterwards obtained permission to do so.

Sir Charles Fox said it was well known that the subject of ventilating rooms had hitherto been one of the greatest difficulty; but this stove of Captain Galton's seemed calculated to accomplish what was required, insomuch as it permitted the air to come from the outside, and enter the room at a fair temperature, so that cold draughts were not felt. Draughts were very curious things, and the objection to them was not confined to the human race, for many years ago a cousin of his, who was a great apiarian, took it into his head that a hive of bees would do more work if they were properly ventilated. He accordingly had a beautiful hive made, with a silver plate at the top, perforated with holes, and over this there was a vertical pipe, with a cap at the top. At the proper time he introduced a swarm of bees, and expected to see a great deal of honey; but it appears the bees did not like draughts, and would not work until they were excluded, for the first thing they did was to stop up all the holes in the silver plate with wax before making a bit of comb. He therefore came to the conclusion, not only that bees liked to be warm, but that they were determined to be so, and that it was of no use to interfere with them. He thought the one great advantage in Captain Galton's stove, which he had not before seen, appeared to be that all the comfort of an ordinary fire, radiating heat, was retained, and, at the same time, there was a great deal of economy of heat, as in a regenerative furnace, by which he meant that air was taken in from the outside, where it was pure, and not from the inside, where it was comparatively exhausted, and this fresh air passing up by the side of the chimney, was warmed and introduced into the room at a comfortable temperature. This was an advantage which he had not seen in any other arrangement, and he was prepared to find very excellent results follow from its adoption.

Mr. Campin said the great difficulty in the way of applying this stove to ordinary purposes seemed to be that during the night, when the stove was not in use, the cold air would still come in from the outside with considerable force, and consequently produce a draught which nobody seemed to like. It appeared to him that this difficulty could be easily overcome by an arrangement of valves in the openings, which might be closed at night so as to prevent any ingress of cold air.

Sir Charles Fox was inclined to think that the amount of draught which would be caused in this way had been much overrated. If the fire were out the alteration in the density of the column of air would not take place, and therefore no draught would be produced. The quantity of air which came into the room must be in proportion to the amount of heat given out by the fuel, and therefore if there were no fuel there would be no heat, and consequently very little draught.

The Chairman asked if Mr. Warriner had noticed, in any case where these stoves were employed, the same unpleasant effect upon the air which was generally produced by warming air upon hot iron surfaces?

Mr. Warriner had not met in any instance with such a result. The heat was really derived from the brick and fire-clay; and even in those cases mentioned by Mr. Benham, where the hot air was carried up an iron pipe, he had not noticed any unpleasant effects. He believed where this arose it was from the iron becoming red hot, and so burning the atmosphere, and that it would not be found in cases where the flue only became warm.

The Chairman asked if the idea had ever suggested itself to Captain Galton, that the inconvenience which certainly was in many cases experienced from the impact of a current of air on hot iron might be avoided, and whether the purpose in view would not be equally well attained by the use of a vitreous or stone ware flue, and whether this would not be found more economical.

Captain Galton said the original idea of inventing this grate arose from the objections which soldiers, like the bees, entertained for cold air, or anything like a draught. After numerous experiments it was found that the least perceptible draught was occasioned by introducing the fresh air near the ceiling, and that plan, therefore, had been adopted. It was quite true that the temperature fell during the night; but as the flue went up very near the chimney, it still remained warm in some degree, and the temperature of the room, if the window was not opened, would not fall below from 45° to 48°; and, as a rule, no complaint was made by the soldiers on this account. In an ordinary room the velocity of the current of air up the chimney at night, if the chimney were at all warm, was from five to seven feet per second, even as late as five or six o'clock in the morning, and that was equivalent to from 1,500 to 2,000 cubic feet of air passing through the room. That air, of course, must come from somewhere, either from the doors or windows, and must be colder than that which passed through the flue. Therefore, although in theory it might appear that this system of ventilating rooms would reduce the temperature at night, he did not think it would be found to do so practically. There was no doubt that if a stone-ware flue were employed the temperature would be more equable at night, as it would retain heat to a greater extent; but, on the other hand, it would not give off the heat during the day to anything like the same extent. At the same time, he should always be an advocate for stone-ware flues. It was intended to adopt these flues in the Herbert Hospital, but, in consequence of some difficulties in the way of construction, they were not able to do so, and an iron flue was used, covered with a layer of loam, and then a second layer of wrought iron, so as to prevent any possibility of the air being injured by the hot iron flue. That, in fact, had been what had all along been aimed at, to prevent the air getting so heated as to produce any unhealthy effect, and the heating surface was so large that the hand could almost always be borne upon it when the fire was burning. The main principle of the grate was the introduction of the air at the top of the room, where the currents produced by the fire were most favourable to its being mixed with the atmosphere of the room.

The Chairman had understood from General Morin that it was very essential that the air should be introduced to the ceiling, and that the angle at which it impinged upon the ceiling was also of importance.

Capt. Galton said the draught was much less perceptible when the air was introduced at the top of the room. They at first tried it with the opening just above the fire, and the eventual adoption of the present plan was very much owing to the objections raised by the men. They gradually tried it higher and higher, until they reached the top, and then they theorised upon the matter afterwards.

The Chairman said he believed Mr. Sharp had been engaged in preparing plans for introducing the system into cottages, and he should like to hear what would be the additional cost in the first instance.

Capt. Galton said that if the fire-place were in the outside wall, the only additional expense was the hot-air flue, which would not be more than £3 or £4. If the flue which introduced the cold air had to be carried

under the floor, of course the cost would be increased to a certain extent, but he did not think in any of the barracks the whole expense had exceeded £5.

The CHAIRMAN said—In proposing the thanks of the Society to Captain Galton, for bringing before it his important contribution to sanitary science and to domestic economy and comfort, I beg to state that the example, great as is its independent merit, may be considered with others as having wide—very wide—relations, and as an instance of the advantages derived from the occupation of officers of the scientific corps in civil works and scientific improvements in time of peace. The increasing introduction of science, or of scientific appliances into the military art, will, it may be averred, increase the need of scientific commands. Routine and prejudice would say, and some old commanders assume, that occupation with art and science and civil work is detrimental to military capabilities. On the contrary, it is proved that it augments them. Competent and impartial civil administrators in India declare that those officers who have been most occupied with civil works in time of peace have been the most successful in war. Of this I might cite brilliant examples. It is perfectly well known in the army, that several of the great military exploits in recent times have been inspired and really executed by the officers of the scientific corps. The Indian department, therefore, were wisely advised in acting upon this knowledge, in departing from the prejudices of the home service, and in confiding the great and most difficult Abyssinian expedition to the command of an engineer officer, Sir Robert Napier, who, for twenty years, in the intervals of his military service, had been occupied in civil works, as in building bridges, barracks, and forming roads. The experience in America, in the late civil war, has been entirely corroborative of the experience of India in this respect. After disastrous experience on both sides, the belligerents were driven to the employment of officers of the Scientific Corps—to the West Pointers—and of these officers of the Scientific Corps, those were, almost without an exception, the most successful in war who had been the most actively engaged in civil works and in civil administrative service in time of peace. If the question be examined and considered this is only what might be expected; for the comparatively uneducated or ill-educated officer of the line is occupied with routine work, commonly of a heavy monotony, productive of "ennui," the disease of unfurnished minds, for the relief of which there was the other night a vote of money for billiard tables for some of the line, whilst the officer of the engineers, with a higher order of education, has generally a higher order of occupation, and when provided properly with civil work or work of a scientific character, has his mind kept in exercise in devising means to useful ends, and in directing men in their execution. In the line able officers no doubt arise despite of adverse influences, and the scientific corps has no doubt its failures. But if a sudden war were to break out immediately, and commands were to be sought apart from routine, the army itself would, I am assured, look, perhaps not exclusively but chiefly, to the scientific corps for leaders, and most confidently to those who, like the great American generals, have been well occupied in peace in civil service or with productive work. In India much occupation falls very much by force of circumstances to the scientific corps. There is, however, much need for their better preparation for it; and some officers I know have come home to acquire that practical knowledge of sanitary works for example, with which, by proper arrangements, they might have been sent out. At home civil occupation and opportunities of practice, and of beneficial service for men as well as officers are neglected to a great extent and to great public expense, to which the attention of the public and of parliament needs to be directed. Without prolonging the digression tempted by the time and the occasion, for which I perceive I need no apology, I beg to move that the thanks of the meeting be given to Captain Galton for his paper, and for the distinguished service he has rendered by his labour in this matter to sanitary science and to economy. I beg to lay before you a table, which General Morin has forwarded to me of the results of his experiments as to the relative capacities of the smoke and air flues used with Captain Galton's stove for rooms of different cubic capacities. I will only express a hope

DIMENSIONS OF VENTILATING CHIMNEYS, ACCORDING TO THE EXPERIMENTS OF GENERAL MORIN.

Cubic contents of room to be heated.	Probable dimensions of room.	Volume of air impelled and admitted per hour.	Section of smoke pipe.	Area of passage of chimney top.	Total section of passage for admitting fresh air.
cub. ft.	feet and inches.	cubic ft.	sq. in.	sq. in.	sq. in.
3,600	20×15 ×12	17,658	77·5	38·7	217·0
4,320	24×15 ×12	21,189	93·0	46·5	260·4
5,376	28×16 ×12	26,487	116·2	58·9	325·5
6,480	30×18 ×12	31,784	139·5	69·7	390·6
7,840	32×17 6×14	38,847	170·5	85·2	477·4
9,180	36×17 ×15	45,910	201·5	100·7	564·2
10,560	33×20 ×16	52,974	232·5	116·2	651·0

that Capt. Galton will be allowed to have opportunities of further trial works and adjustments, so as to adapt the principle for application to cottages and the lower class dwellings, and also to school-rooms, which so greatly need the relief it will confer.

The thanks of the meeting were then given to Captain Galton.

Correspondence.

THE POSTAL TELEGRAPH QUESTION. — SIR, — Mr. Grimston, the Chairman of the International Telegraph Company, has circulated amongst members of Parliament, and throughout the country, a pamphlet, entitled, "The Government and the Telegraphs," in which he comments on the paper which I read to the Society,* and makes further objections to the measure, in addition to those I have already answered, to some of which latter objections it is due that I should reply. One statement that he makes as an objection to the Government measure, unexpectedly raises a question which appears to me to be of large interest and importance for the improvement of the education of the country, as well as for the purifying of the representation of the country. He states that "the large amount of patronage which would be vested by the measure in the hands of Government is no unimportant consideration. It would equal the patronage of the Inland Revenue, Customs, or of any other department except the Post-office itself. Whether it is desirable to concentrate so much patronage in the hands of the Government, is properly the question for Parliament." Whether it be desirable that so much patronage should remain concentrated in the hands of chairmen and directors, is, I conceive, a most important subject, and properly a question for shareholders and the public as well as for Parliament. Patronage may be interpreted to mean appointments at salaries beyond the market-value of the service given. The mercantile manufacturing classes do not talk of appointments in their workshops and offices as "patronage." I have no reason for believing that the appointments of the International or of the other telegraph companies, including numerous appointments of young women, are given as patronage or improperly; but it is notorious that the vast patronage of trading companies is commonly used as a means of political bribery at Parliamentary elections; and I need not describe the pernicious elements and the job-

* *Journal*, vol. xv., p. 222.

bing interests which are introduced, in large and increasing amounts, into the House of Commons by it. I have been assured by parties who know the House of Commons well that the trading companies' directors in the House amount to nearly one-fifth of the members. In 1861 the railway directors' appointments were more than double the number of officers engaged in the national Government. In England and Wales alone there were upwards of 80,000, including 14,000 officers. The secretary of one of the railway companies stated in my presence that, "if he liked," he himself could return two members by it. It is well known that rotten places would prefer a railway director, or a director of a company with large patronage, to a Lord of the Treasury, whose patronage is not so great, nor now thought to be so good, restricted as it is by the yet very partial application of the principle of competitive examination. On the principles enunciated by the present Marquis of Salisbury, who publicly and boldly opposed the principles of the competitive examination when proposed as a test for first appointments, on the ground that patronage was necessary for party Governments, he ought to say that this mass of patronage of the telegraph companies is too great to be left in private hands, and should be garnered for what he considers legitimate political use for party—or, as Swift defined it, "the madness of many for the gain of the few." But Lord Stanley and Sir Stafford Northcote, who have distinguished themselves by contending for the principle of the competitive examination, cannot but concede that the present is particularly a case for the application of that principle, and, as I submit, for giving the appointments to education and science, as is done in France, instead of giving them either to political or to commercial jobbery. The following extract from a notification for a competitive examination for appointments to the telegraph department shows how they manage these things in France:—"An examination of supernumerary 'stationnaires' in the administration of the telegraph lines will take place on the 11th July next, in the cities of Paris, Toulouse, Marseilles, Lyons, Strasburg, Lille, and Nantes. Candidates will be required to apply in writing at the prefecture of the department where they reside, and to produce the following information:—1. A statement as to the town in which they desire to compete. 2. A certificate of registration of birth properly legalised. 3. Certificates of health and moral character duly legalised. 4. A certificate proving definite liberation from the military service. This condition is absolutely indispensable. 5. A diploma certifying the university degree which the candidate has obtained. 6. In the Department of the Seine the intimation of candidature, and the deposition of certificates must be made at the Ministry of the Interior (Bureau du personel des lignes télégraphiques). Candidates permitted to compete must be of the age of twenty-eight or more. This limit of age is, however, extended to thirty years for 'anciens militaires' who have been at least seven years in effective service. The examination will take place on the subjects of which details follow:—1. Legible writing. 2. Composition. 3. Linear design or drawing. 4. Arithmetic, up to compound proportion. 5. Elements of geometry, physics, chemistry, especially in what concerns the electric pile and battery. 6. Geography. 7. The knowledge of one of several of the modern languages, English, German, Spanish, and Italian, will be taken into consideration. The competitors will be informed individually of their admission or non-admission to the competitive examination at least ten days before the period fixed for the opening of the competition. (Signed) E. E. BLAVIER." Stimuli are now much needed to the middle classes, to scientific and to technical education; and the appointments to future vacancies in the telegraph posts, and, I trust, shortly to vacancies in the railway administration in Ireland (where there are upwards of 12,000), and eventually also in Great Britain, would be of the highest importance for us, as proved by the well-working of the competitive principle even among the humbler classes of dockyard apprentices and labourers in England. The competitions for such of the places as are now open to competitive examinations are exercising a very beneficial effect on the education of the country, as shown by the tenor of much recent scholastic evidence; they put schools in competition with each other, and those schools which turn out the most successful competitors are getting most in demand. But think of what it would be if, in addition to those of the telegraph companies, which, as Mr. Grimston says, are nearly equal to that of the Post-office itself, we had those of the railway companies, which are nearly 100,000 more, to administer. The policy of the ancient common law, as laid down by Lord Coke was, "that officers did give grace to the place, and not the place grace to the officers." As Mr. Mill observes, on the prospect of putting up the Civil Service appointments to competition, "the extraordinary stimulus which would be given to mental cultivation in its most important branches, not solely by the hope of prizes to be obtained by it, but the effect of the national recognition of it, as the exclusive title to participation in so large and conspicuous a portion of the national offices; and when we further think of the great and salutary moral revolution descending to the minds of almost the lowest classes, which would follow from the knowledge that Government would henceforward bestow its gifts according to merit and not to favour, it is difficult to express in any language which would not appear exaggerated the benefits which would ultimately be the consequence of the successful execution of the scheme." On these grounds, the fact as to the mass of patronage attached to the telegraph companies, brought forward by Mr. Grimston, enlarges the proportions and importance of the reform for which we contend. Mr. Grimston expresses alarm at the possible misuse of the telegraph for political purposes, after the example which he cites from Spain. This alarm is really as well founded as would be in these times any such alarm as to the habitual violation of the letter post by any government of any party in this country. The privilege of the transmission of telegraphs in cipher, which has been withheld in France, should, however, be secured here, not for political, but for commercial purposes, for which it is sometimes greatly wanted. In the commercial telegraphs to India it is managed by changes in the sense of words, which are understood between the correspondents, who may be writing about "wool" when cotton is meant. It should be known that by cheap machine ciphers, the cryptograph, invented by Sir Charles Wheatstone, with only some millionth chance of decyphering, whosoever chooses may correspond with perfect security for secresy. Mr. Grimston raises difficulties as to the relation of the Government telegraph with the railways and with the submarine telegraphs, as to which it suffices to say that the Government will be, in the first instance, in precisely the same position that the International Telegraph Company and others now are. I anticipate, however, that, eventually, the submarine telegraphs will have to be taken, and that the telegraph post of this country will have to be made as complete in its external relations as the telegraph posts of the continental patterns now are. It would be an important advance in the public administration of foreign affairs, if our Government, and of course other Governments, were to have separate wires laid with the submarine cables and carried to each embassy, and were enabled to carry on correspondence in cipher. With us, it would reduce circumlocution, and save much of the vote of twenty-six thousand pounds annually for foreign office messages. Mr. Grimston takes advantage of the loose wording of the preamble of the bill, which sets forth that—"Whereas the means of communication by electric telegraphs within the United Kingdom are insufficient, and many important districts are without any such means of communication, &c." Taking advantage of the loose

word "districts," Mr. Grimston denies the allegation of the Chancellor of the Exchequer, and asserts that there are no "important districts without telegraphic communication;" and he alleges that "the wires of the Electric Telegraph Company communicate with every town and place of importance,"—giving his own very wide interpretation to what *is* of importance; "that the company have also a network of telegraphs, which includes all the chief towns in Ireland," that is to say, the ninety-two places, against the thirteen hundred Irish postal stations. Now, there is much the same ground for Mr. Grimston's allegation of the sufficiency of the existing telegraph system, that there would be if the existing postal stations were reduced from twelve thousand to two thousand, at the same places where there are now telegraph stations, or if the postal stations were reduced from six to one. Would the public be content with the six, on the ground that every town and place, or district of importance was provided with the means of letter post communication? As instances of the sort of places held by the representative of the telegraph companies to be of no account, I give the following from the list given in Mr. Scudamore's report, of places as they were in 1866 in England, and more striking illustrations of the like kind might be given from Scotland:—

Name of place.	Population.	Distance to the nearest telegraph station.
Bodmin	5,000	7 miles to Bodmin-road.
Bungay	4,000	6 ,, Beccles.
Cricklade	3,700	5 ,, Minety.
Great Marlow	6,000	5 ,, Wycombe.
Horncastle	5,000	7 ,, Perkstead.
Marlborough	5,000	5½ ,, Sevenoaks.
Newport Pagnell	4,000	4 ,, Wolverton.
Redditch	6,000	8½ ,, Bromsgrove.
St. Ives, Cornwall	7,000	5 ,, Hayle.
Shepton Mallet	5,000	4½ ,, Wells.
Whitchurch	4,000	13½ ,, Crewe.
Warminster	4,000	4½ ,, Westbury.
Yeadon	4,000	6½ ,, Leeds.

Mr. Grimston objects to the proposal of the postal telegraph, that it would check progress in improvements such as those for which he claims credit for the company. On this, it is to be observed that in its early stages the adoption of improvements of promise was almost of necessity; but their progress cannot be very rapid, when he talks of their being at this time engaged in experimenting upon Wheatstone's automatic system, which to men of practical science was demonstrated as clearly for practical adoption some six years ago as it is now. As a rule, however, the administration of a trading company is one of the last to progress in scientific improvement, inasmuch as it can usually make no important change except at the expense of existing dividends. This may be exemplified in the want of progress in railway carriages, despite of demonstrations abroad as well as at home. In answer to the interested representations of the essential incapacity of any Governmental administration to improvement or progress—without denying the justice of their application to some stagnant departments—I might adduce further examples of improvements originating within other departments in advance of any made by private administrators. In the department in question, is the system of post-office savings banks, now making such rapid strides, no evidence of capacity for improvement? Nor the money-order system, which has reached such large proportions, and which it is proposed largely to improve and extend, to meet personal exigencies and convenience, by means of a telegraph post? It is to be recollected, moreover, that in telegraphy one governmental administration is now competing against another in improvement, so that the system cannot well remain stationary. On these subjects, which are not within my course of special observation and experience, I do not expect weight to be attached to any mere opinion of my own, but only to the facts and testimony I may cite for independent examination. In the testimony might be included that of men of the highest scientific attainments and experience in the practical application of telegraphy. When I wrote my paper I had seen no plan of Mr. Scudamore's or any other, and I have been happy to find that my views were in general concurrence with his independent observation as also that of several gentlemen practically engaged in telegraphy. On the general legislative and administrative question, however, I beg leave to cite the opinion of Mr. Grimston's predecessor, the late Mr. John Lewis Ricardo, M.P., the founder and chairman of the company, and chairman of it from 1846 to 1858, who in a paper which he sent to Mr. Gladstone in 1861 recommended, as the result of his experience, the adoption of a postal system of telegraphy by the Government. In that paper he used the following terms:—"The financial question is simple and demonstrable, the advantage to the executive is obvious, whilst the benefit to the public is almost incalculable. To secure the honour and reputation of the British government as a guarantee for the privacy of communications, necessarily more confidential than those conveyed under sealed envelope through the post; to establish a conviction that the public are dependent, not upon the discretion of individuals, but upon the faith of a ministry responsible at any moment to a vigilant Parliament, that there shall be no undue preference or precedence given even to the highest financial or most powerful influence in the land; in fine, to substitute the safeguard of statesmen chosen by the nation for their talent and integrity, for that of men of business, however high their character, elected by a body of shareholders simply to pay them the highest amount of interest obtainable from the tolls levied upon the public; to retain the telegraph despatches of the various departments charged with the maintenance of the honour and interests and tranquillity of the country inviolate and inviolable, instead of being passed through the hands of a joint stock company, are advantages which no man can deny, and which Parliament and the people will not fail to appreciate. It is submitted that these considerations are sufficient to induce the Government to give their serious attention to a proposal which cannot fail to meet with the public approbation, and the concurrence of the House of Commons."—I am, &c., EDWIN CHADWICK.

CULTIVATION OF BEETROOT.—SIR,—I have read with much pleasure the paper of Mr. Gibbs on the Cultivation and Manufacture of Beetroot in England. I was in Austria when the paper was read, so I could not attend the meeting. The plan proposed by Mr. Gibbs is very ingenious, but the more rapidly the sugar is extracted the better; it is impossible to dry roots and keep them for some time without injuring the result. In Germany the plan of drying and keeping the roots is almost abandoned; only three factories work on this system, and it is said they are going to give it up, as the loss by conversion of cane sugar into glucose is estimated at 2 per cent. I do not think it would pay to do it in England. Sugar is an article that requires to be looked at from a great many points of view, and without considerable knowledge and experience one is very apt to be misled. One system may suit France, and another system, totally different, may be suitable for Germany. In Germany the duty is paid on the roots, in France on the sugar, in Holland and Belgium on the juice; in Germany, in consequence of the duty being paid on the roots, the aim of the manufacturer is to produce small roots, very rich in sugar, and to extract at considerable cost of labour and fuel the whole of the sugar. In France, Holland, and Belgium, they do not extract all the sugar, as they do not consider it worth the extra cost, so they only press the pulp once. The Germans get more sugar, but it contains more salts. I believe the best size of the roots is about 2½ lbs. In Germany the average weight of roots per English acre is 12 tons, and the average produce about 8 per cent.; in France 16 tons of roots and 6 per cent. of sugar, the

result 19cwts. 22lbs. is the same in both cases as the weight of sugar per acre. Some people look on this industry as a doubtful project for the advantage of the country. On the Continent it is a well-known fact, that wherever the beet is cultivated more cattle are fed, and larger crops of wheat are obtained, and the fertility of the land much improved. I do not think all parts of England suitable for beet; in some places potatoes will be found the most profitable green crop; near large towns mangolds of large size, containing 90 per cent. of water for cow keepers will be also more profitable. The price I am to pay the farmers at Lavenham is 18s. per ton, but roots grown as in Germany would be worth 24s. per ton In conclusion, I may state that I have given the whole question most careful consideration, and I see nothing to prevent the successful and profitable cultivation of beetroot in England. I am about to try the experiment, and if I am successful I have no doubt others will follow my example; if beetroot can be grown in the neighbourhood of Dordrecht, in Holland, on land rented at £12 to £16 per hectare, and in Germany on land rented at 13 to 15 thalers per mongen, I think it can be done in England. —I am, &c., James Duncan.

9, Mincing Lane.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. United Service Inst., 8½. Col. A. Cunningham Robertson, "The Appointment and Promotion of Regimental Officers"
R. Geographical, 8½. 1. Rev. F. W. Holland, "On the Peninsula of Sinai." 2. Commander W. Nimmo, "North East Coast of Labrador."
Medical, 8.

Tues ...Medical and Chirurgical, 8½.
Civil Engineers, 8.
Photographic, 8.
Ethnological, 8. 1. Mr. C. B. Wade, "On the Chinese Notation of Time." 2. Mr. John Crawfurd, "On the Migration and History of Coffee, Tea, Cocoa, &c."
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

Wed ...Society of Arts, 8. Mr. S. Tucker, "On the various methods of Lighting Streets by Gas, with proposals for the introduction of an Improved System."
Graphic, 8.
Microscopical, 8.
Literary Fund, 3.
Archæological Assoc., 4. Annual Meeting. Messrs. H. Slack and W. C. Roberts, "On Organic Growths in Hydrate of Silica solution, and their appearance in Artificial Minerals."

Thur ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.
Royal Inst., 3. Prof. Bain, "On Popular Errors."
Society of Fine Arts, 8. Third Conversazione of the Season, at the Suffolk-street Gallery, Pall-mall East.

Fri.......Philological, 8. Annual Meeting.
Royal Inst., 8. Mr. E. Deutsch, "On the Talmud."

Sat ......Royal Inst., 3. Prof. Bain, "On Popular Errors."

Patents.

From Commissioners of Patents' Journal, May 1.

Grants of Provisional Protection.

Belt fastenings, &c.—1108—W. Clissold.
Bottles, packing, and cases therefor—1158—J. Perry.
Braces, spring—1182—G. H. Palmer.
Breech-loading actions—1226—C. Hargrove and S. Hargrove, jun.
Cartridges, filling—1217—W. Callander.
Coal, &c., getting and hewing—1219—J. Rothery.
Coal, peat, &c., compressing—1138—W. Johnson.
Electrical apparatus—1253—C. W. Siemens.
Engines, steam—1193—J. Plews.
Fibrous substances, breaking, &c.—1225—J. Combe.
Fibrous substances, combing—1239—W. S. Fletcher.
Fire-arms, breech-loading—1236—A. V. Newton.
Fire-arms, breech-loading—1260—F. Bacon.
Furnaces for burning oil—1248—R. Weir and J. Gray.
Harrows, &c.—1234—E. Page.
Hay, &c., gathering from the ground—1262—A. V. Newton.
Heat and light, obtaining—1211—H. A. Archereau.
Heating apparatus—1201—R. A. Wright.
Horse rakes—1242—R. Boby.
Interest, calculating, and apparatus therefor—1103—L. Appleton.
Iron—1205—C. Martin, W. Barrett, and T. S. Webb.
Iron and steel—1256—W. Gorman.
Joints, making mitre, &c.—1118—W. Robertson.
Ladies' dresses, ornaments for—1209—R. Nicholls.
Lamps, subaqueous—1237—G. Glover.
Locks and keys—1061—H. Hughes and C. Jones.
Looms—1199—J. Leeming.
Looms—1217—G. Paton.
Mangles—1235—W. Watts.
Maps, charts, &c.—1203—J. Sutcliffe.
Meal and flour—1227—T. Smith, T. W. Miller, and T. Don.
Ores, treating—1025—A. P. Price.
Paint—1251—J. Robinson.
Pictures, suspending—1213—A. Woodcock.
Pile-driving engines—975—H. Paulus.
Potatoes, machine for planting—1243—F. A. Leigh.
Propellers—1233—M. P. W. Boulton.
Propellers, screw—1255—H. O. Robinson.
Reaping and mowing machines—1221—T. F. Shillington.
Retorts, &c.—1152—J. Dunbar and R. Nicholson.
Saw handles—1231—J. H. Johnson.
Sewing machines—1111—J. H. Dufort and D. Gance.
Taps, &c.—1090—M. Hawthornthwaite and T. Abbott.
Taps, &c.—1249—H. S. Evans.
Telegraphs—1155—M. A. F. Mennons.
Tobacco, twisting—1241—R. Ward.
Tubes, heating, removing soot from the surfaces of—1197—J. H. Whitehead.
Valves, diminishing, &c., for steam pipes—1088—W. Allen.
Worts, &c., cooling—1254—G. D. Kittoe and P. Brotherhood.

Inventions with Complete Specifications Filed.

Cultivators, steam—1333—W. R. Lake.
Packing, lubricating—1314—W. R. Lake.
Tubes, metal, constructing and connecting—1374—V. Delperdange.

Patents Sealed.

3094. C. Riley.
3097. W. Dickinson.
3098. R. Ackroyd & G. Hodgson.
3103. T. Wright and I. Fox.
3108. W. R. Lake.
3113. T. Briggs, jun., and W. E. Yates.
3118. E. C. Vine.
3121. W. Geeves.
3149. J. Wheeler.
3167. H. Ellis.
3172. T. W. Ingram and E. C. Kemp.
3206. J. Carter and T. Chalmers.
3226. W. H. Richardson.
3349. J. H. Johnson.
3354. C. Coates.
3355. J. H. Johnson.
3393. J. H. Johnson.
3419. W. Schofield.
3591. W. E. Newton.
202. A. V. Newton.
566. P. N. Goux.

From Commissioners of Patents' Journal, May 5.

Patents Sealed.

3120. R. Palmer and H. S. Hird.
3136. W. R. Lake.
3139. T. R. Bardsley and W. Blackshaw.
3143. C. H. Bright.
3146. B. T. Newnham.
3150. R. Robinson.
3151. T. Clark.
3157. G. W. R. Pigott.
3159. W. Inglis.
3163. W. Chippindale.
3164. G. T. Bousfield.
3166. S. Hall & M. Whittingham.
3169. J. Gresham.
3171. M. Rollason.
3192. G. T. Bousfield.
3195. H. A. Bonneville.
3196. H. A. Bonneville.
3217. E. Madge.
3218. E. Madge.
3221. R. F. Fairlie.
3225. R. Harrison.
3244. J. Templeman.
3245. R. Howson.
3250. C. E. Brooman.
3251. R. Garbett.
3263. E. Lord.
3306. R. Leighton and T. Kirkham.
3336. R. M. Letchford.
3363. S. A. Chase.
3433. J. Eckersley & D. Martin.
3445. C. Paley.
3449. R. M. Letchford.
3523. G. A. Young.
3602. M. H. Collins.
168. N. H. Rolfe.
281. W. E. Newton.
369. J. Offord and S. W. Hale.
571. W. E. Newton.
586. A. V. Newton.
654. F. Wirth.
685. W. E. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

1198. T. White.
1203. W. Leatham.
1208. H. Bessemer.
1215. M. W. Ruthven.
1264. W. E. Newton.
1271. W. Clark.
1288. C. S. Baker.
1206. D. Y. Stewart.
1257. T. J. Mayall.
1216. W. E. Wiley.
1260. J. Mitchell.
1317. J. Hesford.
1230. C. W. Siemens.
1234. E. T. Read and J. B. Fyfe.
1261. J. Wadsworth, H. Dussett, and J. McMurdo.
1255. W. Henderson.

Patents on which the Stamp Duty of £100 has been Paid.

1075. W. Johnson.
1165. J. Fitter.
1081. W. Horn.
1153. J. Willis.

Journal of the Society of Arts.

FRIDAY, MAY 15, 1868.

Announcements by the Council.

Ordinary Meetings.

Wednesday evenings, at Eight o'Clock :—

May 20.—"On the Condition of the Agricultural Labourer." By J. Bailey Denton, Esq. On this evening William Hawes, Esq., F.G.S., Chairman of the Council, will preside.

May 27.—*Derby-day.*—No Meeting.

Conversazione.

The Council have arranged for a conversazione, at the South Kensington Museum, on Wednesday, the 3rd June, cards for which are now being issued.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Food Committee.

The Committee met on Wednesday, April 8th. Present—B. Shaw, Esq. (in the chair); Messrs. Harry Chester, J. Ludford White, G. F. Wilson, F.R.S., and J. Ware.

The Rev. M. J. Berkeley attended for the purpose of giving information on the subject of fungi, and said —Gentlemen, in the observations I have to make to-day you must not expect any novelty, for I am not aware that anything very important has been discovered lately, with respect to the nutritive powers of fungi. I may begin by assuming that those nutritive powers do exist. Everybody knows that fungi are rich in nitrogenous matter, and that in very many cases they will make a very good substitute for meat. Fungi are abundantly employed in Russia, and in winter become a staple commodity. Enormous quantities are preserved in salt and a certain proportion of vinegar, and are consumed very largely. I think they preserve them almost indiscriminately, with the exception, perhaps, of a few which are acknowledged to possess narcotic principles. For instance, they would scarcely preserve such a fungus as *Agaricus muscarius*. In Terra del Fuego, again, they are for several months the staple food of the country. One of the natives was here a few years ago, brought over by Capt. Fitzroy, and he was asked what they had to eat there. He said, "Plenty of fish, and too much summer fruit;" the "summer fruit being *Cyttaria Darwinii*, which is a parasite, on the evergreen beech, and which is found in Terra del Fuego to a very large extent. This fungus has a curious habit, because it grows up in the same manner as the gelatinous parasites on different species of juniper, year after year. When dried it looks very much like a piece of dried cow-heel, and I have no doubt is extremely nutritious. During the late unfortunate war between the Northern and Southern States of America, when, in the latter part of the time, the people of the Southern States were very much pressed for food, they found fungi of very great importance to them. I have had two or three letters from Dr. Curtis, of South Carolina, in which he has told me that this was the case. He is a person who understands fungi very well, and he has sent me several thousands of specimens—at least six thousand, most of them of different species. He has promised to send me a paper upon the subject, and a very interesting paper I am sure it would be, but I have not yet been able to obtain it. In this country the great difficulty is to overcome prejudice. There is a strong prejudice against fungi. With the exception of the common mushroom—which is far from being one of the most common species in this country—the moment a fungus is found it is destroyed, and that very frequently even by persons of education, as an object of danger or disgust. I believe there was originally some superstition connected with this practice. It is a well-known fact—too well known to archæologists—that if a labourer finds a piece of pottery, or anything of that kind, the first thing he does is to break it. What does he do it for? He does not know why he does it, but there was an old superstition that there was a spirit in it, and he is afraid lest the spirit should do him some harm, and so he breaks it to let the spirit out. I believe there was formerly very much the same feeling with regard to fungi, and some shadow of it still remains. One finds this prejudice, perhaps, more strong in other parts of Great Britain than in England. It is extremely strong in Scotland. I have spoken to people there,—very sensible people, and naturally without any great prejudices, who would not on any account venture to eat any kind of fungus. I am not certain, even, that they would make an exception for *Agaricus campestris.* If you go to Wales, what do you find there? The word which they use for fungi is *bwyd y barcud* or *bwyd y llyffaint*, that is "kite's food," or "toad's food," and they have exactly the same prejudice against their use. There is no doubt that this strong prejudice is one of the reasons why fungi are so very much neglected in this country. Another point is, that even when you point out to people the species which are acknowledged to be esculent, they find, unfortunately, that these things occasionally either prove, or are reported to be, poisonous. Some years ago Professor Henslow sent me some specimens of *Agaricus personatus*, which were said to have proved extremely poisonous to some people in Queen's-lane, Cambridge. There were certainly two or three deaths apparently from eating this species, which is sold in Covent-garden market, or used to be sold there, under the name of "blewits." I never saw it there myself, but I speak on the authority of Old Sowerby and Mrs. Hussey, and other people who are connoisseurs in fungi. This species is considered to be perfectly harmless; I have no doubt it is very nutritious, though the flavour of it is not very captivating. Even *Agaricus campestris* is said sometimes to prove poisonous. It is absolutely excluded from the markets in Rome, as it is there considered to be the most poisonous species they have. At home we sometimes meet with reports of cases of poisoning from it. There was one which happened last year to the family of an Italian warehouseman in London. There was one death, and I believe several members of the family were very ill in consequence of partaking of the fungi. A particular friend of mine was out at a party last year, and ate a portion of some *entrée* in which there were some mushrooms, apparently *Agaricus campestris.* He was taken most seriously ill, and very nearly died in consequence. But there is one thing to be considered, and that is, that we must look upon these things, in

some measure, as idiosyncracies. There was a case at Stamford, a few days ago, in which a person was taken most seriously ill from eating a crab, which had been just boiled. There was no question about its condition; it had been alive in the morning, and was only just boiled, and yet the person became most seriously ill afterwards. I know a person who cannot take anything that has the least particle of egg in it. Some time ago, he told me himself that he was in Kent, and went to dine at a friend's house. He is always extremely cautious as to what he eats. There was an apple pudding, and he thought it was utterly impossible that there should be any egg entering into its composition. He ate some of the crust, and was taken very seriously ill, and on inquiry he found that there had been an egg put into the crust. These cases, however, I believe are pure idiosyncracies.

Mr. HARRY CHESTER—There was an inquest held the other day on a person who was said to have been poisoned by a goose. Let me ask you one question. You have told us that fungi are a very important article of food in Russia. Is it not also the case that in other countries beside Russia fungi are much more eaten than they are in England—in France and Italy, for instance?

Mr. BERKELEY—I dare say it is, and I shall come to them presently; but the reason why I mentioned Russia was, that there fungi are a staple food. In the south of France I am not aware that they lay them up for winter store by pickling, or anything of that kind, but they do suspend a few on strings, and dry them for future use. They certainly eat a great many there. There are a great many people in this country who eat fungi very largely, but I say, even making every allowance for prejudice and for these occasional accidents, I think there is no doubt that a great deal of very valuable food is wasted and neglected. Of course, the distinction of good species from bad species is a matter of experience, but it is an experience that we are all of us accustomed to. A person goes to a brook and gathers watercresses. There are several poisonous or disagreeable plants occasionally mixed with them—as brooklime, wild celery, *Cicuta virosa*, and other things, but every watercress gatherer knows how to discriminate between the one and the other. Again, one hears of cases of gross ignorance in which aconite is substituted for horse-radish, but no person who has ever seen a root of aconite and a root of horse-radish could, one would think, by any possibility make any difficulty about it. There was a case, I think, about ten days ago at Stamford, not a fatal case, but one in which a most serious illness arose in that way, but this is gross ignorance and carelessness, arising from want of observation, which it is impossible for us to guard against. From my own village, where I am incumbent, I can give you a proof of how valuable fungi may be. Our schoolmaster was a person of some scientific information. He had made a nice little collection of entomology, and was employed as amanuensis by Mr. Baker, when he commenced his History of Northampton. You will see by this that he was a man a little above the ordinary level. At a time when he could not afford to buy meat he told m himself that he kept his family for several months upon different species of mushrooms. He was a person who was able to distinguish between that which was good and that which was bad, and he collected them himself. Even *Agaricus campestris*, as I said just now, is said occasionally to prove poisonous. There is so much fear in France lest something should be substituted for it, that no specimens of the common mushroom are allowed to come into the markets except those which are raised artificially in the catacombs at Paris. It is considered pretty certain that those at least will be true mushrooms, but I do not think that that is quite so certain. I myself have seen a great variety of fungi which have been grown artificially. I had the other day two baskets of fungi—apparently very fine specimens of *Agaricus campestris*. I took one out of one basket, and I found that the gills were perfectly white, and they had not a trace of spores about them. This surprised me very much, and I thought it might have arisen from their having been grown under peculiar circumstances. To my great surprise, when I looked at the other basket, which contained apparently still finer samples, there were some in which the gills were in a still worse state, and one in which they were very nearly obliterated. The obliteration of that, and indeed the white colour, was produced by a parasitic fungus of the genus *Hyphomyces*. I have had specimens submitted to me before, which were very much altered by this parasite, and I think it is very doubtful whether fungi affected in that way would be good articles of food. At any rate, I am quite sure that the mycelium of this parasite would penetrate every part of the fungus, and it would probably take away any good quality it had. You go into Covent-garden market, and you see an enormous quantity of mushrooms there, but you scarcely ever see a single specimen of *Agaricus campestris*, except those which are artificially grown. I scarcely ever saw a true *Agaricus campestris* in Covent-garden market, except in the arcade, though one sees there sometimes forty or fifty bushels of *Agaricus arvensis*. In my own part of the country scarcely anybody will eat it, as it is supposed to be poisonous. This, however is a prejudice, and a very mischievous prejudice, because *Agaricus arvensis* is perfectly wholesome, except perhaps one or two varieties, which I will mention presently. Some years ago, when my friend the Rev. Richard Thomas Lowe, who is a well-known naturalist, and accurate observer—as everybody is well aware who has ever studied his "Flora of Madeira," first went to his living at Lea, near Gainsborough, he found that the people would not eat mushrooms belonging to this species. There they grow in immense abundance, and acquire frequently a large size. I have seen some of them which weigh several pounds. He ate them himself, and the consequence was that the people began to think if he ate them with impunity, they might, and now the Leeds market is supplied pretty profusely with this species from this part of the country, and many cartloads go up to the market. I have seen myself in Northamptonshire rings as large in diameter as this room, producing an enormous quantity, which the people neglect, except for ketchup. I eat them myself, but there are very few people who will venture to do so. Still, as I have already said, every variety is not wholesome, and people have a very great prejudice against any mushroom which turns at all yellow. The best mushrooms, as everybody knows, are red when they are bruised, but the horse-mushrooms, as they are called, are not red, but rather yellow. There is a variety which grows under hedges, a very handsome plant, of an intense yellow when bruised, which I believe to be poisonous, and I certainly should not recommend anybody to eat that variety, or indeed any variety where the juice turns to an intense yellow, as is sometimes the case; but where the change is only to a pale yellow, I believe it is quite as wholesome as *Agaricus campestris*. Some time ago I was at the table of a friend in my neighbourhood, and an *entrée* was handed round to me, in which I saw some of these intensely yellow mushrooms. I tasted one of them, and the flavour was so rank that I thought it was far better to give my host a hint on the subject, than from false politeness to allow his guests to be poisoned, as I believe they would inevitably have been if they had eaten them. I think that that is a very important point about *Agaricus arvensis*; but thousands of people eat the ordinary form of the species in London every day in autumn, and I have never heard of anybody suffering from them. I will come to ketchup presently. I have done now with this and *Agaricus campestris*, and I will take next in order *Agaricus gambosus*. There has been great confusion about this, because old Sowerby imagined that it was the St. George's *Agaric* of Clusius, because it comes rather early in the year. It is a perfectly white fungus, the surface of the pileus shining, and very closely re-

sembling that of a cracknel. It grows in rings, in exposed pastures, in various parts of the country, after the first April rains, which generally come about the 20th of April. It is an excellent species, and one that a person cannot very well make any mistake about. It sometimes attains a large size; is excellent in flavour, and perfectly wholesome. I have sometimes met with them in very great abundance. *Agaricus procerus*, again, is a most excellent mushroom. It is tall, with the pileus white and scaly. It is a mushoom of a delicate flavour. I have seen it grow in immense quantities, and it must be considered a very useful species. It is said to be sometimes sold in Covent-garden market. It must not be confounded with a somewhat similar species, *Agaricus rachodes*, every part of which turns red when bruised. *Agaricus personatus* I have mentioned before. It is a coarse fungus, but I believe in general perfectly innocent, and it is one which, late in autumn, is produced in many parts of England in the very greatest abundance. I am sure that at any time of scarcity or famine it would be a valuable article of food, though I do not say that it would be quite so agreeable as some other species. Then we come to the large puff-ball *Lycoperdon giganteum*, which attains a considerable size. That, too, is of value. It must, however, be used before the slightest change in colour takes place, as it then becomes rank, and acquires a very disagreeable flavour, but in its young stage it is a most excellent esculent if properly cooked. It is very much esteemed in Italy. The fungus is gathered when young, and kept in a cellar, slices being cut off as they are wanted. The plant is often kept for a considerable length of time, and is much esteemed, but I doubt very much whether you would get anybody to eat it in this country except connoisseurs. Unfavourable reports are sometimes made, but I suspect that large states of other kinds are sometimes confounded with it. *Agaricus rubescens* is one of our most abundant fungi. In fir woods you may get almost any quantity. It grows on the ground, and is easily distinguished from other allied species by its turning red when bruised. I cannot say I ever eat it myself, though I know many people who do. My friend Dr. Hogg eats it, and considers it extremely good. It is a very abundant species, and it is one of those species that a person with the slightest powers of discrimination may distinguish accurately from others. You would, indeed, say that it is utterly impossible to confound it with *Agaricus muscarius*; but, still, until people are educated for these things, accidents will happen. Some years ago a curious thing happened to my friend, Dr. Badham. He gathered some of these Fly agarics, and sent them over to a friend's house—not, however, to be eaten, but to make a decoction to kill flies with. The gentleman of the house was unfortunately from home; but there were two ladies there, his wife and his sister. When they saw them they thought that they were nasty poisonous-looking things, but said, "Dr. Badham would never have sent them here if they were not wholesome; we will have them dressed, and served up for breakfast." Accordingly, they had some of them dressed, and ate them, and in about a quarter of an hour they began to get very ill, and in a very short time they were both carried up to bed in a state of deep intoxication. This is the very species which the people in Kamschatka, and some parts of North Asia, use for the purpose of intoxication. Poor Dr. Badham was always getting into scrapes, of one kind or another, with fungi. He was made very ill one day, in a very curious manner, from a very small quantity of fungus—so small a quantity that you would have thought it utterly impossible that he could have been at all poisoned with it. He got one of those large milky fungi, *Agaricus vellereus*, and laid it in a plate to collect the seeds—or, more correctly speaking, the "spores." He simply put his finger in his mouth, wetted it, passed it through the spores, and then licked them off, and, to his great surprise, was ill in consequence. There was also a case in which not he himself, but his schoolmaster, was the sufferer. This schoolmaster, after the example of his master, ate, amongst other species what he supposed to be *Agaricus ostreatus*, a very indifferent species. The schoolmaster unfortunately mistook for this *Agaricus euosmos*, which he could only do from extreme carelessness, and suffered much in consequence. Dr. Badham, of course, bore the blame which was simply due to his schoolmaster. The doctor stayed with me once, and we had all sorts of things cooked. At last we got *Agaricus deliciosus*, and my cook said she was sure that if we ate it we should be poisoned, and she absolutely refused to cook it. It is one which grows in very great abundance in fir woods occasionally; and I can positively state myself, having partaken of it, that it is most excellent, but it is a most questionable looking thing to a person who does not know anything about it, because when you break it a bright orange-coloured blood exudes in enormous quantities, which soon turns green; so one need scarce wonder at some degr e of hesitation. I must not omit the very best of all our fungi, which is *Marasmius oreades*. This is one which is produced sometimes in very great abundance. I have seen it where you could actually get bushels of it. It has an extremely fine flavour, and makes, perhaps, the very best ketchup that there is. I have also seen it in immense abundance at Kew, accompanied by another species, *Marasmius urens*, which has a very acrid taste, and which is in all probability poisonous, and it would therefore be very necessary to distinguish between the two. But the true *Marasmius oreades*, or *Champignon*, as it is sometimes called, has cream-coloured gills, while *Marasmius urens* has brownish and much narrower gills, so that a person ought not to make any difficulty about it. Before we get out of the genus *agaricus* and its near ally, *Marasmius*, I might mention some other species, but I think I have noticed the principal ones. We come now to *Boletus*. In this genus there is one most excellent fungus, *Boletus edulis*. In my part of England it is very scarce, but in some parts of England it is abundant, particularly about Tunbridge Wells, and it is now very much used there, in consequence of Dr. Badham having brought it into notice. I had some cooked last year in Sussex, and everybody pronounced it excellent. But there are many species of *Boletus* which are acknowledged to be poisonous, and should be carefully distinguished. The grand distinctive character of *Boletus edulis* is the reticulated stem, which is accurate enough when comparison is made with its own immediate allies, but in the poisonous group distinguished by the mouth of the tube being red and the flesh becoming blue. When broken, the stem is sometimes reticulated, and there are other instances. *Boletus fellens*, for example, might be very easily indeed mistaken for it as regards external appearance, though its bitter taste ought to distinguish it; people, however, do not always taste fungi when they get them. Mr. Salter, indeed, who was formerly attached to the Geological survey, informs me that when at a distance from places amongst the mountains, where he could not obtain food, he had made use of various species of *Boleti*, and found them an excellent substitute for meat. Unfortunately we have no accurate information as to the particular species. I must not omit the common chantarelle, *Cantharellus cibarius*. I have seen it in Scotland in the utmost profusion, but no one could be induced to eat it, as it is thought to be poisonous, though its very agreeable smell is highly in its favour. There is another fungus, *Hydnum repandum*, which is a most excellent one, but it requires a little caution in the preparation for the table. It should be previously steeped in hot water, and well drained in a cloth, in which case there certainly is not a more excellent fungus than it is. I said I would say something about ketchup. There are persons in our Midland Counties who are great ketchup merchants. They purchase what is collected about the country, and store it in barrels, with enough salt to prevent putrescence, and sometimes keep the mass for two

or three years, till it commands a good price, when it is boiled down with spice, strained, and sold as ketchup. I believe they use anything that yields a black juice almost indiscriminately. Such watery species as *Copirnus atramentarius*, known under the name of "numparels," and other of these deliquescent fungi are in great favour, though their only merit is yielding a great quantity of juice, which is of an intense black, on account of the enormous quantity of spores which it contains. I know that they use these in great quantities, and certainly they do not improve the flavour of the ketchup, but one never hears of any accident from the ketchup so made, and I suppose that something may depend on the quantity of salt which is used, and the comparatively small quantity of the condiment which is consumed at any single time. Whether that has any effect upon the amanitine, which I believe is the poisonous principle in fungi, is perhaps doubtful. One would suppose that the vinegar, as used in Russia, would be more likely to neutralise it. I never, heard of anybody being poisoned with this abominable ketchup. A great portion of that which comes to London is probably made in the way I have mentioned. I believe I have mentioned the principal facts, as far as I know them, which bear upon the question of fungi as an article of food. There are one or two useful treatises on the subject. I think Mr. Cooke's is a nice little book, but if I recommended one rather than another it would Dr. Hogg's. Then there are two tables of fungi—one of esculent fungi, and the other of poisonous fungi, which are published by Groombridge, and which, I think, are good things to hang up in a school. They are by Mr. Worthington Smith, but I do not think they quite do justice to his drawings. It would be an excellent thing if he could be induced to publish a series, of the natural size, of those fungi with respect to which there can be no mistake; and if the Society of Arts would undertake anything of the kind, I have no doubt he would be very willing to supply the figures. He is a most excellent draughtsman, and is familiar with a large portion of the British species of fungi. I have before me something which has interested me very much. It is a box of specimens of a new method of preserving fungi. They are not models of fungi, but real specimens of fungi, and you see how beautifully the gills are preserved. (The reverend gentleman handed to the Chairman the specimens referred to.) These have been sent to me by a man of the name of English, at Epping. He tells me that he has been in the habit, for some years, of going about Epping Forest collecting insects; that he admired fungi very much, and that he tried several experiments about preserving them. They are preserved with wax, but I do not know the exact method which is pursued.

Mr. Harry Chester—Would it not be a good thing to have specimens like that in the South Kensington Museum?

Mr. Berkeley—Certainly; and I have no doubt that Mr. English would be most glad to supply them.* I have his letter in my pocket. It is as follows:—"Epping, Feb. 24th, 1868.—Reverend sir,—Having rambled over the forest and woods for many years in search for insects (*Lepidoptera*), and observed the numerous species of fungi growing in the neighbourhood of Epping, the forest being very extensive offers a good opportunity for a collector. In the autumn of 1866 I commenced collecting fungi, in hopes of preserving them in form and colour; but, to my great dismay, I found many difficulties to encounter—gills collapsing and shrivelling, and a host of other troubles. But perseverance soon rewarded me with perfect specimens—perfect so far as dry specimens could be, to my thinking. I continued to collect specimens, and mounted about thirty species under a glass shade, which gave a very pleasing effect, and were admired by those that saw them; but as those gentlemen did not know anything about fungology, I could not obtain any information on the subject. Last autumn I purchased your excellent work ("Outlines of British Fungology"), and found a great deal of necessary information. I now began working more in earnest, and collected a great many species. I commenced by making a careful outline of each species, and copied the contour of pileus, gills, and stem, and numbered each species before drying. In order to give them a pleasing aspect and life-like appearance I waxed them over, which preserves them from damp, and they do not mould or get out of shape. Now, whether this waxing and mounting is admissible to science, and retains enough of character to make them of sufficient interest to form collections, I have to ask your opinion on the specimens sent, being a fair example of what I have done, although not the most difficult. Among those I have mounted are *Phallus impudicus*, *A. atramentarius*, *A. fascicularis*, showing the cespitore character, and *A. radicatus*, with its long stem and distant gills, and many others that are very difficult. Although I am aware that many species would be impossible to preserve, would it be worth persevering in the plan, and carrying it out as far as practicable? The *Boleti* are very difficult, but I feel certain of success from some experiments I have made with them. I have enclosed some dried specimens, with corresponding numbers, showing them as they are before waxing. I do not want them returned, if you should like to show them to any of your friends and fellow-workers in this beautiful study.—I have the honour to be, reverend sir, your most obedient servant, James English."

Mr. Harry Chester—If Mr. English would undertake the labour of making a collection, and you would look at it, I should think it would be very valuable.

Mr. Berkeley—I have no doubt he would make a very nice collection. If you compare these with the models that are in the British Museum, you will see that they are more natural.

The Chairman—Can you suggest any means to us by which, by giving information, some degree of the popular prejudice might be removed? Do you think any intelligent greengrocer in Covent-garden market would exhibit a set of those which you guarantee as wholesome?

Mr. Berkeley—I see considerable difficulties in such a plan.

The Chairman—Is there any evidence as to what one might call the digestibility of fungi? Because a thing may not be poisonous, and yet, to a considerable extent, be indigestible.

Mr. Berkeley—I might have said that one reason why people suffer from eating fungi is, that they come home excessively hungry; having got a basket of these things on their way home, they are cooked, and then two or three pounds are consumed, and they wonder very much if they prove indigestible. Some years ago Dr. Willdenow determined to make the experiment how far he could live upon fungi. He went into the woods, and confined himself to fungi, and the black bread which they have in his country, and said he was never so well in the whole course of his life as he was when he persevered for a considerable period in that regimen.

Mr. Foster—Are those he ate considered indigestible?

Mr. Berkeley—Yes; but then he masticated them with the bread. We find in England that fruit is very indigestible. In Germany, however, many persons half live on fruit, but then they eat their brown bread with it. I believe all sorts of fruit are wholesome if you masticate it well with bread. I conceive there is nothing specially indigestible about fungi. If you swallow great lumps, of course it becomes like so many pieces of sponge, but properly masticated with bread, I do not believe there is anything specially indigestible about them. I should not recommend anybody to eat any species of mushroom that was not perfectly fresh.

* Mr. Berkeley has since had a letter from Mr. English, in which he promises to present the Museum with a group similarly prepared.

Mr. HARRY CHESTER—There is, unfortunately, a difficulty in London in gettting such things fresh, but could they not be properly dried, and reduced to powder and preserved? It seems to be done in foreign countries.

Mr. BERKELEY—In the Italian shops they sell powdered mushroom, but I suspect there is occasionally a great deal of chalk in it. I could never make any use of the powder. It is clear that it would be a difficult thing to dry any mushroom so as to reduce it to powder.

Mr. CHESTER—Could you tell the committee anything about mushrooms as compared with meat?

Mr. BERKELEY—I am not aware that there is any very good analysis of mushroom. The best, perhaps, is in Thompson's Chemistry. However, there is a large quantity of nitrogenous matter in it. I do not know that there is any ozmazone in it. I am not aware of any very recent analysis. It would be a desirable thing to have plates illustrating the different species of fungi. There are two sheets published by Hardwicke, but I think the fault of those is that there are too many species on each sheet. Five or six would be quite enough, instead of which there are perhaps twenty. Another thing is, that many of them are things which are not at all likely to be met with in any quantity, and which might therefore be omitted. What you want is a few really good figures of a few common things. I think it would he a good thing to get a good analysis of mushrooms from the School of Mines.

Mr. HARRY CHESTER—Are fungi much affected with parasites?

Mr. BERKELEY—They are sometimes very much infested with the larva of flies, which makes them extremely disagreeable. I should not like to eat them in that condition. I have seen mushrooms dressed in which the larva were absolutely not killed by cooking. One might get them into one's stomach and produce very unpleasant results.

Mr. FOSTER—There is a mushroom which grows in what are called "fairy-rings."

Mr. BERKELEY—That is *Marasmius oreades*. It is one of the best. Many *Agarici*, however, have the same habit, as, for instance, *Agaricus arvensis*.

Mr. HARRY CHESTER—There is also one which grows on the tree—an orange red.

Mr. BERKELEY—That is *Fistulina hepatica*. It is not very common. It grows on oak trees. Some years ago I was staying in Flintshire, and found a most magnificent specimen of that in the park of a friend. We had it cooked, and it certainly was one of the very best things I ever ate, but then it was prepared by a skilful cook. It is not good when inartistically dressed.

Mr. CHESTER—Could you mention any little treatise that would be useful in schools?

Mr. BERKELEY—No; they must be expensive, because they must have good and well-coloured representations; they are of no use unless well coloured.

Mr. HARRY CHESTER—Would it not be desirable for the Horticultural Society (particularly now that there are so many shows held in different parts of the country) to offer prizes for the best collection of wholesome mushrooms? It would call the attention of people to it.

Mr. BERKELEY—I will bring this matter before the society.* I am in communication with Mr. Ingram, the gardener to the Duke of Rutland, and he has promised to make experiments to show what difference there is between field mushrooms and the *Agaricus campestris* grown from spawn. Those that grow in the open field are of a much better flavour, and more digestible. Mushrooms are grown at Belvoir in a very curious way. The Duke of Rutland has a large riding-school where they exercise the horses. They put straw down, and the horses going round and round tread it till it becomes almost as small as chaff, and it is found to produce most excellent mushrooms. Experiments have been made at the Horticultural Society with regard to the growing of esculent fungi, but I am sorry to say they have failed entirely. We also took great pains to grow truffles, but that was equally abortive. I think we require to know a great deal more about them than we do at present. It is quite certain that *Agaricus campestris* is not so frequent in the country as it formerly was, whether on account of some of the improvements in the mode of agriculture or not I do not know. I know they were much more abundant when I was a boy than they are now. We never thought then of eating any that was not a real pink-gilled mushroom, and no cook would ever use anything else. There is one excellent fungus which I have not mentioned — *Morchella esculenta*. It is very rare in my part of the country, but I do not know that it is so in the South of England. It is the morrel of commerce. It grows about Margate in such abundance that they make ketchup of it. Many fungi besides *Agaricus campestris* come up in mushroom beds. There is a white-gilled one which is very common at Belvoir, whether the spawn is used under shelter or in the open ground, which is probably wholesome. I have lately received specimens of *Agaricus phalœnarum*, which came up in great abundance at Street, in Somersetshire, on a sea-kale bed, and proved a very agreeable and wholesome article of food.

Mr. FOSTER—Do you think any of these species of mushrooms could be cultivated commercially?

Mr. BERKELEY—Mr. Ingram has tried, and he is a most excellent cultivator, but he has never been able to succeed. I supplied him with the spawn of those very things that we tried at the Horticultural Society, but he had no success.

Mr. M. B. ORR, of the firm of Orr and Honeyman, Glasgow, attended, and gave evidence in reference to dried meat in powder, from Australia, specimens of which were laid before the Committee.

Mr. ORR, in reply to a question from the Chairman, said,—I do not know that I have any particular statement to make to the Committee, but seeing that a Committee on Food were sitting, I thought I would send these specimens. I called here this morning, and was asked to attend here this afternoon.

The CHAIRMAN—We had something of this sort here before. We got Dr. Taylor to analyse it, and he reported very favourably on it. Is this merely pounded, or is anything else done?

Mr. ORR—It is dried on plates, by steam. The plates are tinned, so as to prevent any oxide from getting into it, and it is then ground. Nothing is done to preserve it except dessicating it—first drying it and then pounding it. I do not know what the qualities of the other specimens are, and therefore I cannot compare this with it. There are only about three cwt. of it in this country at present. It can be sold at two shillings a pound, and I believe we may reduce the price. Five pounds of fresh meat is reduced to one pound without losing any nutritive qualities? There is no salt with it, but it is smply dried meat; I do not know that it would be desirable, but a greater quantity of jelly could be put into it if wished. This has been exported to Glasgow; there is no regular place in London for the sale of it. We are the agents in Glasgow of the importers in Brisbane. It is made in Brisbane. I consider the mutton to be equally as successful as the beef. I have tried both at home, and find both uncommonly good. I have had some for ten months, and which has been good all that time. I do not know how long these specimens have been made, but they must have been made this five or six months, because they have come all the way from Queensland. We have had letters from ship-captains who have tried it on the voyage to England, and they state that they find it to be very good, and to keep well.

* The subject has already been mooted, and a prize proposed. A second prize will shortly be offered; and it is hoped that an interesting collection will appear at one of the Tuesday meetings in September.

If I could get any suggestion upon it I should be glad, as I am a business man, and not a scientific man.

Rev. J. E. Hall—I think it would be a good thing when the tins are filled to take a piece of paper steeped in a solution of isinglass and put it on the top of the meat. I have seen preserves treated in that way, and it keeps them from getting mouldy, and preserves the flavour most excellently.

The Chairman—We are very glad to have an opportunity of seeing it, and shall be glad if you will leave some specimens of it here.

Subsequently some specimens were laid before Dr. A. S. Taylor, F.R.S., for examination, who reports as follows:—

"Excepting the appearance there is nothing objectionable in the two samples of dried beef and mutton which you left with me. I cannot discover any acari in either. There is no offensive smell; and I do not find, by operating in a close vessel upon the whole of one parcel for forty-eight hours, that the slightest trace of ammonia is evolved. The odour is like that of dried fibrin and albumen. The colour is peculiar, and rather repulsive, but this, of course, is a matter of fancy or taste, and in the cooked state it would constitute no objection. It consists of fibrous animal matter reduced to powder, containing a small quantity of oily substance associated with it. A portion is soluble in cold water, and this indicates a slight acid reaction to test paper. A larger quantity is dissolved by hot water, while a still larger proportion (fibrin and coagulated albumen) remains undissolved after boiling. The dry powder contains a large proportion of nitrogen and sulphur, such as dried meat would contain. I have not determined the amount of mineral matter contained in it, but I suppose it would not exceed two or three per cent. On the whole, I think it would prove a nutritious article; but unless kept closely shut up in tins, it would be liable to be attacked by acari."

Twenty-Second Ordinary Meeting.

Wednesday, May 13th, 1868; Thomas Hawksley, Esq., C.E., in the chair.

The following candidates were balloted for, and duly elected members of the Society:—

Brooke, William, Northgate-house, Huddersfield.
Waddington, John, 35, King William-street, E.C., and Hope-villa, Longton-grove, Sydenham, S.E.

The Paper read was—

ON THE VARIOUS METHODS OF LIGHTING STREETS BY GAS, WITH PROPOSALS FOR THE INTRODUCTION OF AN IMPROVED SYSTEM.

By Stephen Tucker, Esq., M.A.

"Non fumum ex fulgore, sed ex fumo dare lucem, cogitat."—*Horace.*

I very much regret for myself, I still more regret for you, that it has unexpectedly devolved upon me to bring a subject to your notice of which I possess but a literary and anything but a practical knowledge. Indeed, I could have little justification in addressing myself to so many better versed in the matter than myself, if I had not the ulterior object of submitting to your criticism a recent and very ingenious invention—not, I need hardly say, of my own—in connection with gas lighting.

When exploring any new field in science or literature, however much one may be assisted by the recorded labours of predecessors, there is a certain amount of discouragement in discovering, as I have in this instance, that the thing has been done over and over again, and by writers too, whose inkstands I am unworthy to hold. One of my difficulties, therefore, has been to avoid a simple repetition of that already known to you. I must tell the same tale, though perhaps in a different way; and if I may lay claim to any originality, it will be found in the historical arrangement of my materials, and that, while limiting myself to the terms of my syllabus, I shall hope to show the gradual development of artificial lighting; and as gas illumination, as a general principle, is scarcely half a century old, I must ask you to bear with me while I take a retrospect of the means known to and employed by the ancients and in the middle ages. It is a long and dreary road to travel, but I can promise you a light of some sort all the way.

It is but reasonable to assume that the several means of setting fire to wood and other inflammable substances were known to the earliest of mankind. The first scriptures speak of fire and burnt offerings; and similar expedients for illumination were doubtless adopted when needed. We know that the Egyptians had lamps, and so many of them that (with the early Greeks) they could not only afford to use them for the living, but to bury them with their dead, as symbolical of the soul's immortality. The use of the lamp or light in religious metaphor, ceremony, or parable has ever been remarkable; and even at the present day the burning candle and smoking censer seem to be reverenced by some of our priests as indispensable to salvation.

Candles are first mentioned by Pliny. Referring to the lost books of Numa, he records how the scribe Terentius discovered the king's sepulchre, and in it a parcel of books tied with candles, which, as they were applicable to such a purpose, must have been made of string or flax, dipped probably in pitch or wax. Some of the earliest candles, however, were made of leaves of papyrus covered with wax or tallow, and so distinguished as *cerei* (wax) and *sebacei* (tallow). From the minute directions he gave to his chaplain, it would appear that King Alfred knew more about candle-making then he did of the baking of cakes; he commanded him "to supply wax in sufficient quantity, and cause it to be weighed in such a manner that when there was so much of it as would equal the weight of 72 pence, six candles were to be made thereof, each of equal length, so that each candle might have 12 divisions marked across it." It was not, however, till the 15th century that the use of candles became general in this country, and at that time the Company or Guild of Chandlers obtained their charter of incorporation. Companies seem to have been "got up" in these old days just as they now are, whenever demand threatened to out-balance supply. I don't know whether in any sense the Company of Candle Makers was limited, but they must always have been in a state of liquidation. In olden times candles were invariably made by dipping the wick into the melted wax or tallow; and it was not until the 18th century that the Sieur de Brez invented in Paris the still existing process of casting them in metal moulds. The candle branch of my subject I found very interesting, but I will here dismiss it, as it cannot strictly be classed with external lighting.

Beacons, open fires of wood and coal, torches, lanterns, first of horn and then of glass, bowls and braziers holding and burning various substances, and lamps, first filled with vegetable and then with other oils, were the means by which public lighting was effected by the ancients, with more or less generality or extravagance, according to their requirements or civilisation.

We have abundant evidence that lamps were common enough in Rome and all Latin cities; and the streets so early as the days of Constantine (A.D. 353) were so far artificially lighted, that Ammianus Marcellinus speaks in evident astonishment of the ease with which conspirators could plot treason: — "Ubi pernoctantium luminum claritudo dierum solet imitare fulgorem."

The suitors of Penelope are said to have paid their homage with torches and odoriferous wood burning in braziers, although they might have treated her and regaled themselves with a more modern article—the lamp; the main principle, however, and rude appliances of which remained substantially the same till the invention, in 1780, of M. Argand, of Geneva, upon which no im-

provement of any practical importance has since been made. (Argand's Letters Patent, dated 5th January, 1787—annulled at Revolution in 1793). Public illuminations for the celebration of victories or religious festivals are of great antiquity. One is recorded when the conspiracy of Cataline was defeated by Cicero; but the actual nightly lighting of streets was of very slow growth, the public buildings only being at first adorned with lamps. Jerome refers to a serious dispute maintained for some hours in the streets of Antioch, between "a disciple of Lucifer and one of the orthodox." This lasted till the lamps were lit, when they spat in each other's face and retired,—an easy way of settling religious controversy, which gains in satisfaction what it loses in courtesy.

Eulogius, Governor of Edessa, kept lamps burning throughout the night, and used part of the oil given to the churches for that purpose.

In tracing the further development of public lighting, I cannot do better than quote verbatim the following passage from an early, but nevertheless elaborate and valuable, treatise on this subject by Dr. Letheby, to whom, amongst many kindnesses, I am also indebted for very material assistance in the compilation of this paper.

He says:—"Until very recently, the modern cities of Europe were no better provided for in this respect (street lighting) than the ancient. It is true that statutes were made, and orders proclaimed, to the effect that every citizen should contribute his share to a system of general illumination. This was effected by placing a candle in each of the lower windows of the house, and keeping it burning, from nightfall to the hour of twelve. At first the performance of this duty was optional, but at last it became compulsory; nevertheless, it was at all times so sadly neglected, that the thief and the assassin had abundant opportunities for mischief. Paris was the first city to improve on this condition of things; for in the year 1558, huge contrivances, called 'falots,' were erected in the principal thoroughfares. The 'falot' was a sort of vase filled with pitch, resin, and such like things, in a state of combustion; but it was soon found that this mode of lighting the streets was expensive, dangerous, and inconvenient, and consequently the 'falot' was quickly displaced by the lantern, which was a rude frame, covered with horn or varnished leather. For more than a hundred years this was the plan of illumination generally adopted; and, as may be supposed, the light was too feeble for any useful purpose; indeed, no one of importance ventured abroad after dark without his torch or flambeau. The latter, therefore, became so indispensable to the midnight traveller, that an ingenious Italian, named Laudati, conceived the idea of opening stalls for their hire. He started his business in Paris, in the month of March, 1662, and he managed it so well that he obtained the entire monopoly of the whole city. His charge for a link was from three to five sous the quarter of an hour, according to the rank of his customer. In 1667, Nicholas de Regnio, the first lieutenant-general of police, introduced a still better system of street-lighting. He invented lamps of glass, which, from their resemblance to a bucket, were called *lanternes à seau*. These he fixed in the middle of the streets, exactly in the same way as they are now suspended in many parts of France, by means of ropes or wires fixed at each side of the street, the lamp being suspended in the centre."

If religious discussions were only terminated in London, as we have seen they were at Antioch, by the timely lighting up of the streets, one need not be surprised that they were so rife amongst its inhabitants in the 15th and 16th centuries, for there is little record of any light, save those in Smithfield, which burned to put a stop to them in another sense. The quaint old chronicler, Stow, in his "Survey of London," tells us that "In 1417 Sir Henry Barton, the Mayor, ordained lanthorns with lights, to be hanged out in the winter evenings, betwixt Hallowtide and Candlemasse"—a very appropriate season, by the way, for their discontinuance. Successive mayors kept on "ordaining" the same thing for three centuries, and then the Corporation contracted with a person for the public lighting, for which service he was empowered to levy a tax of 6s. per annum on every householder paying over £10 rental. The City authorities first applied to Parliament for power on the subject of public lighting in 1736, and again in 1744.

Beckmann says, that "Amsterdam was first lighted in 1669, Hamburg in 1675; Copenhagen, 1681; Berlin, 1682; Hanover, 1696; Leipsic, 1702; Vienna, 1704; Dresden, 1705; Halle, 1728; Birmingham, 1783; Brunswick, 1765; Nantes and Marseilles, 1777; Zurich, 1778; and Strasburg, 1779." The name of M. de Sartines should not be omitted, as one specially identified with the subject of public lighting, and under whose influence the reflector lamps were introduced by Laugrin.

As to whom is due the discovery of coal-gas, and more particularly its practical application as a means of lighting, was for long, and with some may be said still to be, a subject of dispute. The very derivation of the word itself has proved a bone of contention amongst the learned; it is, however, I believe, from the Norse "gaesa," to ferment; from which the German "gascht," or "gast," another supposed root of "gas," may be derived. I have also read that some chemists, deliberating as to a name for the new discovery, argued thus—"It is not air—it is not a spirit—let us call it "gheist" (ghost). At any rate, the term seems first to have been used by Van Helmont, and to denote an uncoagulating spirit. Gas, indeed, may be said to describe any air which exudes from bodies under the influence of heat.

I do not see how we can account for the so-called "perpetual fires" and "sacred lamps," so associated with Pagan superstition, unless we give the ancients credit for having taken advantage of the escape of hydrogen gas from the earth, and in localities where, for that reason, their altars were placed. They must have used gas, although in perfect ignorance of its nature and origin. I take it that the existence of other gases, besides that of which I particularly treat, was known to much earlier philosophers and chemists than those from whom their introduction dates by ordinary repute. The properties of oxygen, for instance, although never generally known till within the last 70 years, were distinctly propounded, as early as 1654, by Dr. Bathurst, Dean of Wells, in his "Prælectio tertia de Inspiratione," in which he describes it as the "pabulum nitrosum, vel spiritus aëris nitrosus." He asserts it to be an essential of life, from which "non hominum solum cæteraque animalia, sed et ipsæ etiam plantæ vegetari videntur et reviviscere." Four years after this—viz., in February, 1658—Mr. Thomas Shirley communicated to the Royal Society his experiments upon gas issuing from a well at Wigan. The paper is printed in the *Philosophical Transactions* for June, 1667, and is headed, "Description of a Well and Earth in Lancashire taking fire by a Candle approached to it."

It was at Wigan, also, and not improbably at the same place, that the attention of the Rev. John Clayton, D.D., Rector of Crofton, and afterwards Dean of Kildare, was drawn to the investigation of the nature of coal gas. Dr. Clayton seems first to have communicated his experiments to the philosopher Boyle (the Hon. Robert Boyle), in a letter dated 12th May, 1688; and although the Dean's discoveries only date from their appearance in the *Philosophical Transactions* in 1739, he is clearly entitled to rank before Dr. Stephen Hales, whose distillation of coal appeared in his "Vegetable Statics" in 1726.

In 1733, Sir James Lowther, of Lowther, sent to the Royal Society an account of "damp air issuing from the shaft of a coal mine near Whitehaven," and of its being collected in bladders and burnt. It is worthy of note that two other members of this eminent family identified themselves with the history of gas. Lord Lonsdale, the descendant of Sir James Lowther, offered to

light Whitehaven, at his own cost and risk, in the earliest days of gas lighting; but the inhabitants were afraid of explosion, and refused the munificent proposal. And the present venerable Earl, when in the House of Commons as Lord Lowther, divided the House, and was in a considerable minority, on the introduction of gas being first discussed.

In 1767, Dr. Richard Watson, Bishop of Llandaff, in his "Chemical Essays" (vol. 2) examined the nature of the gaseous products evolved during the distillation of pitcoal, although he was not, as has been believed, the first to discover its inflammable character after having passed through water. The Bishop was so respectable a philosopher, that he can afford for me to rob him, after the lapse of a century, of this one atom of his reputation. He is the third dignitary of the church recorded by others and enumerated by me, who materially contributed to the elucidation of the important discovery of gas, and it is well that Bishops and Deans of old had their attention drawn to a different sort of lighting to that which distracts their successors now.

It is certainly a remarkable fact that, notwithstanding all these discoveries, experiments, and papers in the *Philosophical Transactions*, it was more than a hundred years after the inflammable property of coal-gas was clearly proved, before it occurred to any one to apply it to some practical use; nor did this come from any scientific source,—William Murdoch, a miner and engineer at Redruth, in Cornwall, astonished the natives in that distinct and distant part of the country, in the year 1792—by lighting his house and offices with gas, and going to and from the mines at night in a locomotive, (another instance of his ingenuity,) also lit by it. Five years afterwards, Murdoch renewed his experiments with success, at Old Cumnock, Ayrshire; and in 1798 constructed the first gas-making apparatus, at the works of Messrs. Boulton and Watt, at Soho, near Birmingham. These works were illuminated by the new principle at the celebration of the Peace of Amiens, in 1802.

Contemporaneously with Murdoch, two men — both of whom disputed, though wrongfully, the priority of invention with him, were working hard in the same field. M. Lebon had fitted up a room, and lit it by gas in Paris—had made proposals for lighting the city, and applied for a *brevet d'invention;* and Mr. Winsor was lecturing upon the subject at the Lyceum Theatre, in London, which he had appropriately illuminated with the new and brilliant agent. In 1805, Mr. Northern, of Leeds, was urging this application of coal gas, and early in that year Murdoch introduced it into the large factory of Messrs. Phillips and Lee, of Salford; and Mr. Lee, when examined by Lord (then Mr.) Brougham before a committee of the House of Commons, upon the Gas Light and Coke Company's Bill, said he had 1,000 burners, and estimated their light as equal to 2,500 candles.

Gas now began to create considerable sensation, though half the civilised world were afraid of it, and a great part of the rest laughed at it. It was only in isolated instances where its advocates could influence its use; but in 1807 the college at Stonyhurst was the first public institution to adopt it, under Murdoch's direction; and Winsor obtained permission to try it in Pall-mall. This gave rise to a squib, which I am very sorry I have not been able to see, as, if I may judge from other effusions by the same author I have seen amongst the king's pamphlets, it would have amused you to have quoted it. It was entitled "Ludicrous Debates among the Gods and Goddesses in a grand council assembled on the proposed destruction of the notorious London Smoke by the use of Gas Lights; dedicated without permission to the National Light and Heat Company, by Obadiah Prim, Esq., M.D., B.A., F.R.S., F.A.S."

About the same time the imperfect lighting of the streets of Paris called forth the suggestions of a Mr. A. Lucas, who published his *Projet d'Institution d'une Surveillance spéciale de nuit pour la sureté publique;*" but as Mr. Lucas's system does not seem to have been adopted, it may be described as the "*Lucas a non lucendo.*" Mr. Lucas, I find, subsequently published a treatise on the social evil—a subject with which he seems to have been better acquainted. Paris was lighted by gas in 1820. It was not till 1812 that the Chartered Gas Company (incorporated as the Gas Light and Coke Company, in 1810) commenced operations, despite the prejudices and opposition of even the most eminent of scientific men. It was the precursor of the 13 companies now established and flourishing in London alone. Mr. David Pollock was the first governor of the Chartered Company; and Jerdan relates the story of his writing to his friend Dr. Masham (afterwards warden of Merton), asking him to take shares in the new scheme, to which Dr. Masham sent the following curt reply:—

"Believe me, Dear Pollock, I'm not such an ass,
As to fancy that Gaza's the Latin for Gas."

'Gaza,' I need hardly remind you, was the name given to the Royal Treasure of Persia, but I dare say Dr. Masham has often regretted since that he did not act upon David Pollock's suggestion. There is another anecdote of Pollock, which is worth recording; on his becoming so prominent on the gas question, Mr. Baron Bolland wrote of him:—

"Little David of old with a sling and a stone,
Slew Goliath the giant, alas!
If on our little David this task had been thrown,
He'd have poison'd the giant with gas."

In 1812 Mr. Samuel Clegg, who had been a pupil with Messrs. Boulton and Watt, and became the worthy successor of Murdoch as their engineer, introduced gas into various establishments—Ackerman's, in the Strand, being the first. In the *Gentleman's Magazine* for that year, it is shown also that the new scheme had reached the other end of Europe:—"May, 1812, Messrs. Sobolewsky and Horner, of St. Petersburgh, have announced the discovery of the process of the French engineer, Bon *(sic)*, and of Messrs. Murdoch and Winsor, for extracting gas from wood and coal and applying it to the purpose of illumination. Their greatest difficulty, they say, consisted in absorbing the smoke which exhaled from the gas, and in giving brightness and purity to the flames; for, in all experiments made in foreign countries, or in Russia, the flame was always weak and bluish, not very luminous, and attended by a mephitic smell. After many ineffectual experiments, they at length succeeded in obtaining a clear light from the gas, without any smell, and unaccompanied by any sooty evaporation. They have described their process, exemplified it by experiments to numerous assemblies, and undertaken to light the public national establishments, manufactories, &c."

As an evidence of the progress we have made in the matter of gas apparatus, I will trouble you with a description of what a writer in 1813 calls, "a much more preferable apparatus for producing a light." What the thing was to which this was "preferable" I am at a loss to imagine. He says, "It consists of a handsome box, lined with copper, containing hydrogen gas, confined by water. On turning a cock a stream of the gas issued from it, and is inflamed at the same moment by an electrical spark proceeding from an electrophorus placed as the bottom of the box; a candle or lamp is placed before the flame, by which it is immediately lighted. The cock must then be turned back to prevent an unnecessary consumption of the gas. The process for replenishing the box with the gas is cheap and easy, and is but seldom required. This apparatus would save the expense of a constant light in a bed chamber, and might be used with perfect safety."

The illuminations at the peace rejoicings in 1814 gave to the promoters of the gas movement a great opportunity for display; and although the 10,000 lights arranged at the instance of Mr. Pollock on the Pagoda in St. James's-park were doomed to an accident, it is specially noted, in an account of the day, that "one of

the most ingenious displays was in front of Knight's Gaslight Office, Fleet-street; a tree was formed of laurel leaves, with a profusion of blossoms; the blossoms were of gas light, and their keen and quivering splendour threw every other into comparative obscurity." In the previous year, Westminster-bridge was lit with gas; and Mr. Clegg had to do all the lighting and extinguishing himself, so fearful was everyone of explosion. The parish of St. Margaret's, Westminster, was the first to remove their oil lamps and substitute gas. In 1815 it was adopted at the Guildhall; and between that date and 1823 it became much used, and gradually rose into favour and surmounted prejudice. The Church of St. John the Evangelist was the first in which gas was tried; and Westminster-hall, the avenues to the House of Lords and Commons, the residence and offices of the Speaker, and the Mansion-house were amongst the earliest buildings in which the new system became popularised.

It was estimated that in 1818 fifteen miles of gas piping had been laid in London. The number of miles at the present time can be reckoned by thousands. In 1822 Sir William Congreve calculated that £1,000,000 was invested in gas companies, and advised the allotment of districts, which was effected by Act of Parliament the following year. At that time gas was 15s. per thousand cubic feet, and was reduced in 1849 to its present average price of 4s. It is said that the Westminster Gasworks alone supply 5,000,000 cubic feet nightly; and Dr. Letheby estimates that about 8,000,000,000 feet are annually supplied to the metropolis, of which an eighth is wasted by leakage. So large has grown this great social and commercial fact that the sum expended in gasworks in London alone would have paid a very respectable dividend on the National Debt, and has been calculated at 14s. 6d. a head on the entire population. I must not weary you with statistics, astounding and interesting though they be; to the uninitiated they would be dreadfully dry, to the many present who are masters of my subject they would be needless. By the same rule I need not stop to describe the advantages, or otherwise, of the various burners which have from time to time been introduced. The argand, the bat's-wing, the swallow-tail, the cockspur, the fish-tail, and twenty others, either variations of or improvements on these, have all been minutely described by many writers. But, whatever the form of a burner, its construction should be such that, while it admits sufficient air, it should never admit more than is requisite for the perfect combustion of the gas; and although the size of the jets has been measured even to the fortieth of an inch, I presume I am right in supposing that such dimensions must vary according to the quality of the gas, and that no such minute standard can be fixed or sustained.

Such, then, is a brief outline of the introduction and progress of gas lighting; and, accustomed as we are to it now, whether in or out of doors, we can scarcely believe that, a little more than a generation since, it was practically unknown, and had to force its way against the sneers and the fears of everyone. In the perfect simplicity of its present use we may well recur with wonder to all this opposition, and feel surprise that it was left to an obscure Cornishman to develop one of the greatest improvements of modern time, which had for years been within the reach of the scientific. It is true, as I have shown, that several had formed the most just conclusions as to the capabilities of coal gas, and many had predicted the introduction of an illuminating vapour instead of oil; amongst them Dr. Johnson, who, watching from his window in Bolt-court the bungling of the lamp-lighter of the period, said to some one with him that "the day would come when London would be lighted by smoke." The prejudice against the use of gas exists with some few people of the oil-lamp type to the present time. There are one or two clubs in London to which the gas pipe has not penetrated; and it was not till 1853 that the Haymarket Theatre was (by the removal of the restriction by the lessor) enabled to enjoy the greater brilliancy and economy of gas.

It needs no argument of mine to prove that which must be patent to everyone—viz., that an article of universal importance and adoption, and in the manufacture, application, and consumption of which a far larger sum of money has been invested than in any other product or undertaking, is one well worthy the attention of those by whose ingenuity its quality can be improved, its price modified, its advantages increased, or its use and appliances economised. My own belief is that we are comparatively as much in our infancy in the question of gas now as they were a century ago. We shall not only have it of a far better quality, but at a less price. We shall be taught how to save all that we now lose by leakage, and even the lamp-posts themselves will be made to do double duty, and become innocuous ventilators to the sewers. I can afford to be a prophet when I tell you that all these improvemenents have already engaged the attention of such men as Mr. Hawksley, Mr. Barlow, and Dr. Letheby; and whether or not the Government will be able to make themselves masters of the gas companies as well as the telegraphs, the same field will still be open for the thoughtful and the learned.

In lighting and extinguishing lamps we have made some progress towards improvement. The lamp-lighter, although proverbial for his nimbleness, has not now to run from post to post with his ladder, to run up and down, to open and shut lanterns, and apply the flame to the burner. His ladder is superseded by a long stick torch, which is long enough to put through a hole at the bottom of the lantern, to turn the tap and light the gas, as it were, by one movement. It was lately tried to light the lamps by electricity, but this, at present, has been found to be an imperfect system.

The one I have been asked to explain to you to-night aims at three objects of improvement—to abolish the genus lamp-lighter, to simultaneously light and extinguish the lamps, and to economise gas. If it is capable of effecting only one of these it is worthy of your attention, as beneficial to the gas companies, their shareholders, the ratepayers, and the public generally; and I shall recur with great satisfaction to the fact of my having been, in however indirect a way, the means of introducing it to the Society of Arts and the gas world. I may mention as a fact,—though I do not wish to throw it out as a hint—that when, some 50 years ago, Mr. Clegg read a paper on "gas-lighting" to this Society, he received the silver medal. My aim is for your golden opinion,—your approval of the system I am now about to describe; and although prepared to hear many objections, I believe that if you admit the merit of the principle they may all be overcome.

The Letters Patent (No. 2,435) of Mr. Walter Thurgar (who, I may mention, is not professionally connected with gas-engineering, but is a surgeon, at Norwich), sealed 25th February last, are for "Improvements in Apparatus for Regulating the Supply of Gas to Burners." The basis of this invention is the American clock. The central spindle of an eight-day clock revolves once an hour, and has two arms inserted to gear with 48 teeth on an independent plate, which therefore makes its revolution in 24 hours. Of these 48 teeth half are inserted on the upper and half on the under surface of the plate, and so have more liberty to bear upon the arms of the spindle. This independent plate has 96 cogs in its circumference, and its retrogression is thus prevented every quarter of an hour by a small spring-stop, to avoid strain on the mainspring. In this 96-cogged plate is inserted a spindle, connected with the outer or dial-plate, which has two arms, one fixed, one movable. This movable or adjusting arm is for regulating the hour at which the gas should be lit or put out, according to the time of year. The dial-plate, of course, revolves also once in twenty-four

hours, and at the proper time the arm presses one side of the double cam fixed to the tap in the vertical gas pipe. On each side of the tap, and connecting, as it were, the perforations, is a small groove to which I wish to direct your attention, for it is through this groove only when the light is turned off, that sufficient gas escapes to supply the small blue flame, which continues—though invisible—during the day-time. The cam being pressed, as I have stated, turns the tap, and reduces the light to this blue flame, and on the other arm coming round, and in contact with the cam, it lowers the guard, turns on the gas at full, and in effect lights the lamp. The guard (the sole object of which is to protect and hide the small day-light flame) has perforations for air at the bottom, and is connected by a tube with the plate on which the loops of the cam act.

There can be no doubt as to the ingenuity of this machine; and most of those to whom it has been shown have expressed decided opinions as to its value and practical utility. The effect of the principle, if applied generally, would be very striking—the illumination at the same moment, or practically so, of every public lamp, and that, too, at the very moment when artificial light is required, and the extinction of the light in the morning, which, however, would be gradual, and in relation to the gradual consummation of the light of day. When a lamp-lighter commences his beat, he necessarily has to light a great many lamps long before they are wanted—as we frequently see them—and these are all burning, at full cock to waste. By the same rule a countless amount of gas is burnt to waste before it is put out in the morning. I cannot but believe therefore that an apparatus which can be made to light and extinguish in a moment, can fail to effect a great saving in the supply of gas, for the infinitesimal flame it burns during the day (and which has the advantage of preserving an equal temperature in the lantern) consumes no more than a cubic foot in twelve hours, the value of which we may reckon at a farthing.

As regards the far greater saving in the matter of lamp-lighters, I am informed that one gas company admitted that the adoption of this principle would save them £450 per annum on every thousand lamps. Every lamp must now be visited fourteen times each week for lighting and putting out, and once at least for cleaning; while a lamp fitted with Mr. Thurgar's machine need only be visited once in each week, when the man could wind the clock, move the regulating arm forward or backward one hole, as the season may require, and clean his lantern. It is within the mark to say that two men could well do the work of sixteen under the present system, and that, too, by an isolated visit at any hour one day every week. I believe it is estimated that the cleaning, lighting, &c., of each lamp costs from 15s. to £1 per annum. This machine, therefore, at a cost of, say, 12s. 6d., would soon pay itself, and is exceedingly unlikely to get out of order. But companies do not like to go to large outlays, even if favourably disposed to the introduction of evident improvements; and although, in this instance, their expenditure would soon be recouped, the difficulty could be met by their renting the machines at a stipulated royalty, the patentee undertaking to wind, clean, and repair. The shade which would be cast by the machine on the pavement below is one objection that has been raised to it. I do not see that the fault can be weighed against the many advantages which the principle would secure. All future lamp-posts could be contrived to enclose the machine; and till then I may argue, as the advocates of the carburettors argued, that the "shadow cast is not absolute, but merely relative, and that the real practical detriment to the efficiency of the light is not considerable."

The occurrence of a London fog must also be provided for, and, as at present, each lamp must then be visited; and as the apparatus must not be interfered with, the man would have, in the usual way, to light a second burner of the ordinary kind, attached to the supply pipe below its connection with the machine, which burner could be raised and used in such rare emergencies. It was at the instance of Lord Ranelagh, who, taking a praiseworthy interest in matters of public utility and benefit, was desirous of helping the views of his countryman, Mr. Thurgar, that this invention was brought under the notice of Lord John Manners, the first Commissioner of Works. Lord John directed a trial of the machine to be made, and one was fixed in one of the outer passages of Somerset-house for that purpose; subsequently to this, by the direction of the master (Professor Graham), a machine was also fixed at the Mint, over the porter's lodge. These machines have been ever since working, viz., for three and four months respectively; and I may mention that during a violent wind storm which occurred some three months since, although two panes of glass of the lantern in Somerset-house were blown in, the guard of Mr. Thurgar's machine preserved the little blue flame alight. The only fault that has been found with these two machines is that they have not been strictly regular in the time of illumination. Mr. Thurgar therefore directed his attention to this point, and by the skilful and scientific arrangement of his present dial-plate and regulator, has successfully overcome the difficulty, and, I think, completed the efficacy of his invention. He found that an arbitrary and undeviating adjustment of the regulating holes would not make the machine work in accordance with the caprices of the sun and moon, and after careful calculation he devised an arrangement of 23 holes, at varying distances, into which the regulator is moved one by one, say from the 8th of January to the 11th of June forwards; then having been stationary till 9th of July, backwards to 10th of December, where it again remains till January 8th. This may seem very complicated when heard in description, but, like everything else, is simple enough when you know it. Although, therefore, the tests at Somerset-house and the Mint have been highly satisfactory as exemplifying the principle of Mr. Thurgar's invention, and the durability of the machines, which are infallible in the working, they are wanting in the more recent and important adjunct of his improved dial-plate and regulator. The clocks also are now made to wind at the side, and have been in other respects much improved since the two I refer to were put up.

Mr. Thurgar takes the bold but effectual step of attacking you scientific gentlemen of the gas world with your own weapons—of asking you to see and criticise his invention. He may, at least, lay claim to novelty; for, with the exception of Mr. Malam's early invention of the meter, I am not aware that clockwork has ever before been employed in gas apparatus, certainly not as a means of lighting and extinguishing burners. I am sensible of the imperfections with which my introduction of this machine to you has been characterised, but with you, who will understand its object and application so much better than myself, I have the satisfaction of reflecting that the interests of the inventor will not suffer, and that you will give to the subject that impartial attention and investigation which every invention tending to great economy and public good demands and should receive.

DISCUSSION.

Mr. FORD asked how long the apparatus would last, and whether the light would not be liable to go out during the day in stormy weather?

Mr. HEATH thought the little groove through which the gas passed, when the tap was turned off, would be liable to get filled up with the grease used for lubrication. A similar arrangement had been in use for some time in bakers' ovens, and this was found to be the case, so that the plug had to be taken out and cleaned.

Mr. JONES said Mr. Denison, President of the Horological Institute, had recently published a book, in

which he referred to a somewhat similar arrangement as being in use for the illuminated clock at Westminster, and also for the Town-hall clock at Leeds. Mr. Denison spoke approvingly of this automatic action, and thought it was applicable to public lamps; but his (Mr. Jones's) impression was that the apparatus would require considerable attention to keep it in order. For his own part, however, he hoped it would be adopted, as it would probably lead to considerable activity in the watch and clock-making trade.

Mr. Pearce said he had understood from the paper that this was the first application of clockwork to the lighting of lamps, but he believed it had been applied to the lighting of oil lamps in France long ago.

Mr. Botly said he could corroborate what was said in the paper as to the waste of gas occasioned by the lights not being lighted and extinguished at the proper time. In his own neighbourhood he believed that on an average the lamps were lighted from an hour to an hour and a half before sunset, and remained so till about the same time after sunrise in the morning; therefore if they could all be lighted and extinguished just at the proper time a great saving must be effected.

Dr. Letheby had listened with great pleasure and interest to the paper, which contained many matters entirely new to him. Passing over the historical part, he would make one or two practical observations on the little machine which was introduced to their notice, and which was certainly highly ingenious. The first question which presented itself was this, was there any occasion for such a machine? Considering that at the present moment gas companies were pressed upon in all directions with regard to the economical management of their affairs, he should say there was the utmost necessity for the application of any instrument which might help to economise and reduce the large expense to which they were put in respect of public lights, for the good old days were long passed when (as the Chairman might remember) the price of gas was 13s. a thousand feet. In conjunction with Mr. Haywood he had made an inquiry for the purpose of ascertaining the successive reductions in the price of gas, and he found that in 1827 the price charged was 15s. per thousand; during the succeeding three years it came down to 13s. 6d.; then for two years it stood at 12s. 6d.; for four years at 10s., and then for seven years, from 1837 to 1842, at 9s.; two years it was at 8s.; then came three years at 7s.; one at 6s.; and in 1849, the memorable year to all conversant with the history of gas-lighting, when the agitation in the City led to the establishment of the Great Central Gas Company, the price suddenly fell to 4s., at which it had since remained, but there was legislation at present going on which would probably lead to an increase of illuminating power and diminution of price; there was, therefore, every possible inducement to the companies to turn their attention to any method by which a saving might be effected in the cost of public lighting. There were in the City 2,884 lamps, which burned on an average about twenty thousand feet per annum, that being a fair average of eleven hours a day, at five feet per hour. These public lamps cost the City at present about five guineas per lamp, being a total cost of something like £15,000 per annum. The cost of lighting these lamps and keeping them in repair was about 15s. each per annum, of which about 12s. fell to the lamplighter; one man could only keep in order between 80 and 90 lamps, and his wages would average not quite 20s. per week; and this amounted to £1,730 a year. By the use of such an apparatus as had been described, one lamplighter would do about the work of three, and would thus be enabled to attend to 270 lamps—he did not think they could go beyond that. The lamps would require cleaning at least once a week, and he did not think one man could clean more than 45 a day, or between four and five an hour, working ten hours a day; this would enable him, working six days a week, to attend to 270 lamps, and if this were so there would be a saving in the wages of the lamplighters of about £1,153, out of £1,730. That was a great reduction, and offered a strong inducement for the matter to be entertained. There would also be an economy in the amount of gas consumed, for, as they had heard, there was undoubtedly a great amount of irregularity in the times of lighting and shutting off the gas. Then came the question, who would be benefited by this economy? For those who would receive the advantage ought to be the parties to apply the invention. Would the companies be benefited? He thought the history of legislation on the subject of gas-lighting showed that the local authorities would derive the benefit from the application of this apparatus, and not the companies. With regard to the disadvantages of the apparatus, in the first place there was the cost of the instrument. They had not yet heard the cost at which it might be rented, but supposing even there were a large economy in that respect, there was another matter which appeared to have been lost sight of, viz., the cost of the application, for not one of the lamp-posts at present in use would permit of the adoption of the apparatus. If they were applied as carburettors and regulators had been applied, there would be a considerable shadow cast under the lamp-post, which the police authorities would say was a very dangerous thing for the public. Again, if they were affixed, as was proposed, to the present lamp-posts, they would be so exposed as to furnish a strong temptation to thieves. The lamp-posts, therefore, would require to be altered, so that the instrument might be placed inside; but this, of course, was not an insuperable difficulty. He should be very glad to see this invention lending its aid to the abolition of the present ugly lamp-posts, for the time was come when they should be replaced by something better. As had been said, they might be utilised, not only for lighting the roads, but also for ventilating the public sewers, and perhaps in other ways also. They wanted a lamp-post which would hold a governor, a meter, and, he ventured to add, although it might not accord with the views of some who were present, a carburettor. But there was yet another difficulty, he feared it would be an uncertain instrument. A question or two had already been asked, which would seem to indicate that the flow of gas during the day along the little channel might be impeded by grease. There would be an imperative necessity, therefore, if this invention were adopted, for visiting every lamp at night. Already among the 2,884 lamps in the City, there were 926 cases of going out, or 32 per cent., which was looked upon as a very serious thing, and the attention of the police was constantly being drawn to it, and complaints were made. The consequences, therefore, would be very serious, if by the use of this instrument they in any way imperilled the lighting of the public way. Then came another difficulty—how arrangements were to be made for foggy days. As he understood, the proposition was to have an extra jet in each lamp, but this, he feared, would not only be expensive, but would be liable to leakage. There were, therefore, these serious objections to the invention, but though he did not say they were insuperable, they would require the careful attention of practical men before the plan could be adopted. At the same time the instrument was unquestionably very ingenious, and, if these difficulties could be overcome, would be of great public benefit.

Mr. E. H. Thorman said he had spent some time over this instrument with the inventor, and was exceedingly pleased with it in many respects; at the same time he found all the faults he could with it, many of which had already been mentioned by Dr. Letheby. It was not unfrequently the case in his neighbourhood that ten or twelve lights in a row would be turned out by some mischievous person, and this, he apprehended, would have the effect of injuring or destroying an apparatus of that kind; and he apprehended that in the suburban districts the apparatus would be sometimes stolen. Then, again, he thought too much had been taken for granted

as to the saving which might be effected. He did not agree that the lamp-lighters might clean the lamps once a week only; he should find fault if his lamps were not cleaned twice a week. If the invention could be practically carried out it would be a great advantage, and it would certainly be a fine thing to see a long line of lamps all lit up at once, but he was afraid such a thing would not just yet be realized. He did not concur in the idea of utilising lamp-posts for ventilating purposes, inasmuch as he thought they were at present much too high; the light should be brought down from a height of 10 or 11 feet to 8 ft. 6 in., in order to give light to the passers by. He had been much struck by the advantages of this plan in France, particularly at the railway stations.

Mr. Campin thought the instance, which had been mentioned, of lighting oil lamps by means of clockwork must have been very different from the present invention, which was not really for lighting lamps, but for instantaneously increasing the supply of gas at night, when more light was wanted.

Mr. C. F. T. Young thought the amount of work required from lamp-lighters, up to a very recent period, was anything but creditable to science, considering the labour in proportion to the result attained. Supposing the lamps were 10 feet high, the man formerly had to carry a lamp about with him, to place it against each lamp, ascend about 5 feet, take his small lamp, and kindle a little flame about as long as his finger. If he lighted eighty or ninety lamps, taking it that he had to ascend and descend 5 feet each time, that gave 800 feet as the space through which he had to carry his body, weighing, probably, 130 lbs. This had, certainly, been improved to some extent by the introduction of a long pole, with which to light the lamps; but he was not at all satisfied that that was the best possible arrangement, or even that the one now proposed was everything that could be desired, although he believed the idea was a good and practical one. He thought there might be in each long row of lamps a tap, on the ground level, communicating with an apparatus at the corner of the street, with clockwork or an electrical apparatus, by which each line of lamps could be worked very easily. He thought something of that sort would carry out the idea of automatic lighting better than the invention now brought before them. Of course, nothing was perfected at once; but he had no doubt this invention might be made the starting-point for something better.

Mr. Varley called attention to several ways in which gas might be economised. More than seven years ago, when the use of flat-flamed candles was universal amongst certain classes of workmen, it was shown that by bringing two flames near each other the light was much more than doubled, and he apprehended the same principle would apply to gas burners. Again, in the ordinary burner the purity of the upper part of the flame was affected by the air which fed it passing through the under part; if the jet were placed horizontally every part of the flame got a supply of pure air, and a better light resulted.

Mr. Pearce said that a long time ago a plan of lighting lamps by clockwork was invented, a stream of hydrogen gas being turned on to a small piece of spongy platina, which immediately ignited and lighted the lamp. He thought this plan could be easily applied to street lamps.

Mr. Bishop had seen that plan tried a considerable time ago, but the apparatus so soon got out of order as to be useless for practical purposes. With regard to the blowing out of the light, that was easily obviated. He, like others, had been used to turn down the gas, and often found it went out altogether, but on applying at the bottom of the burner where the current of air entered a copper wire webbing, he found this was effectually prevented.

Mr. Heath asked if any provision was made by the inventor for cleaning out the burners if they became dirty. In dusty weather they very often became clogged, and the lamp-lighter had to clean them out before the gas would light. He felt satisfied that if such a small blue flame as was contemplated were kept alight only by the usual pressure during the day of about three-tenths, it would very often be put out by accidental causes such as had been alluded to. He suggested that instead of the groove formed in the plug of the cock, an independent channel should be provided for the passage of the gas by day, terminating in a jet close to the ordinary burner; by this means the danger of the channel becoming choked by grease would be avoided.

Mr. Schomberg wished to know the opinion of the Chairman, whether the little instrument under their notice could be kept clear from their troublesome enemy napthaline; and whether, if there should be a deposit of napthaline, the cleaning of such a piece of mechanism could be safely left to the ordinary lamp-lighters.

Mr. Tucker, in reply to the observations which had been made, said he thought he could answer some of the objections which had been raised. It was known to those acquainted with machinery that the American clock would work infallibly for years, and these machines had been at work for some months without showing any signs of getting out of order. As to the cleaning, that could very easily be done, whenever required, by taking out the tap. As to the machine having been anticipated by that alluded to by Mr. Pearce, he conceived it was not the same kind of machine at all; and he still believed this was the first application of clockwork to the lighting and extinguishing of gas. As to the comparative waste of gas, he conceived it was out of all proportion greater where, as was said to be the case, it burned an hour or an hour and a half morning or evening or both, when artificial light was not required, than where it only remained on for twelve hours in the shape of a small blue flame. He had already stated that the cost of the apparatus was 12s. 6d., and it could be readily applied to the existing lamps. As to the instruments being stolen, he thought that was not likely, though he was ready to bow to the authority of his friend Dr. Letheby in that matter. This danger might not be altogether imaginary in rural districts, but the metropolitan streets must be guarded against any chances of such an occurrence. Moreover, if it were necessary the lanterns might be locked. He had suggested a second burner to meet the emergency of a foggy day, and he did not think that would add materially to the difficulty or expense. As to the flame being blown out, he had in the paper given an instance, and he thought a convincing one, that this need not be feared, the flame having remained burning in a gale of wind so strong as to break two panes of glass in the lantern.

The Chairman said they must all have listened with great interest to the paper, which was partly historical and partly practical. Leaving the former portion, he would make some few observations on the practical part, especially as some questions had been put to him, which he would endeavour to answer. One question was, what would be the effect of the napthaline which was deposited, particularly in some states of weather, and in particular stages of manufacture, because even at present the lights were often liable to destruction from this cause. His honest opinion was that these lamps would be extinguished, for the little connecting aperture by which the small blue flame was kept up, would, under certain circumstances, be completely stopped up. If, then, that and other accidents were to occur, by means of which there would be at times an interruption of the public lighting, he did not see that the introduction of this apparatus would be the means of reducing the attention required to be given by the lamp-lighters, or the number of persons who had to pay that attention; and, therefore, he did not conceive there would be any economy in the matter of wages. But, on the other hand, there might be some additional expenses, because the whole apparatus—however ingenious—was one of some delicacy, and one

which would necessarily require some attention, much more, indeed, than the writer of the paper seemed to imagine. That attention must be given, not to remedy defects in the public lighting, but to prevent them, and attention of this sort must always be more serious than that of merely a remedial character. The public — he did not say they were wrong — were very intolerant in such matters, and would not submit to have an intermittent light; and if the lighting were to be accomplished by any automatic means, the result must be at least as perfect as that attained by the hand of the lamp-lighter; but he did not imagine any apparatus of this kind would be so perfect and certain in its operation as the men. As to the question of cost, he had no doubt that these instruments might be made as cheaply as 8s. each if machinery were introduced for their construction; but then they must be kept in repair, and replaced when worn out, and they had as yet no experience of what the cost of maintenance and renewal would be. Again, although the little blue flame might be kept up by the consumption of a quarter of a cubic foot an hour, or at the cost of a farthing a day, that would amount to 7s. 7d. a year; and if to that were added the cost of maintenance and renewal, and of the lamp-lighter's attention, he did not see that any saving whatever could be effected. There was another consideration, however, which affected the subject in an economical point of view, and that was the lighting and extinguishing of the lamps at exactly the proper hour. Coming into London, as he often did, by the mail train in the morning, he was aware that the defects of the present system which had been alluded to occurred only too often, and that the gas was not unfrequently burned for a hour and a-half longer than it ought. That, however, only occurred during a small portion of the year, and when it did occur in the summer months it arose from negligence in the superintendence of the lamp-lighting department. It was the practice in well-managed undertakings for the men to receive and deposit their ladders and torches at a particular place, so that it was known to a moment when they began and when they left off work, and it was simply for want of proper superintendence if there were more than half an hour's waste per day at any period of the year. That of course was a matter under the control of the gas companies; and if, as Dr. Letheby had said, the gas companies were likely to be put under greater restrictions, so as to enforce upon them more rigid economy than they had yet been in the habit of exercising, of course they would look to these matters, and allow no irregularity in the conduct either of the lamp-lighters or of those who superintended them. Having said this much he must add that he regarded this as a most ingenious instrument, and if it were not applicable to public lamps, it would be perfectly so in a great number of other instances, and under other circumstances. He believed it might be extensively used for many private purposes in connection with large buildings and so on, and therefore they were much indebted to the inventor of such an apparatus. They were also indebted to Mr. Tucker for the interesting paper which he had prepared for the purpose of bringing the invention before them, and he therefore begged leave to move a vote of thanks to that gentleman accordingly.

A vote of thanks to Mr. Tucker was then passed and acknowledged.

Fine Arts.

ANNUAL EXHIBITION OF WORKS OF LIVING ARTISTS IN PARIS.

The *salon* opened on the accustomed day, the 1st of May, with the largest collection of works of art ever seen within its walls, and, there is little doubt, the largest ever collected in any place at one time. The catalogue contains no less than 4,213 entries, consisting of 3,389 paintings and drawings, 522 specimens of sculpture and medal engravings, 63 architectural designs, and 236 engravings and lithographs, the total being nearly one-third larger than that of last year. The *salon* of last year lost, however, much of its interest for exhibitors and proprietors of works of art on account of the greater attraction of the Universal Exhibition; a fairer standard by which to measure the extent of the present collection is that of 1866, which was itself a full year; the result of such comparison shows an increase this year of 775 paintings and drawings, 132 objects of sculpture and medal engravings, 18 engravings and lithographic works, with a decrease of 12 in architecture —total increase above 900. Only those well accustomed to large collections can form an idea of the extent of space occupied by four thousand works of art.

The number of works in the Exhibition is, however, of little consequence, except as showing the activity of art, and as supplying a large field for study—the quality is the grand point. Great works are rare, and there is scarcely one which can be singled out as marking great genius or originality; but if there be no extraordinary emanation of genius there are very many evidences of undoubted talent, and it certainly was the general impression amongst a crowd of artists and critics on the opening day, that the level was higher than usual, and that the number of very poor works was pleasingly small. This is the more remarkable and satisfactory, inasmuch as it is understood that the Jury of Admission exhibited great indulgence, and excluded no work which, in their opinion, exhibited laudable industry and tolerable success.

The liberal system of election adopted for the jury must therefore be regarded as an eminently successful experiment. The names of the two-thirds of the members of the jury elected by the artists themselves was given in the *Journal* of the 10th of April, and no change occurred with the exception of the substitution of M. Ph. Rousseau for M. Gérôme, who was absent from Paris. The remaining third, appointed by the administration of the department of the Beaux Arts, consists principally of well-known art critics or connoisseurs, thus introducing another new element, and a very important one, that is to say, a number of judges free at once from all party and technical prejudices. This official list is composed as follows:—In painting and drawing, MM. Alfred Arago, Charles Blanc, Cottier, Théophile Gautier, Lacaze, and the Marquis Maison. In sculpture and medal engraving, MM. Bonnassieux, Michaux, De Saint Victor, and Eudoxe Soulié. In architecture, MM. Boeswillwald, Albert Lenoir, and Du Sommerard, curator of the Museum of the Hôtel Cluny. In the section of engraving and lithography, MM. Adalbert De Beumont, Vicomte Delabore, conservator of the Department of Engravings in the Bibliothèque Impériale, and Eudoxe Marcille. MM. Robert-Fleury, Dumont, Duban, and Henriquel, all members of the Academy of Beaux Arts in the Institute of France, were elected respectively presidents in the four sections; and the Comte de Nieuwerkerke, as superintendent of the Fine Arts, presides officially over the whole.

The collection which is now open to the public for six weeks, must be pronounced as almost entirely wanting in historical, religious, or poetical works of the highest class; the number of large military pictures is certainly smaller than usual; landscapes and animals are more rare than formerly, and the number of portraits rather below the average; official subjects are few in number, and startling nudities are much less remarkable than they have been of late. The great mass of the pictures exhibited belong to the class of *genre*, including many graceful subjects drawn from mythology and fable.

Like its predecessors the Exhibition shows to what an extent drawing has become an integral part of the national education, the small number of figures that exhibit glaring anatomical defects or want of life-like reality

being truly surprising; and, generally speaking, there is an improvement in colouring—more brightness, and fewer attempts to excite astonishment by almost impossible harmonies. Some few artists still seem to imagine that one of the greatest achievements is to paint half a dozen reds one upon the other, or a white dress upon a white ground; but, generally, there are fewer glaring eccentricities of this kind than usual, while there are certainly more true examples of brilliant colouring. In this respect the French school is certainly undergoing an important change; Delacroix, Decamps, Diaz, Troyon, Rousseau, and others, have revolutionised the chromatic theories of the old Academic school.

There is another very promising fact to be noted with regard to the present and recent exhibitions—the contributions of young painters who have won the Grand Prix of Rome are decidedly of a higher character than they were. This may result from the new system adopted in the Ecole des Beaux Arts during the last few years, taken in connection with the fact that these promising painters have been encouraged of late to take part in the annual exhibitions, which offer them a much wider public than the exhibition of the works sent by them from Rome in the gallery of the schools only.

The Great-room, or *Salon carré*, contains the most remarkable works of the exhibition, together with official subjects and portraits, and is the only one that can well be examined thoroughly on the opening day. The gems are rare this year; Pils and Meissonier, Hamon, Hebert, and other well-known names are absent from the catalogue altogether. Cabanel only contributes two portraits of ladies, excellent works of their kind, but not of general interest, and therefore not placed in the Great room; and the brilliant forest scenes of Theodore Rousseau are gone for ever. The most remarkable work in the room is that of M. Gerôme, who has been voyaging in the East, and presents us with a Jerusalem treated in an original and remarkable fashion. The foreground is the Calvary, covered with huge round stones bathed in sunlight. M. Gerôme has not dared to paint the scene of the Crucifixion, but the shadow of it lies on the stony hill, while a number of spectators view it from a distance; and beyond the valley, over the tree tops, lies Jerusalem. The work is somewhat out of the painter's former range, especially as regards the atmospheric effects, and must add greatly to his reputation. M. Gerôme has another work in the exhibition, but we have not yet found it.

Gustave Doré has a remarkable work called the "Neophite," a row of grey monks at prayers, the almost effeminate head of a young one contrasting finely with the rubicund, white-bearded, or servile faces of the elder brothers; it is scarcely a picture, but it is a fine study of heads.

The place of honour is occupied by an imperial group—Louis Napoleon, the Emperor of Russia, and the Prince of Prussia, with their suites, on horseback, by a Prussian artist, whose name has escaped us; a good, bold work. Over this is a remarkable picture, by a Bohemian artist, named Cermak, "Christian girls being carried to Adrianople for sale by Bashi Bazouks. "The Four Seasons," a pleasing work, by Smits, a Belgian; two pretty pictures of the time of the First Napoleon—"A Scene at Milan in 1796," by Masse, and "Madame Recamier and Lady Georgina Gordon, afterwards Duchess of Bedford, receiving a lesson in the gavotte, from the famous dancing-master Vestris the Younger," in the presence of a party, amongst whom are the Duchess of Gordon, Lord Holland, and Fox; two pictures form a strange contrast to the brilliant female faces, the silks, satins, and embroidery of the preceding; the first is an effective though curious view of "Verona by moonlight," painted almost in monochrome, by a Bremen artist, named Hennings; the second the "Sahara," by Guillaumet, an artist of great ability in a peculiar line; within very moderate limits the interminable sand lies in shallow waves beneath a burning, hazy sky; the skeleton of a dead camel, and a few wild flowers in the foreground, a caravan disappearing in the glare of the setting sun in the distance, nothing more, but the soil and the atmosphere are rendered with a masterly hand, and crowds of connoisseurs bear witness to the artist's success. A brilliant landscape, by M. Hanoteau; a finely-painted interior, the "Sistine Gallery in the Vatican," by M. Naolet; a bold design for a ceiling, representing the "Birth of Minerva, all armed from the brain of Jove," by M. Mazerolle; a painful picture of the "Visit of the Empress to the Cholera Hospital at Amiens;" and a bright picture, by a Prussian artist, named Heyden, of "The two Princes meeting after the battle of Koningsgraetz," complete the list of the chief works in the great central room.

The arrangement of the rooms deserves a few words. The system of moderating the light by means of false ceilings suspended in the centre of the rooms has been again adopted in all but the large square room, but these canopies are lighter than formerly, seem transparent, and the effect is good; in the large room a white awning, raised in the centre like a tent, is adopted, and the pictures here also are well seen though the moderation of the light is perhaps scarcely sufficient for a bright day.

The number of foreign exhibitors is very considerable, though many of these belong to the French school as pupils of French masters; but we are sorry to see so few English names in the catalogue. The only English pictures we have yet seen are one by M. Calderon, "The return of a knight after victory," and a charming autumnal picture of ferns beneath forest trees, at once rich and sober in treatment.

The central area of the building is converted into a charming geometric garden, containing a collection of beautiful flowers and plants, the show of the Horticultural Society of France; there is a good exhibition of roses, some beautiful orchids, and a very fine collection of foliage plants; as regards cut flowers, variegated pansies and tulips seem for the moment to be the chief favourites. The sculpture is arranged in the garden, a few large works occupying central points, and the statues, busts, and bas-reliefs against the surrounding wall. Altogether the exhibition is very brilliant, and there is scarcely a work of all the four thousand that is not fairly placed; this is not an every-day achievement.

Exhibition of Works of Art at Pau.—The success of provincial exhibitions in France is most encouraging for artists. That of Pau has just closed, and we have the results as regards sales. The authorities of the town have purchased the Struggle at Novillos, by M. Worms, which was to be seen at the great Paris Exhibition last year, while the Society for the Encouragement of Art and private individuals have bought more than fifty works. The latter list includes pictures of all classes, half a dozen bronzes, and two works in terra cotta.

Manufactures.

Introduction of Steam Ploughing into France.—During the late Universal Exhibition in Paris, as the readers of the *Journal* are aware, great interest was taken by agriculturists, and careful trials made of steam-ploughing machinery; the inquiries and experiments then made have not been unfruitful; several rich proprietors have introduced steam ploughs on their estates, but the other day the steam plough may be said to have made its triumphal entry into France. On the last day of March last, some ten thousand farmers assembled in the plains of Berry to witness the inauguration of steam ploughing. A steam plough, purchased by MM. Dubois, Suard, and Cie., of Messrs. John Fowler and Co., awaited the benediction of the Bishop of Bourges. The enterprising firm named above is said to include several of the best friends of agriculture in France.

The object of the company is to introduce a steam plough into each district where labour is difficult, such as the Landes, Gascony, Brittany, the Sologne, and Berry, and to establish a fixed tariff of prices per day and per acre, so that each farmer may avail himself of the steam labourer if he please. The rate at present fixed is 22 francs per hectare, little more than seven shillings per English acre, and the applications are said to be numerous. The proceedings terminated with a grand banquet of 160 covers, at which the préfet of the department, and many of the most influential persons in the district were present. It was announced by M. Cornu, Vice-President of the Agricultural Society of Châteauroux, that the Emperor had, at the instance of the president of the society, presented a gold medal to MM. Dubois, Suard, and Cie., for their patriotic action. Enthusiastic speeches were made, and amongst the toasts drunk was one to the memory of the late Mr. John Fowler.

PRODUCTION OF FLAX AND HEMP IN ITALY.—The production of flax in Italy is estimated at about 135,000 quintals, and that of hemp at 500,000 quintals; in all 635,000 quintals. The principal varieties of hemp cultivated in Italy are the common hemp (*Cannabis sativa*), the Chinese, and the Giant hemp, the stalks of which are sometimes as much as five metres in height. The imports and exports of flax and hemp in straw, tow, and fibre, both raw and combed, from 1862 to 1865, were as follows:—

Imports.

	Quintals.	Frs.
1862	12,659	1,220,000
1863	26,743	2,490,000
1864	14,067	1,330,000
1865	14,366	1,394,000
Average....	16,959	1,610,000

Exports.

	Quintals.	Frs.
1862	139,199	13,266,000
1863	132,507	12,274,000
1864	151,495	14,868,000
1865	204,932	20,886,000
Average....	157,033	15,324,000

About three-quarters of the exports from Italy are to Austria, and the greater part in a raw state. The following is the trade in rope and cordage:—

Imports.

	Quintals.	Frs.
1863	10,831	745,000
1864	13,133	1,214,000
1865	9,427	675,000
Average....	11,130	878,000

Exports.

	Quintals.	Frs.
1863	11,584	1,375,000
1864	14,769	1,769,000
1865	19,715	1,830,000
Average....	15,356	1,658,000

The spinning of flax and hemp is chiefly carried on by hand; there are very few establishments where machinery is used. The three most important spinning mills are in Lombardy; the first at Cassano, the second at Villa d'Alné, in the province of Bergamo, and the third at Melegnano; they contain in all 14,120 spindles, of which 1,088 are for retwisting; they employ 980 persons (245 men, and 735 women and children). The wages are from 25 to 45 centimes per day for the women and children, and the men earn from 1·32 to two francs per day. The quantity of flax and hemp used at these establishments is 12,500 quintals, from which are produced 9,000 quintals of threads of all kinds. A great part of the hemp comes from Romagna, whilst the flax is nearly all grown in Lombardy. To this may be added the work of 300,000 peasants, who are engaged in spinning 150 days out of the year. Taking their earnings to average 15 cents. per day, the total produce may be estimated at 6,330,000 francs per annum. At Bologna there are two establishments for spinning hemp; they work about 7,000 quintals of hemp, and produce 5,000 quintals of yarn. The production of yarn in Italy does not equal the consumption in that country, and a great quantity of the raw material that is exported returns again as yarn from England and France. The exports of this article do not bear any proportion to the imports.

FLAX AND HEMPEN YARNS.

Imports.

	Quintals.	Frs.
1862	16,297	4,316,000
1863	27,224	7,150,000
1864	40,420	10,504,000
1865	34,358	9,116,000
Average....	29,575	7,772,000

Exports.

	Quintals.	Frs.
1862	1,749	444,000
1863	2,266	632,000
1864	3,423	880,000
1865	4,728	1,199,000
Average....	3,042	789,000

These exports are nearly all to Austria. Upwards of 120,000 looms and 171,000 weavers are employed in weaving linens, and their produce is estimated at 60 millions of francs annually. In Piedmont and Lombardy there are several establishments with power looms. The greater portion of the fine linens are imported from France and England, and are very considerable; whilst, on the other hand, the exports from Italy are insignificant, as will be seen as follows:—

Imports.

	Quintals.	Frs.
1863	11,145	6,836,000
1864	16,091	8,778,000
1864	17,535	9,246,000
Average....	14,924	8,287,000

Exports.

	Quintals.	Frs.
1863	7,168	2,785,000
1864	5,780	1,859,000
1865	4,049	1,647,000
Average....	5,666	2,097,000

The exports and imports of other products of flax and hemp, such as haberdashery, buttons, trimmings, galloons, lace, etc., were as follows:—

	Imports. francs.	Exports. francs.
1863	1,117,000	486,000
1864	852,000	404,000
1865	1,264,000	763,000
Average....	1,078,000	551,000

The total of the exports and imports of flax and hemp, of all kinds, both raw and manufactured, was as follows:—

	Imports.	Exports.
1863	18,345,000	17,552,000
1864	22,678,000	19,780,000
1865	21,696,000	26,325,000
Average....	20,906,000	21,219,000

A special manufacture is carried on in Sicily for making a kind of cord from the fibres of the dwarf palm. It is chiefly carried on by women and prisoners, and the average produce may be estimated at about a million and a half of francs annually.

Commerce.

Italian Wines.—The total production of wine in Italy is estimated at 28,879,908 hectolitres (about 63,535,846 gallons) of the value of 1,052,740,000 francs (£42,109,600). The following is the production, divided amongst the various provinces:—

	Quantity. Hectolitres.		Amount. Francs.
Piedmont and Liguria	3,800,412	..	136,800,000
Lombardy	1,228,144	..	46,670,000
Venetia	2,368,045	..	87,600,000
Emilia	5,013,933	..	180,500,000
Umbria	1,724,149	..	58,600,000
The Marches	2,447,421	..	83,200,000
Tuscany	1,500,000	..	58,500,000
Neapolitan provinces	2,101,712	..	69,400,000
Sicily	8,188,092	..	311,150,000
Sardinia	508,000	..	20,320,000
Total	28,879,908	..	1,052,740,000

The principal wines in Piedmont are the Barbera, the Nebbiolo, the Barolo, the Bracchetto, the Gattinara, the Grignolino, the Malvaria of Asti, the Passeretta, the Agliano, the Caluso, and the Moscato. These wines are exported in considerable quantities to South America, where they find a ready sale. In the Ligurian provinces the principal wines are the Dolcetto, the Pignolo of Neive, the Malvasia of Grinzano, and the Dinazzano. In Lombardy, the San Colombano, the Monterobbio, the Sassella, and the wine called Inferno, grown in the Valtellina, which is exported to Switzerland and the Tyrol. In the province of Modena the Lambrusco, the Fiorano, and the Scandiano, are well known. At Piacenza the best wines are the Cisolo, the Sangiovesi, and the Vinoranto. The wines of Tuscany, the Montepulciano, the Aleatico, the Montalcino, the Broglio, the Valgiano, &c., are well known even in England. The best wines in Umbria and the Marches are the Montefiascone, the Orvieto, the Prosanico, and the Vino Santo of Perugia. The importance of the vintage in the island of Sardinia has increased considerably of late years; the best wine is the Nasca, of an amber colour and of agreeable bouquet. The Neapolitan provinces produce excellent wine, the best known of which is the Lacryma Christi, grown at the foot of Vesuvius, and the Capri, from the island of Capri, in the Bay of Naples. Calabria also produces many varieties of good wines. The island of Sicily is celebrated for its wines, amongst which may be mentioned the Syracuse wine, which somewhat resembles Chablis. The vineyards of Massara and Castelvetrano produce the Marsala, which resembles sherry. More than 500 persons are employed for this purpose, and the yearly production is estimated at 3,000,000 francs (£120,000). The following are the exports and imports of wines from 1862 to 1865:—

Wine in the Wood.

Imports.

	Quantity. Hectolitres.		Value. Francs.
1862	159,036	..	8,952,000
1863	182,710	..	9,135,000
1864	278,248	..	13,912,000
1865	218,101	..	10,805,000

Exports.

	Quantity. Hectolitres.		Value. Francs.
1862	214,233	..	10,712,000
1863	462,501	..	23,135,000
1864	223,539	..	11,176,000
1865	264,512	..	13,225,000

Wine in Bottles.

Imports.

	No. of bottles.		Francs.
1862	288,715	..	303,000
1863	407,432	..	408,000
1864	315,968	..	332,000
1865	345,627	..	353,000
Average francs		..	11,050,000

Exports.

	No. of bottles.		Francs.
1862	233,618	..	245,000
1863	549,835	..	577,000
1864	1,271,707	..	1,325,000
1865	1,091,582	..	1,164,000
Average francs		..	15,385,000

Colonies.

Minerals in Tasmania.—A mineral discovery, which promises to be important, has recently been made on the banks of the River Don, Tasmania. A lode has been found, yielding cobalt, silver, copper, and antimony. A few stones broken from the lode were, a short time since, forwarded to an assayer at the Wallaroo Smelting Works, for analysis. The result was as follows:—Cobalt, 4 oz. in the ton; silver, 100 oz.; copper, 14 per cent., and a quantity of antimony. The ore is estimated at worth £85 per ton. A specimen of lead, as taken from the same locality, has also been analysed, and found to contain 82 per cent. of pure galena, besides several ounces of silver to the ton.

Queensland Finance.—It appears, from the report of the Treasurer of Queensland, that the cash expenditure of 1867 was £661,795 8s. 9d., and the receipts during the same period were £610,860 5s. 9d., the expenditure thus exceeding the receipts by £50,935 3s. The expenditure of the colony in 1866 exceeded its receipts by £161,430 10s. 10d. The receipts of the year 1867 exceeded those of the year 1866 by £120,590 10s. 2d.; but the amount of land orders redeemed by the sale of land shows a diminution in the latter year of £44,517 12s. 9d. The expenditure of the year 1867 exceeds that of 1865 by £67,665 8s. 8d.

Land in Queensland.—A Brisbane paper, referring to a recent Act of the colonial Parliament, says:—"For the first time in the history of Australia, the public lands of the colony of Queensland are fairly thrown open on the most easy terms to permanent occupation and settlement. The conditions under which land can be taken up for permanent settlement under the new Act are various, but in every case they are of the most liberal character, so much so, in fact, that every man who chooses can have a farm and work it in any way he thinks fit. If he is disposed to enter into cultivation, the best land for agriculture on the colony is at his disposal at 15s. per acre, with ten years to pay the money in. If he wishes to enter upon pastoral farming he can take up seven or eight square miles of land at from five to ten shillings per acre on the same terms, and by fencing and building on it during the ten years he more than fulfils the condition of improvements required by the Act. If he be a poor man, and only wishes to take up a small quantity of land, of from 80 to 160 acres in area, he can, under the homestead clauses, take up a farm of this kind, and by paying a quit-rent of a few pence per annum for five years, and residing on it for that time, and fencing in his farm, the land becomes his own for ever. These advantages are open to all. With the new industries that are springing up in Queensland, however, the new Land Act offers greater induce-

ments to emigrants possessed of such qualifications than any other British colony. Cotton-growing and sugar cultivation have now been proved to be successful undertakings on the rich agricultural lands of the colony, and other staples are attracting some considerable degree of attention."

Obituary.

JOHN CRAWFURD, F.R.S., a distinguished Oriental scholar and ethnologist, died on the 11th inst. He was born on the 13th of August, 1783, in the island of Islay, and was educated in the village school of Bowmore. In 1799, the profession of medicine having been chosen for him, Mr. Crawfurd repaired for his studies to Edinburgh, where he remained three years. In 1803 he obtained a medical appointment in the Indian Service, embarked for India in April, and landed in Calcutta in September of the same year. For the first five years of his residence in India he was employed in his professional duties with the army, chiefly in the North-West Provinces, in the neighbourhood of Delhi and Agra. In 1808 the same duties took him to Penang, in the Straits of Malacca, where he began to devote himself to that study of the languages and manners of the Malay race, which was destined to make him widely known. In 1811 he accompanied Lord Minto, then Governor-General of India, on the expedition which effected the conquest of Java. Afterwards, in consequence of his acquaintance with the Malay languages, he was appointed to represent the British Government at the Court of one of the native Princes, and it was then that he collected the materials for the work which he afterwards published, entitled, "The History of the Indian Archipelago." Java and their other Indian possessions having been restored to the Dutch, Mr. Crawfurd returned to England in 1817, and in 1820 published the work just mentioned. In 1821 he went back to India, and shortly after his return was appointed by the Marquis of Hastings, at that time Governor-General, to the diplomatic mission to Siam and Cochin China. In 1823 Mr. John Adam, *ad interim* Governor-General, appointed him to adminster the new settlement of Singapore. In that position he remained three years, and concluded with the native chiefs, to whom the settlement belonged, the convention by which we hold its sovereignty. In 1826 he returned to Bengal, and was appointed by the Governor-General Commissioner in Pegu, and eventually, on the conclusion of peace, Envoy to the Burmese Court. In 1827 Mr. Crawfurd finally returned to England, and in the following year published an account of his mission to Siam and Cochin China, and in 1829 another of his mission to Burmah. After this period, long leisure, good health, and an inclination to study and capacity for work enabled him to keep up and perfect his stores of Indian and Eastern information. He was an indefatigable contributor to the press on matters relating to the East, and indeed on many other subjects. In 1852 he published a grammar and dictionary of the Malay languages, and in 1856 a descriptive dictionary of Malay and the languages of the Philippine Archipelago. He was elected a member of the Society of Arts in 1861, and frequently attended its meetings, often joining in the discussions. He was also well known at the Geographical and Ethnological Societies.

Publications Issued.

ANNUAIRE DE L'ECONOMIE POLITIQUE ET DE LA STATISTIQUE. Par Maurice Block. 23rd year, 12mo. MANUEL DU NEGOCIANT. Par Max. Hofmann, avec Introduction par Paul Boileau, 12m. MANUEL DES HALLES ET MARCHÉS EN GROS, GUIDE DE L'APPROVISIONNEUR, &c. Par Ernest Thomas, 12mo. *(Guillaumin and Co., Paris.)*—Messrs. Guillaumin publish every season a considerable number of works connected with political economy, international law, and commerce. The little work which stands first in the above heading is the recognised handbook with respect to the subjects which it embraces, and contains a vast amount of matter in a small compass. It deals with the colonies and foreign countries, as well as France proper, and Paris in particular; and gives valuable information on the proceedings of learned societies, finance, the funds, public charity, public works, and other subjects that present special interest. The "Manuel du Négociant," as its title imports, is a collection in a handy form of information useful to merchants. The opening chapter gives a sketch of the commercial geography of the earth, with the products of its various regions, an account of the various means of communication between all parts of the world, and special information relative to France, tariffs and regulations respecting carriage of merchandise, &c. The second part treats of the administrative system as regards commerce in France, Government services, tribunals and chambers of commerce, authorised agents, financial and commercial establishments, licences and taxes, commercial forms, patents, trade marks and copyrights. This chapter contains much matter of value to those who have business in France where the regulations and customs of trade are so different to our own. The third part deals with commerce proper, navigation, imports and exports, tariffs, assurances, &c., all which are treated at considerable length. The remainder of the volume treats fully of money, weights and measures of France and other countries, with rules and examples for their reduction; commercial paper and exchange, bullion, commission, charges, and insurance, trade accounts and invoices fully exemplified, freight, tonnage, and measurement, &c., with a useful vocabulary of commercial terms and recognised abbreviations, forming altogether a valuable commercial companion. The "Manuel des Halles et Marchés en Gros" is an exposition of the system on which the Paris markets for the sale of grain, meat, fish, vegetables, and fruit, butter, cheese, and eggs are managed. A few particulars respecting the fish market will be *apropos* at present. It appears that the sale of fish in the markets of Paris was organised so far back as the year 1258, when authorised salesmen and *forts*, or ticket porters, were appointed by order of Saint Louis. The whole arrangement has been revised, abolished, and re-established at least half a dozen times in as many centuries. The system at present in force may be explained in a few lines. There are two sets of inspectors and assistants attached to the market, one, under the prefect of police, whose duty it is to maintain order, to see that the fish is in proper condition for sale, and that the business of the market is properly carried out; the other for the collection of the city dues. The market is opened every day by sound of bell, between six and eight o'clock, according to the season. There are eight salesmen appointed for salt-water fish, each having to lodge £240 by way of security. These salesmen act in concert as a body, whereas in other markets they act individually; they are appointed and may be removed by the prefect of police. The *forts*, or ticket porters, receive from two to twenty centimes per package, according to size, for placing the fish on the sale counters, and afterwards delivering it at the gate of the market. With some special exceptions all the fish is sold by auction. Common fish sold in the market pays a tax of 6 per cent. *ad valorem*, and all the better kinds 10 per cent. The salesmen receive a tax of 10, 15, or 20 centimes on each parcel sold, and, if they act as agents for the proprietor, one per cent. commission in addition. When fish is left unsold, and put aside for the next day, the porters receive a fee of ten centimes per package, and are responsible for its safety. Everything must be cleared out of the market enclosure within an hour after sale. The octroi duty taken by the city is

equivalent to 24s. per cwt. for all the superior kinds of fish, and 6s. per cwt. for the inferior kinds, with, in each case, two-tenths additional tax. It may be interesting to state that the list of the superior kinds of fish includes salmon, turbot, sturgeon, tunny, brill, trout, chad, mullet, lobsters, crawfish, and prawns. Freshwater fish, salt fish, and oysters are all sold by different sets of salesmen, but the regulations and taxes are very nearly the same in all cases.

Notes.

The Swiney Professorship. — The trustees of the British Museum have appointed Dr. Cobbold, F.R.S., to this chair of Geology. It is tenable for five years, and the first course of lectures will be delivered in Scotland.

The Royal Academy of Music.—On Saturday, the 2nd inst., a special meeting of the supporters of this institution was held in the concert-room of the academy, in Tenterden-street, Hanover-square. The object of the meeting was to consider the present financial position of the institution. It appears that Her Majesty's Government has refused to comply with the terms of a memorial asking that the academy should be subsidised as a national institution, and have also withdrawn the grant of £500, which has been made out of the public treasury since 1864. Sir John Pakington, Bart., M.P., presided, and in the course of his address related how the government had received, and had carefully considered, a memorial asking them to give an annual grant of £2,000 to the academy, and how they had decided not only to refuse that sum, but also to withdraw the grant of £500 which has been made yearly since 1864. Before the meeting concluded, it was decided to appoint a committee of members of the musical profession and subscribers, to consider what steps should be taken.

Utility of Coal Ash in Agriculture. — A correspondent of the Paris *Journal of Agriculture*, seeing the amount of ashes thrown away annually, and considering that Sir Humphrey Davy and other chemists have found by analysis that ashes contain many substances which contribute to vegetable life, such as sulphates of potash and lime, various compounds of acids and minerals, and carbonates of lime, alumina and silica, has made some interesting experiments; in the autumn he filled three flower-pots with coal ashes, without admixture with any other substance; in one pot he sowed wheat, in another oats, and in the third strawberry seeds. The pots were then placed in a garden bed and left to themselves. In the month of March the plants were in a very thriving condition, and in April they were luxuriant. The wheat and oats ripened perfectly, the grains being large and heavy, and the straw, in the case of the wheat, 55 inches, and in that of the oats 43 inches high. The strawberry plants continued to flourish till October, when it was necessary to transplant them, and after being planted out in the open ground they succeeded so well that the writer says they surpassed all his other seedlings. The experiment is an interesting one.

Correspondence.

Beetroot Sugar.—Sir,—In reference to statistics and remarks upon Mr. Gibbs' paper on beetroot sugar (read before the Society, April 22nd, and also that gentleman's letter of May 1), I beg to say that the points mooted were the insufficiency of data for manufacturers and capitalists, and why they should be called upon in 1868 to depend upon the state of trade of 1866? Mr. Gibbs had his attention particularly drawn to these points, and distinctly explained that no later returns had been made by the Board of Trade, and also that these returns distinctly specified raw sugar only (see page 422 of *Journal*); his letter, however, given at page 449, shows that he had not quoted 660,384 cwt. of refined sugar imported that year. Now, it was this very kind of omission that induced me to follow another speaker on the same subject, as I knew that some countries were increasing their competitive supplies 100 per cent. after 1866. When discussing the influence of beet-sugar it must be evident that refined sugar imported represents a much larger quantity of the raw material raised in a foreign country, and thus not only are the colonies prejudiced by supplies readily obtained across the Channel, but the property, plant, and labour of English refiners are not required to that extent. My off-hand figures then had reference to one omitted quality of sugar, and perhaps applied to one country only. Of the sugar thus omitted by Mr. Gibbs from beet-crop countries, I take the official figures of the French Imperial Government, who declare there have been sent of refined sugar to England :—

	1866. Kilogrammes.	1867. Kilogrammes.
France	9,549,671	18,454,099
Belgium ..	4,408,613	4,000,000*
Holland ..	34,307,919	37,932,286
Total....	48,265,590	60,386,385

and this 60 millions kilogrammes of foreign refined sugar may be taken as about 132 millions of English lbs. imported for the year 1867. Taking the French official figures for January and February, there was imported into England :—

In the year	1866	1,163,899 kilos.
„	1867	3,787,655 „
„	1868	2,316,880 „

and at the end of March the French exports to foreign countries, for two years, stand thus :—12 millions of kilogrammes for 1867 and 24 millions of kilos. for 1868, omitting all mention of refined sugar for 1866, '67, and '68. Mr. Gibbs's statement can be somewhat understood as to the causes for some of the largest and best appointed refineries in London being closed and cannot be sold, "and many others are yet to follow" (p. 416); but, I may ask, does the suggestion to grow beet-root crops, and get the products at onerous risks, and create new manufactories, afford compensation to those who have been for years in trade, or does it afford temptation to the capital of willing agriculturists? Mr. Gibbs was distinctly understood to say that no returns had been made by the Board of Trade since 1866. This meaning was conveyed and was so accepted at the meeting, whatever may have been the source of misapprehension; I have now to state that the Board of Trade has compiled and published, by authority, sugar totals regularly for the months, quarters, and year 1867, and even the quarter ending March 1868 was published before the reading of Mr. Gibbs's paper, including and comparing similar periods for 1865, '66, and '67. From their report (Trade and Navigation, 1867, at page 7), it appears there were imported of refined sugar into England, to the end of December, for the two years—in 1866, 660,384 cwts.; and in 1867, 834,452 cwts. Of first-class un-refined sugar 92,318 cwts. in 1866, and 147,881 cwts. in 1867. Of imports of raw sugar of 2nd, 3rd, and 4th classes there were about 10 millions of cwts. each year, thus apportioned to foreign and British possessions :—

	In 1866.	In 1867.
British	5,723,990	4,389,492
Foreign	4,824,711	6,007,942
	10,548,701	10,397,434

It will be thus seen that influences are at work that depress the productions of our colonies, while countries

* Founded on nine months' figures in 1867.

compete at our own doors and increase their supply to markets constantly in demand. For France alone, the beetroot produce of the season of 1866-7 was 167,025·252 kilogrammes; and for 1867-8, 205,810·315 kilogrammes. To show whether the colonies have anything to fear, let us take the Board of Trade tables as to the computed real money values of imported sugars. Of refined sugars in 1866, £927,648; of refined sugars in 1867, £1,237,736. The value of first class unrefined was, for 1866, £112,576, and £167,787 for the year 1867. Of the raw sugars of the 2nd, 3rd, and 4th class, for 1866, the value was £9,952,216; and for 1867, £10,612,160. If we take the value of raw sugars from British possessions only, it was £5,613,273 for 1866, but for 1867, £4,639,421; so that in the year 1867 the British colonies had lost ground in money value to the extent of one million sterling. (See page 16 of "Accounts relating to Trade and Navigation," for twelve months, 1867). The British revenue received (page 49) for refined sugar and sugar-candy duty from British possessions out of Europe, in 1866, £2,102; in 1867, £839; from foreign countries, in 1866, £492,786; in 1867, £469,421. The duties on raw sugars were, collected from British possessions out of Europe, for 1866, £2,711,136; 1867, £2,228,699; from foreign countries, for 1866, £2,337,896; 1867, £3,061,368; making a total of, for 1866, £5,049,032; 1867, £5,290,067. So that foreign competition is not only able to break up established, well-appointed refineries at home, but competes with the declining influence of our colonies, and thus we have the Imperial revenue actually increased and more aided by foreign produce than by our own skill, capital, labour, and estates. Surely our enlightened men will see some impending danger, if the English markets and the Imperial revenue are thus made seemingly prosperous, but really dependent upon the action of foreign governments and their peoples. It is proper to remark that all imports of sugar to England from the Continent may be assumed as the result of beet-root produce, for even if these countries import and export cane-sugar, they are enabled to do this, by obtaining beet-root sugar in excess; it is thus taken for granted by all parties; so much so indeed, that I do not remember the title of beet-root sugar in the Board of Trade or Customs returns. The discussion on the Customs duties, and incidentally on the sugar competition between France and Belguim, in the French Corps Legislatif, as given in the *Moniteur* (May 2, p. 589), may shew in very few words something of the ruin that may follow in this country, injudicious crops of beet-roots, and the manufacture of beet-root sugars, as I believe the low sugars would be absolutely useless to the farmers. In the debate, M. des Rotours said, the refineries of sugar give three distinct products. The Candies, properly so called (or refined sugar); 2nd, the Vergeoises or Cassonades (low brown or bastard sugars); and 3rd, Molasses. M. Ozenne (Councillor of State, Commissaire du Gouvernement,) said, "In France they use the sugar of beet, whilst at Antwerp, and generally in Belguim, they more particularly use cane-sugar. All the world knows that the low products of the cane have a more considerable value than the low products of the *betterave* (beet-root), for this simple reason, that the one is eatable, and the other can only be of service for distillation." Such is the last week's information on beet-root sugars; and again I may ask, is it wise to call the attention of agriculturists, tenant farmers, and others to the subject, without warning them that if they succeed in making sugar, they will then have to pay 12s. duty on each cwt., this is on all saccharine matters, including the low sugars which are useless except for distillation, and this involves a permit duty, excise, surveys of premises, vessels and apparatus, with necessary consequences of permits, visits, and duties to pay, and severe risks of penalties connected with the production, storing, and sale of spirits. The present state of things in England at this time is, that works are being closed and their engines and machines, &c., sold for a price about equal to the expense of fitting them in their places for work; all other metal work sold at the price for old materials, and our colonies are declining. We may, however, suppose that the refiners are capable of looking to their own interests, and that the West Indies and other colonies have their defenders and exponents; but I confess I do not see how the matter will be mended by the farmer being induced to grow crops to be manufactured with the chances of being exchequered; and I spoke only with good intentions, and on behalf of agricultural talent, enterprise, and capital, that they should be truly and completely aroused to the subject of foreign competition, and with a feeling of respect for one great body of intelligent men, and as having been many years honorary consulting chemist for North Lincolnshire.—I am, &c., THOMAS J. PEARSALL, F.C.S.

For further information on these great sugar questions, I may refer with pleasure to the very full, and, indeed, admirable returns made on all branches of sugar imports from 1844 to 1867 inclusive, moved for by Mr. Moffatt, and ordered by the House of Commons to be printed April 22nd, and published with official promptitude some days since; these elaborate and extended customs tables will supersede or lessen the labour of references to the other departmental tables of the Board of Trade, and also of foreign journals. From these laborious tables can be seen at a glance, for any number of years since 1844, such particulars as these:—The imports of refined sugar for the years 1860–1–2–3, averaged 255,819 cwts.; then in 1864, consequent upon legislation, sprung up to 700,000 cwts. The average imports for 1864, 5, 6, and 7, being 759,090 cwts.

MEETINGS FOR THE ENSUING WEEK.

MON......British Architects, 8.
Asiatic, 3. Annual Meeting.
Victoria Inst., 8.
R. United Service Inst., 8½. Mr. Samuel Mackie, "The National Defences of Great Britain, especially with reference to the future requirements of Floating Forts."
Social Science Assoc., 8. Jurisprudence Department. Mr. Robert Wilson, "On the Bankruptcy Law."

TUES ...Civil Engineers, 8. Mr. Edwin Clark, "On Engineering Philosophy: The Durability of Materials."
Statistical, 8. Mr. Courtney, "On the Finances of the United States, 1861-67."
Pathological, 8.
Anthropological, 8.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

WED ...Society of Arts, 8. Mr. J. Bailey Denton, "On the Condition of the Agricultural Labourer."
Geological, 8.
Pharmaceutical, 11 a.m. Annual Meeting.
R. Society of Literature, 8½. Sir Charles Nicholson, "On some Remains of the Disk-worshippers at Memphis."

THUR ...Antiquaries, 8½.
Zoological, 4.
Chemical, 8.
Numismatic, 7.
Royal Inst., 3. Prof. Grant, "On Astronomy."
Society of Fine Arts, 8. Mr. George Cooper, "On the Influence of International Exhibitions upon our Domestic Decorative Art."

FRI.......Royal Inst., 8. Prof. Odling, "On the Rapid Decomposition of Water, and other effects of the Heat of the Oxy-hydrogen Flame."
R. United Service Inst., 3. Mr. M. Parkyns, "On Abyssinia."

SAT ......Royal Inst., 3. Prof. Grant, "On Astronomy."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 28th April, 1868.*

Schools Inquiry—Reports, Vol. IX.
Colonial Possessions—Reports, Part III. (Eastern Colonies.)

Delivered on 29th April, 1868.

86. Bill—Entail Amendment (Scotland).
97. ,, Documentary Evidence.
215. Post Office—Comparative Statement.
220. Richmond Green—Report.
Public Petitions—Fifteenth Report.

Delivered on 30th April, 1868.

94. Bill—County Courts Admiralty Jurisdiction (amended).
119. (II.) Trade and Navigation—Accounts (31st March, 1868).
130. (II.) Railway and Canal Bills—Third Report.
228. Municipal Boroughs (England and Wales)—Abstract.

Delivered on 1st May, 1868.

209. Judge's Lodgings—Return.
216. Metropolis Gas—Correspondence.
217. Occupiers (Scotland)—Return.
224. Merchant Seamen's Fund—Account.
Education (Scotland)—Third Report, Vol. 1.

Delivered on 2nd May, 1868.

99. Bill—Municipal Rate (Edinburgh).
201. East India (Godavery River)—Return.
227. Metropolitan Foreign Cattle Market Bill—First Report.
230. Post Office (Sunday Delivery) (Scotland)—Regulations.
Public Petitions—Sixteenth Report.

Delivered on 4th May, 1868.

102. Bill—Vagrant Act Amendment.
128. Navy (Channel Fleet)—Return.

Delivered on 5th May, 1868.

96. Bill—Cotton Statistics.
98. ,, Non-Traders Bankruptcy (Ireland).
42. (III.) Postal Contract.
213. Sugar, &c.—Tabular Return.
214. Foreign Sugar—Return.
221. Spirits—Returns.
223. Mercantile Marine Fund—Account.
225. Seamen's Savings Banks and Seamen's Money Orders—Account.
226. Ramsgate Harbour—Statement.
229. Peerages and Baronetcies—Return.
235. Royal Gun Factory—Estimates.
236. Electoral Statistics (Ireland)—Returns.

Session 1867.

431. (D.) Poor Rates and Pauperism—Return (D).

Delivered on 6th May, 1868.

91. Bill—Government of India Act Amendment.
92. ,, Governor General of India.
95. ,, Military at Elections (Ireland).
203. (3.) Railways Abandonment—Report of the Board of Trade.
207. County Treasurers—Abstract of Accounts.
222. Criminal Offenders (Scotland)—Abstract of Tables.
Victoria—Further Correspondence.
Trades Unions and other Associations—Fifth Report of Commissioners.
Public Petitions—Seventeenth Report.

Delivered on 7th May, 1868.

101. Bill—Sea Fisheries (Ireland).
130. (III.) Railway and Canal Bills—Fourth Report.
203. (4.) Railways Abandonment—Report of Board of Trade.
206. Abyssinian Expedition—Return.
210. Public Income and Expenditure—Account (31st March, 1868).
245. Counties (Ireland)—Return.
246. Area, Population, &c. (Ireland)—Return.

Patents.

From Commissioners of Patents' Journal, May 8.

Grants of Provisional Protection.

Anæsthetics, preparing, &c.—1263—A. P. Price and J. A. Wanklyn.
Animals, shearing or clipping the wool or hair of—1299—A. D. Renshaw.
Baking, &c., apparatus for—1343—C. Brown.
Boilers—1281—J. and J. A. Fawcett.
Boilers, &c., preventing incrustation in—1347—C. W. Harrison.
Boilers, &c., securing tubes in—1257—D. Smith.
Brick-making machinery—1268—R. Scholefield.
Brick-making machinery—1287—J. J. R. Humes and J. G. Sullivan.
Brooches, &c., spring fastenings for—1328—J. Bush & H. Welchman.
Brushing and sweeping machines—1330—G. F. and J. Stidolph and T. Simpson.
Capstans—916—W. Clarke and E. Walker.
Carding and condensing engines—1265—G. Lister.
Carpet linings—1316—W. R. Lake.
Cartridge boxes—1339—W. R. Lake.
Casks—1335—J. Reid.
Churning, &c., apparatus for—1261—T. Bradford.
Compasses, correcting the deviations of, in iron ships—1309—J. H. Johnson.
Copying presses—1277—C. D. Abel.
Cotton, &c., winding on to cards, &c.—1000—R. Smith.
Crank pins, &c., machines for turning off—1270—W. Lund.
Curtain poles and laths—1301—J. and H. T. Fogl.
Elastic bands—1289—G. Coles, J. A. Jaques, and J. A. Fanshawe.
Engines and pumps, rotary—1279—J. Cooke.
Engines, governors for—1272—H. W. Widmark.
Engines, marine—1294—E. Kemp and H. Gourlay.
Engines, motive-power—1302—M. S. Maynard and R. Grime.
Explosive compounds—1210—G. Clark.
Fabrics, ornamental—1305—W. Clarke.
Fabrics, textile, treating—1278—C. D. Abel.
Fabrics, waterproof—1308—T. Whittaker.
Fabrics, woven—1345—R. and T. Nuttall and B. Barber.
Felt, machinery for manufacturing—1326—E. Rostron and W. W. Whittaker.
Filaments, producing from various substances—1296—G. Coles, J. A. Jaques, and J. A. Fanshawe.
Fire-arms, breech-loading—922—R. Townsend.
Gas, &c.—1283—W. Malam.
Hats and bonnets—1266—E. T. Hughes.
Hats called "Sou' westers"—1229—A. and L. Braham.
Iron and steel—996—R. A. Hardcastle.
Iron and steel—1148—J. Griffiths and J. Jeavons.
Lamps—1291—A. Cole and J. Carter.
Light, ascertaining the actinic power of—1297—L. Bing.
Lubricators—1269—A. Ashley, E. Rawnsley, and W. P. Waite.
Mangles, &c., bowls for—1325—T. Hardcastle.
Matches, safety—1309—H. Howse.
Metal, sheet, manufacturing small articles from—1315—W. R. Lake.
Millstones—1275—A. B. Childs.
Motive-power, transmitting and multiplying—1331—A. M. Clark.
Nails, manufacturing—1293—W. Gorse.
Nails, &c., manufacturing—1338—A. Carter.
Ores and minerals, extracting copper from—1240—R. Oxland.
Paddle wheels—1318—W. E. Newton.
Paddle wheels, &c.—1274—R. Hill and J. F. D'Oyly.
Petroleum, &c., storing and burning—1202—L. Verstraet.
Phosphates, &c., obtaining—1267—J. Hargreaves.
Pistons, &c., metallic packings for—1303—J. Johnson.
Railway carriages and waggons—1321—R. F. Fairlie.
Ring spinning, rings for—1288—A. V. Newton.
Ropes, apparatus for tightening, &c.—1295—A. Paget.
Spinning and doubling machinery—1282—J. B. Farrar.
Spinning or twisting apparatus—1284—J. McGhie.
Stamping, dating, &c., apparatus for—1307—C. B. Ingham.
Steam, generating—1324—W. Hamilton.
Tables—1323—E. Samson.
Tailors' irons—1327—J. Whitehouse.
Thrashing machines—1320—H. H. Murdoch.
Water-closets—1317—H. Hill.
Window sashes, &c., fastenings for—1271—N. Ager.
Wood, machinery for sawing—1337—J. Casson.
Wood, planing and cutting—1285—S. W. Worssam, jun.
Yarns, &c., sizing, &c.—1256—W. W. Symington.

Inventions with Complete Specifications Filed.

Buckets, &c.—1446—W. R. Lake.
Fabrics, manufacturing—1400—J. Booth.
Liquids, measuring, &c., the flow of—1434—H. A. Bonneville.

Patents Sealed.

3170. S. Simon.	3264. C. E. Brooman.
3173. C. Bedells.	3273. R. Ward.
3177. J. H. W. and A. W. Biggs.	3292. J. Owens.
3179. W. Payne.	3321. C. E. Brooman.
3181. S. Buxton and W. Gardam.	3334. A. V. Newton.
3185. W. R. Lake.	3406. S. Sharrock.
3187. W. R. Lake.	3441. R. Hornsby & J. E. Phillips.
3189. W. R. Lake.	3444. F. R. Ensor.
3191. F. L. de Gerbeth.	3505. C. Conner.
3193. F. Ransome, H. Bessemer, and E. L. Ransome.	3610. J. Atkins.
	3611. J. Clay.
3194. J. C. Bayley and D. Campbell.	3622. G. Davies.
	3636. E. and A. Ludlow.
3202. M. B. Westhead & R. Smith.	3702. J. Davison.
3215. U. P. Würflein.	218. H. Brinsmead.
3216. R. Adams.	393. H. Bunning, jun.
3224. G. Kent.	830. C. Attwood.
3249. R. Holliday.	891. W. E. Newton.

From Commissioners of Patents' Journal, May 12.

Patents Sealed.

3210. F. Andrew & E. Whittaker.	3260. J. G. Tongue.
3212. A. M. Clark.	3262. R. Husband.
3214. W. R. Lake.	3324. J. H. Johnson.
3220. P. E. Bland.	3361. J. S. Smith.
3223. P. de Bavay.	3366. A. Mackie.
3228. L. A. Wainman.	3386. T. B. Jordan and J. Darlington.
3229. A. M. Clark.	3552. W. E. Newton.
3231. W. R. Lake.	3553. L. Christophe and J. Montigny.
3234. P. M. Parsons.	
3235. G. R. Solomon, jun., and M. Bebro.	1. W. R. Lake.
3238. A. Airiau.	84. W. R. Lake.
3240. L. B. Bertram.	111. J. H. Johnson.
3243. A. M. Clark.	602. W. Krutzsch.

Patents on which the Stamp Duty of £50 has been Paid.

1262. J. McGlashan.	1625. J. Hartley.
1335. W. Clark.	1275. R. B. Cooley.
1319. H. Ransford.	1345. H. Besley.
1360. J. Worrall and T. Hughes.	1313. A. Parkes.

Patents on which the Stamp Duty of £100 has been Paid.

1134. T. Blackburn and Mark Knowles.	1190. J. F. L. Baddeley.
	1221. R. Hornsby, jun.

Journal of the Society of Arts.

FRIDAY, MAY 22, 1868.

Announcements by the Council.

ORDINARY MEETINGS.

Wednesday evenings, at Eight o'Clock :—

MAY 27.—*Derby-day.*—NO MEETING.

CONVERSAZIONE.

The Council have arranged for a conversazione, at the South Kensington Museum, on Wednesday, the 3rd June, cards for which are now being issued.

MR. WHITWORTH'S SCHOLARSHIPS — PREPARATORY EXHIBITIONS.

The Council have received the following communication from the Committee of Council on Education :—

Kensington Museum,
May 8, 1868.

To the Secretary of the Society of Arts.

SIR,—I am directed by the Lords of the Committee of Council on Education to transmit a copy of a minute, dated 5th May, 1868, which their Lordships have passed on a communication made to them by Mr. Whitworth, expressing his intention of preparing for carrying into effect his liberal endowment for thirty scholarships of £100 each, to create at once sixty exhibitions of the value of £25, to be held for the ensuing year. It is Mr. Whitworth's desire that three of these exhibitions should be placed at the free and absolute disposal of the Council of the Society of Arts.

The exhibitions may be given with or without competition, as the Council see fit, to an artisan who has obtained certificates of competency at the examinations conducted by the Society of Arts, or by the Science and Art Department. The only condition attached to the acceptance of these exhibitions is, that the holder proceeds to qualify himself for the competition for the scholarships of £100 to be conducted in May, 1869, and satisfies the Council that he will present himself as a candidate at that competition. The use of one or more of the tools specified, namely, the axe, saw, and plane, hammer, chisel, and forge may be acquired at almost every village in the United Kingdom.

I also inclose specimens of the Examination papers, showing the nature of the Examination which will be held for the competition for the scholarships of £100 by the Science and Art Department in 1869. In the event of the Council's accepting the exhibitions of £25, further information respecting the £100 scholarships in 1869 will be sent.

The Lords of the Committee of Council on Education desire to express their earnest hope that the Council of the Society of Arts may be able to give its hearty co-operation to Mr. Whitworth's patriotic endeavour to benefit the mechanical and engineering industry of this country.—I have the honour to be, Sir,

Your obedient servant,

HENRY COLE.

[ENCLOSURE.]

MR. WHITWORTH'S SCHOLARSHIPS FOR MECHANICAL SCIENCE.

At Whitehall, the 5th day of May, 1868.

By the Right Honourable the Lords of the Committee of her Majesty's most Honourable Privy Council on Education.

My Lords read Mr. Whitworth's letter of 4th May, 1868, transmitting a memorandum on his scholarships, and on the establishment of sixty exhibitions of £25 for the present year preparatory to the competition for his scholarships, and requesting that the Science and Art Department may conduct the necessary examinations and correspondence.

Their Lordships have great pleasure in acceding to Mr. Whitworth's request, and giving every assistance in their power in carrying out his patriotic munificence.

Manchester, 4th May, 1868.

Sir,—Referring to your letter of March 28th, by which you transmit to me a copy of the minute which the Lords of the Committee of Council on Education had passed in acknowledgment of my endowment of scholarships for promoting mechanical science, and to the concluding sentence of the minute, which invites further suggestions and offers to render assistance in carrying out the intentions of the endowment :

1. I beg leave to enclose, for the information of the Lords of the Committee of Council on Education, a memorandum on the subject of the endowment, which I trust will meet with the approval of their Lordships, and that they will cause it to be circulated, and the necessary correspondence arising out of it to be conducted by the Science and Art Department.

2. I would beg leave to ask the Lords of the Committee of Council on Education to undertake the examinations for these scholarships.

3. As respects the preparation of the necessary details for the examinations in the use of tools, I am willing to be responsible myself with the aid of friends, and I propose to obtain the consent of a few gentlemen to advise with me from time to time in whatever may arise in the future for my consideration.

4. In reply to the invitation of their lordships to submit any suggestions, I venture to submit for consideration whether honours, in the nature of degrees, might not be conferred by some competent authority on successful students each year, thus creating a faculty of industry analogous to the existing faculties of Divinity, Law, and Medicine. I am of opinion that such honours would be a great incentive to exertion and would tend greatly to promote the object in view.

5. I venture further to express a hope that the Government will provide the necessary funds for endowing a sufficient number of Professors of Mechanics throughout the United Kingdom.

6. In conclusion I inform you that the necessary arrangements for securing the endowment have been made, and I have given instructions for the preparation of the draft of a deed of trust which will be sent for the approval of the Lord President.

I am, Sir, your obedient servant,

JOSEPH WHITWORTH.

To Henry Cole, Esq.,
Secretary of the Science and Art Department.

MEMORANDUM ON SCHOLARSHIPS FOR MECHANICAL SCIENCE.

To be competed for in May, 1869.

I. Having offered to the Lords of the Committee of Council on Education to "found thirty scholarships of the annual value of one hundred pounds each, to be applied for the further instruction of young men, natives of the United Kingdom, selected by open competition for their intelligence and proficiency in the theory and

practice of Mechanics and its cognate sciences, with a view to the promotion of Engineering and Mechanical Industry in this country," I propose that the following should be the general arrangements in the first instance, which may be modified after the first competition has taken place in May, 1869.

II. That the thirty scholarships of £100 each should be open to all of her Majesty's subjects, whether of the United Kingdom, India, or the Colonies, who do not exceed the age of twenty-six years, and be held either for two or three years, as experience may prove to be desirable; that ten scholarships should be competed for and awarded in May, 1869, at the annual National Examinations in Science, provided that a sufficient number of candidates prove themselves to be competent; that the successful candidates should be required to spend the period of holding the scholarships in the further satisfactory prosecution of the studies and practice of Mechanical Engineering, and pursue their studies according to the spirit of the endowment, making periodical reports of them; that the student should state where he proposes to pursue his studies, the Lord President of the Council deciding if the proposal can be allowed, also if the student's progress be satisfactory, and the manner in which it shall be tested from year to year. In deciding if the plan of study proposed by the student be satisfactory as much latitude as possible may be allowed. If the student wish to complete his general education, instead of continuing his special scientific study, he may be permitted to do so. He may go to the universities or colleges affording scientific or technical instruction, or he may travel abroad. The successful artisan should be encouraged to study theory, and the successful competitor in theory aided in getting admission to machine shops and other practical establishments. All further details would be hereafter prepared and issued by the Science and Art Department.

III. The candidates must be of sound bodily constitution.

IV. The first competition should be in the following theoretical subjects:—

1. Mathematics (elementary and higher).
2. Mechanics (theoretical and applied).
3. Practical plane and descriptive geometry, and mechanical and freehand drawing.
4. Physics.
5. Chemistry, including metallurgy.

And in the following handicrafts:—

1. Smiths' work	3. Filing and fitting.
2. Turning.	4. Pattern making and moulding.

V. No candidate should obtain a scholarship who has not shown a satisfactory knowledge of all the following theoretical subjects:—

1. Elementary mathematics.	3. Practical plane and descriptive geometry, and freehand drawing,
2. Elementary mechanics.	

with the power to use one or more of the following classes of tools:—

a. The axe.	*d.* The file.
b. The saw and plane.	*e.* The forge.
c. The hammer and chisel.	

I propose that the maximum number of marks obtainable in the theoretical subjects and those obtainable by the most skilled workman should be about equal.

IV. My object in devising the foregoing scheme has been, while requiring a practical acquaintance with a few simple tools as a *sine qua non*, to render the competition accessible on fairly equal terms to the student who combines some practice with his theory, and to the artisan who combines some theoretical knowledge with perfection of workmanship.

PREPARATORY EXHIBITIONS OF £25 FOR THE YEAR 1868.

VII. As the scholarships scheme can only come into full operation by degrees, I propose from the fund ultimately available for the scheme at once to create sixty exhibitions or premiums, of the value of £25 each, tenable until April, 1869, and to place them at the absolute disposal of the governing bodies of the following educational institutions and towns, in order that they may award them to youths under twenty-two years of age, who may thus be aided to qualify themselves, and must undertake to compete for the scholarships of £100 in May, 1869.

VIII. Eight exhibitions to Owens College, and two to the Grammar School, Manchester, the seat of my workshops; three to the University of Oxford; three to the University of Cambridge; three to the University of London; and one to each of the following universities, colleges, and public schools:—

University of Durham.	Harrow.
University of Dublin.	Rugby.
University of Edinburgh.	Charterhouse.
Watt Institution, Edinburgh.	Westminster.
University of Glasgow.	Winchester.
Andersonian University, Glasgow.	St. Paul's, London.
University of St. Andrew's.	Merchants Tailors.
University of Aberdeen.	Christ's Hospital.
To each of the Queen's Colleges at Belfast, Cork, Galway, Ireland.	City of London.
King's College, London.	Shrewsbury.
University College, London.	Marlborough.
Eton.	Cheltenham.
	Chester.
	Clifton.
	Brighton.
	Liverpool.

Two to the College of Preceptors, and three to the Science and Art Department. I propose that the following exhibitions shall be given to artisans only:—

Three to the Society of Arts.

Also one for artisans to each of the following towns:—

Birmingham.	Leeds.
Bristol.	Northampton.
Swansea and Cardiff.	Sheffield.
Halifax or Huddersfield.	

and if there be any of the above unapplied, they may be given by the Science and Art Department to any other scholastic institution which makes satisfactory arrangements for affording instruction in Mathematics and Mechanics, Freehand and Mechanical Drawing.

IX. I would point out that the exhibitions to artisans may perhaps be increased to £50 for the year, by connecting them with the Science and Art Department, under the minute of the 21st December 1867.

(Signed) JOSEPH WHITWORTH

Manchester, 4th May, 1868.

MINUTE ON MR. WHITWORTH'S OFFER TO ENDOW SCHOLARSHIPS.

At Whitehall the 27th day of March, 1868.—By the Right Honourable the Lords of the Committee of Her Majesty's most honourable Privy Council on Education.

My Lords consider Mr. Whitworth's letter to the First Lord of the Treasury, dated 18th March, 1868. In this letter Mr. Whitworth offers to found thirty scholarships of the annual value of one hundred pounds each, to be further applied for the instruction of young men, natives of the United Kingdom, selected by open competition for their intelligence and proficiency in the theory and practice of Mechanics and its cognate sciences, with a view to the promotion of Engineering and Mechanical Industry in this country; and he expresses hopes that means may be found for bringing Science and Industry into closer relation with each other than at present obtains here.

It is unnecessary now to repeat the thanks which the First Lord of Her Majesty's Treasury and the Lord President of the Council have already conveyed to Mr. Whitworth for his generous offer, which they are convinced the country will fully appreciate.

Mr. Whitworth proposes that these scholarships should be tenable on conditions to be defined by a deed of trust regulating the administration of the endowment fund during his life, and that thereafter the management of this fund, subject to the conditions specified therein, should rest in the Lord President of the Council or other Minister of Public Instruction for the time being.

It is the wish of my Lords to see provision made in several large centres of manufacturing industry in the United Kingdom for affording to all classes of Her Majesty's subjects ample opportunities for acquiring instruction in the sciences which are applicable to productive industry. My Lords are of opinion that by the union of local and private efforts supplemented as far as is proper by State assistance this provision will be best made.

This will be rendered easy if the munificent example set by Mr. Whitworth shall be extensively followed by others.

My Lords will be happy to receive any further suggestions from Mr. Whitworth should he desire to make them, and to be informed if the Department can render him any assistance in carrying out his liberal intentions.

The following is the reply of the Council of the Society of Arts to the Committee of Council on Education :—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C.,
May 15th, 1868.

SIR,—I am directed by the Council of the Society of Arts, to acknowledge the receipt of your letter of the 8th instant, covering copy of a minute, dated 8th of May, 1868, which the Lords of the Committee of Council on Education have passed on a communication made to them by Mr. Whitworth, expressing his intention of preparing for carrying into effect his munificent endowment for thirty scholarships of £100 each, to create at once sixty exhibitions of the value of £25 each, to be held for the ensuing year, and intimating that it is Mr. Whitworth's desire that three of these scholarships should be placed at the disposal of the Council of the Society of Arts to be given to artisans on the conditions specified in Mr. Whitworth's communication. I am directed to signify the acceptance by the Council of Mr. Whitworth's liberal offer, and to say that they are anxious by every means in their power to aid in the furtherance of Mr. Whitworth's very munificent, and at the same time, carefully considered and wisely directed efforts to benefit the manufacturing industry of the country.

I have the honour to be, Sir,
Your obedient Servant,
P. LE NEVE FOSTER,
Secretary.

To Henry Cole, Esq., C.B.,
Secretary Science and Art Department.

The following letter, covering a minute passed by the Council of the Society, has been addressed to Mr. Whitworth :—

Society for the Encouragement of Arts, Manufactures, and Commerce, Adelphi, London, W.C.,
May 15th, 1868.

SIR,—The Council have received from the Lords of the Committee of Council on Education a minute which their Lordships have passed on a communication from you, expressing your intention of preparing to carry into effect your munificent endowment of 30 scholarships of £100 each, by creating at once sixty exhibitions of £25 each, to be held for the ensuing year, and their Lordships have informed the Council that it is your desire that three of these exhibitions should be placed at their absolute disposal, to be given to Artisans according to certain conditions specified by you.

I am directed by the Council to forward to you the accompanying resolution unanimously passed at a meeting held on Monday the 11th instant.

I have the honour, &c.,
P. LE NEVE FOSTER, Secretary.

Joseph Whitworth, Esq.

Extract from the Minutes of the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce, held 11th May, 1868.

Resolved :—"That the Council express to Mr. Whitworth their high sense of his disinterested and munificent endowment of scholarships, by which the progress of scientific education among all classes of the community will be materially promoted, and offer him their best thanks for having placed at their disposal three exhibitions of £25 each, to be held for the ensuing year.

"W. HAWES (Chairman)
"P. LE NEVE FOSTER (Secretary)."

SUBSCRIPTIONS.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The Committee met on Wednesday, April 29. Present—G. F. Wilson, Esq., F.R.S. (in the chair), Rev. J. E. Hall, and Mr. E. Hollond.

JAMES DEWAR, Esq., M.D., attended to give information as to a process of preserving provisions by means of sulphurous acid.

Dr. DEWAR.—My process consists in subjecting the substance to be preserved for a longer or shorter period, according to its size, to the action of sulphurous acid. This piece of meat (holding up a specimen) was immersed for about six hours in the mixture—the time requisite being about half an hour for each pound of meat. On being taken out of the liquid the meat or other article is, with as little delay as possible, subjected to a high temperature, so as to dry it to the condition in which you see these specimens. The temperature should not exceed 140°, so that the albumen may be preserved simply in a desiccated, not in a coagulated state. It is then resoluble by simple mixture with water, which is a very important matter in the making of soups. It is redissolved in about six hours, and may then be converted into excellent soup. It is better, however, to let it soak for a longer time in cold water, and then to boil it in the liquor. This sole was simply immersed for an hour and a half in the acid, and then hung up to dry in a high temperature. Here is a haddock, of which fish thousands of tons are used in a dried and salt state in Scotland; it is sweet, and although dry, is wholesome food. One or two of these specimens have had a slight sprinkling of salt, which of course would give them a faint taste of salt. These fish should be soaked about six hours before cooking.

Mr. HOLLOND.—There seems a little salt taste in this fish which you say has had no salt applied to it.

Dr. DEWAR.—That must arise from the salt in the juices of the fish. There is the same taste with the preserved lobster, which has had no salt applied to it. That

salt taste is not occasioned in any way by the sulphurous acid. I think it shows, the meat being in a somewhat concentrated form, that the animal has salt in its composition. The lobster is seven times concentrated.

The CHAIRMAN.—How long have you been making experiments in this direction?

Dr. DEWAR.—For about two years. I first tried fumigation, but I now adopt immersion as preferable. The sulphurous acid is that of the British pharmacopœia. My experience has shown me that failures are very rare if the drying process is carefully attended to after immersion; but the high temperature must be maintained; if it falls to 60° matters will go wrong. I may enumerate some of the specimens which I have brought here. Here is a halibut which was immersed for an hour and a half, and then dried in the ordinary way; other specimens of fish are prepared in the same way. This shin of beef was immersed for six hours, and it has since hung in a high temperature for two months. I do not know that it is necessary to keep it for such a length of time in a high temperature; probably a fortnight would be sufficient, but unless the meat is well dried the process might fail. This piece has been exposed to a high temperature for one month; previously it had been in an ordinary temperature for five months, but bottled and tightly corked.

The CHAIRMAN—How long do you consider it necessary to expose the meat to a high temperature before packing it?

Dr. DEWAR—With a good current of air I think three days might do. This tongue, which has been cooked, hung in the same place for ten weeks. Here is a piece of rabbit which has been hanging at a temperature of 55° for six months. In a very dry climate the temperature is not so important. Here is a bullock's heart which was immersed in the acid for six hours, and has since been hanging in the same temperature for eight weeks. A little salt was put to it at first. Here, again, is some beef powder. The meat was killed in November last; it was dried to the condition of these other specimens, and then ground into meal. All the fat was removed from the outside, but of course there is a certain quantity of fat in the grain of the meat which cannot be removed. Here are some biscuits which are made from the ground meat; twelve of them are equal to half a pound of beefsteak.

Mr. HOLLOND—What would be the retail cost of these biscuits?

Dr. DEWAR—I have not calculated that, but it can be arrived at in this way; the meat from which they are made loses four-fifths of its weight in the process, and therefore that must be allowed for. On the other hand, the lessening of the weight would, in the case of meat imported from abroad, be an advantage in the matter of freight. The biscuits are made of equal bulks of wheat meal, potato meal, and beef meal, all dried. Some of the constituents of the potato are considered important as being antiscorbutic, and the potato meal is therefore introduced. There has been no salt introduced, unless it was done by the baker. The meat loses nearly four-fifths of its weight of water, the potato rather more than four-fifths, and the wheat meal about one-tenth, so that at present prices in this country, the materials would cost about 5s. 4d. per lb.; but one pound would be equal to about five pounds of beefsteak. An eminent professor in the University of Edinburgh says that twelve of these small biscuits contain as much flesh in substance as half a pound of beef. Some of these preserved specimens have been tried, to a small extent, on board ship, and have been sent to India and Australia, with perfect success. Duplicates were likewise sent to the Abyssinian expedition.

Mr. HOLLOND—There seems a slight smell of tallow in the fat on this piece of beef.

Dr. DEWAR—In the process of drying, the fat loses its oleine and retains the stearine, which is the probable cause of that smell, like that of partially cooked fat.

The CHAIRMAN—Will you shortly state the advantage possessed by your process over the ordinary one of salting?

Dr. DEWAR—The first advantage is that the juices of the meat are retained by this process, whereas salting makes the fibres contract and thereby expel a great portion of the most valuable part of the meat. Again, salt, when taken into the constitution in excess is injurious, whereas in this process there is no taste remaining of the agent by which the preservation is effected; and if in some instances it did remain, it is not only harmless but wholesome. As to the time it will keep, if well dried and kept dry I think it will keep interminably. I have a piece of beef 21 months old lying on my mantel-piece, which has not changed at all.

Mr. HOLLOND—Can you tell us what is the proportionate difference in strength between Liebig's essence of beef and your ground beef?

Dr. DEWAR—As I understand, Liebig's essence contains little else than gelatine; the albumen is all coagulated and lost, which is a fatal defect. I have not compared the cost of this process with that of salting, but twelve of these haddocks could be preserved for a penny, as regards the sulphurous acid; then the cost of drying would depend upon the size of the premises. Twelve beef-steaks could be preserved for 1½d. or 2d., because the same liquor could be used repeatedly, with the addition of a little acid, if necessary, to keep up the strength. Here are some pieces of preserved blood—bullock's and sheep's—which is very valuable for feeding horses, cattle, pigs, poultry, &c. All of them eat it readily.*

Mr. JENKINS—Do you intend this process to take the place of salting for common domestic purposes?

Dr. DEWAR—Many of my friends use it regularly. There may be a little difficulty in exposing the meat to the high temperature required for complete preservation, but I have reason to believe that beef or mutton will keep three or four times as long by this method as it would otherwise, and that without further trouble than the mere immersion.

Mr. JENKINS—First of all, do you consider the obtaining and preparation of the acid quite within the reach of a housewife, who would use it similarly to common salt?

Dr. DEWAR—Yes; there would be more difficulty in the drying process, because that requires a heated room, the maximum temperature being 140°, and the minimum 80°. On a small scale I think the operation could be conducted before the kitchen fire. In no other way could it be accomplished by persons living in flats. I have succeeded in drying specimens before a fire, the fire being well kept up. 140° would be a safe limit, as albumen coagulates at 157°. Most unquestionably I consider there is more nutritive matter left in the meat than in the ordinary process of salting. It should be soaked 24 hours before cooking, and it then becomes fit for use. If it is to be made into soup it does not require quite so long. Here is a cake composed of preserved blood and meal; some of these were sent to Abyssinia, as being suitable provender both for man and horse. This dried fish, when made into meal, forms an excellent material for soup, and its piquant flavour makes a little go a long way. It is fit for cooking after

* In connection with the blood meal as food for horses, cattle, pigs, dogs, &c., perhaps I may be permitted to state that more matured experience fully warrants the anticipations which were early formed in regard to its efficiency as the representative of nutritive substances. Horses take it readily, mixed in a dry state, with their ordinary feed, or baked into cakes with oatmeal: and cattle eat it without hesitation, if the preservative process has been duly attended to. I have at present two oxen, which are being fed upon this novel system, and they are thriving very much to the satisfaction of my farmer friends, who inspect them periodically. Their steady and even rapid improvement is quite unusual, and the cost of their "keep" is less than one-half of the ordinary rate—the secret being that they each eat blood equivalent to 4 lbs. of beefsteak daily, their food otherwise being restricted to oat-straw, draff (malt waste), dreg (malt-steep), with the exception of 1d. worth of Indian corn meal.

twelve hours' soaking, but it is not then so soft as a fish just caught.

Mr. JENKINS—Does it retain that peculiar sapid flavour which is characteristic of many kinds of salt fish?

Dr. DEWAR—Many of my friends who have tried it prefer it greatly to salt fish; they say there is a peculiarity about it which is found in nothing else. Here is a bottle containing some small pieces of preserved salmon, which have been pronounced very good; but it does not pretend to compete with salmon freshly caught, but only as a substitute for it. I have kept herrings fresh in this way for a considerable time, and those who have tried them prefer them to anything of the kind; they are exceedingly delicate in flavour. This process has not yet been tried on a commercial scale, but I believe it very shortly will be. I believe this preserved beef would keep good for any length of time in a dry place. Dryness is more important than heat; if it were allowed to get moist it would decay.

Mr. FOSTER—I believe it is your intention to bring meat from Australia in this state?

Mr. DEWAR—Yes. My principal difficulty has been that the pieces of meat get slightly mouldy on the outside. The plan I propose is to pack them in a cask, with the interstices filled up with some anhydrous substance, such as potatoe meal; or this blood meal, which, being nearly as valuable as the beef itself, would pay its own expense of carriage. If the cask were perfectly tight I should not care in what part of the ship it was stowed.

Mr. FOSTER—Your object is to keep the albumen in such a state that it may be readily soluble when placed in water for cooking?

Dr. DEWAR—Yes; that is a point, however, as to the real value of which one may be easily deceived, because, although the albumen may have been re-dissolved, it would necessarily be coagulated during the process of cooking, and thus be practically lost, unless some means were used to suspend it, such as thickening the water with rice or other vegetable substance. In certain states of the digestion, it is important that coagulation should not have taken place, and, consequently, soup can be made of this meat or blood meal suited to invalids, by whom ordinary cooked meat could not be digested.

Mr. JENKINS—You propose to send this meat packed in casks, but with some dry material between the pieces? I can quite understand that the material with which it is packed may make all the difference in the success of the enterprise in a commercial sense.

Dr. DEWAR—It is very important and somewhat difficult to find a material which is perfectly dry, and which has no flavour of its own which it can impart to the meat. The only two things which I know of are this potato meal and preserved blood meal. The latter is free from any odour, and when it arrives here would sell readily at 5d. per lb. for the purpose of feeding cattle and horses.

Mr. JENKINS—Would there be any difficulty in separating and collecting it?

Dr. DEWAR—There need be no difficulty about that. The blood could be saved when the bullock was killed, and both might be in the cask within 48 hours. I am told that meat in Australia will dry in the open air.

Mr. FOSTER—If you had to provide a very high temperature it would add considerably to the cost.

Dr. DEWAR—My friends in Australia say that their temperature in the open air is sufficiently high to dry a beefsteak in the course of 48 hours or less.

Mr. HOLLOND—That would only be at particular seasons of the year.

Mr. FOSTER—What was your object in mixing the sulphurous acid? Was it that a stronger mixture gave any flavour to the meat, or simply to save the material?

Dr. DEWAR—It was the result of experiment. I tried it first of various strengths, which did not answer, and I made it stronger and stronger until I arrived at the correct proportions. I find the application of heat dissipates all flavour of the acid. I am not able to speak exactly as to the temperature required to dry this meat in a dry climate like Australia, but in our climate, on a dry day in summer, a haddock will dry in 12 hours if hung up in the sun. I do not think that meat could be dried in the open air in this country—we have not sufficiently steady weather. All these specimens have been dried in the same room. The higher the temperature the better, if it does not exceed 140°.

Mr. HOLLOND—I understand you that when fish were dried in the open air the temperature must not go below 80°—What would be the corresponding temperature for beef in the open air?

Dr. DEWAR—These have all been dried under the same circumstances, but I should say that below 80° would be dangerous either to meat or fish.

Mr. FOSTER—We have been told that about 80° is the most critical temperature to which meat of any kind can be subjected, so that to prevent anything going wrong you want it higher than that?

Dr. DEWAR—Yes.

Mr. JENKINS—As I understand, two conditions are requisite to the carrying out of your process—first, a temperature above 80°, and secondly a certain amount of dryness. Can you tell us what amount of dryness that would be?

Dr. DEWAR—As near perfect dryness as possible. I have not tested it by the hygrometer.

Mr. JENKINS—For instance, it would be very doubtful if you could get the requisite conditions during a great portion of the year for applying the process to the preserving of the Cornish pilchards.

Dr. DEWAR—That could, no doubt, be secured by artificial means, which would be requisite in any case to carry out the process on a commercial scale in this country. But my aim has rather tended towards applying it to the bringing of meat from abroad rather than to preserve meat in Great Britain. Nevertheless, the time during which salmon and other fish can be procured, is materially prolonged by the employment of this process. In April last, I kept a piece of salmon twenty-two days, after six hours immersion, and then sent it to London, where it was much appreciated. Haddocks, &c., after two hours' immersion, will be found available for food days after they would, under other circumstances, have been useless. They keep best when hung in a dry current. I have sent some specimens to a friend in Australia, who wrote to me the other day that he had tasted them, and found them perfectly fresh, not at all like ordinary preserved meat. A portion which he had allowed to get damp, however, went wrong.

Mr. JENKINS—Have you any notion how much of this beef powder would make a quart of soup, and what would be the cost?

Dr. DEWAR—I have not tried that; soup varies so much in strength. But it is nearly five times as strong as ordinary fresh beef.

TWENTY-THIRD ORDINARY MEETING.

Wednesday, May 20th, 1868; WILLIAM HAWES, Esq., F.G.S., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Evans, Henry Sugden, 154, Holland-rd., Kensington, W.
Hawksley, Thomas, C.E., 30, Great George-street, S.W.
Pochin, Mr. Alderman, Manchester.

The following candidates were balloted for, and duly elected members of the Society:—

Compton, William, 68, Prince's-square, Bayswater, W.
King, John, 10, Hyde-park-gate south, W.
Price, Hugh Powell, Castle Madoc, Brecon.
Ward, William Augustus Hardcastle, 49, Pall-mall, S.W.

The Paper read was—

ON THE CONDITION OF THE AGRICULTURAL LABOURER.

By J. BAILEY DENTON, Esq.,
Honorary Member of the Royal Agricultural Societies of Sweden and Norway.

At a time when the education of the wage-paid classes is receiving much public attention, and when we are just on the eve of a great political change, by which all classes will be admitted into the exercise of the franchise except one—the working class in agriculture—I have thought it possible that a few words from a member of the Society, who for many years has directed the operation of a large number of agricultural labourers, and who necessarily feels a great interest in their welfare, might have some influence upon those who are giving their attention to the means by which their condition may be improved.

Having incidentally alluded to the new franchise about to be exercised under the "Representation of the People Act, 1867," let me at once disclaim all intention to give a political bearing to the observations I am about to make. I respect too highly the standing rule of this Society, that political discussions should be avoided in this room, to break it intentionally. But though it is my purpose to treat the subject in a practical manner, I should fail in impressing upon others its full importance if, in the first place, I did not call attention to the fact that at the next general election that class of the community known as the agricultural labourer will be the only operative class which will be excluded from voting. Though, in the practical view I take of the matter, I fail to discover any reason why operatives living in boroughs should be admitted to the franchise, while operatives living in the country should be excluded, I cannot help recognising in the uneducated, dependent, and scattered condition of the latter the real reason why the country has tacitly allowed—as if by common consent—a distinction to be made between the wage-paid labourer of the factory and the wage-paid labourer of the farm. This distinction cannot have arisen because the premises occupied by the one are more valuable than those occupied by the other, for it would be difficult to say which labourer's dwelling—the rural or the urban—costs more money to provide, and it has often been shown in this room that the actual money rent paid by the farm labourer is no criterion of the value of the premises he occupies; nor can it be because the wages of the one are much greater than those of the other, for when the earnings of each are carefully dissected it will be seen that there does not exist that great difference between the two which there is generally supposed to be. It can, in fact, only arise from those causes which limit his mental abilities, and prevent his increasing the value of his labour, while they depress his status in the social scale—causes which it is the duty of the country to investigate and remedy.

But before I go into these causes and remedies, I will do my best to remove the misapprehensions that prevail as to the value of the farm labourer's occupation and the amount of wages his services command. There is much in the one that affects the other, and no effort to improve either can be successful unless we carefully comprehend the circumstances of both. The average rent of farm labourers' cottages at the present moment may be fairly stated to be rather under than over 1s. 6d. per week, which is less than £4 a year. This rent is quite as much as the majority of old existing cottages are worth, for most of them have but one bedroom, and are wanting in those accommodations which are essential to decency and comfort. Such dwellings have been, and may still be, built for about £50 each, if constructed of plaster and thatch, without regard to substantiality, and £4 a year—being 8 per cent.—may be considered a full return, if such dwellings are admissible at all. But if we have reference to those cottages which, under the influence of sanitary reform and sound estate economy, are taking the place of these miserable hovels,—which all well-thinking people condemn,—we shall find that their average cost is £160 each, or £320 the pair, exclusive of the site on which they stand. This site, which would cost £15 more, would make the fee simple value of the whole £175. We all know that every speculator employing capital in house building, looks for something like 7 per cent. if he is to replace the capital and make 5 per cent. net after paying insurance and doing repairs. If, therefore, a farm labourer paid for his occupation the rent in money which a speculator would demand, the payment, instead of 1s. 6d. or 2s. which he still continues to pay for a good cottage as he did for a bad one, would be £12 5s., which closely approximates the rateable value fixed as the qualification of a county voter, while it exceeds that of the lodger in boroughs. But it is not in money wholly that the farm labourer pays for the improved cottage, if it forms part of the farm on which he works, or is so connected with it that the farmer has command of the services of the cottager. A farmer having good cottages at his disposal can select the best workmen as his daily labourers. Moreover, he can keep them, which is not the case with the occupiers of the miserable hovels that generally exist; and as newly-built cottages are now usually placed so as to reduce to a minimum the distance the labourer has to walk, whereby time and sinew are saved, the advantages to the employer are, in the aggregate, equal to the difference between the return due to the condemned hovel and that due to the improved cottage, and thus, in point of fact, the farm labourer receives in a better home an equivalent to increased wages.

Let us now turn to the more direct earnings of the agricultural labourer, and see what they are. It appears to me that, although much has been said about wages lately, a great deal of misapprehension prevails.

It is not my object at the present moment to provoke any discussion on the principles which govern the price of labour. That is too wide a subject, and would divert our attention too much from those facts it is most desirable to establish to remove misapprehension. But, having had some considerable experience in nearly every county in England, I desire to state shortly the conviction at which I have arrived—that, measured by the real value of the services rendered by the agricultural labourers in different parts of England, the prices peculiar to different districts are as high as the return to be gained from those services will sanction. It appears to me to be a fallacy to suppose that the labourers of one district are as good workmen as the labourers of another, and that for the services of each, when applied to the same object, the same money should be paid. Still, it can only be on such grounds that the proposal lately enunciated for the formation of unions, even though "established on principles strictly defensive," among agricultural workmen, can be supported. Considering that combinations of workmen are injurious in proportion as ignorance prevails, and that the want of education is the special characteristic of the agricultural labourer, I can anticipate only the worst results from unions among them, and am quite at a loss to comprehend how any national benefit can arise by encouraging them. If the labourer of Dorsetshire or Devonshire was as able a workman as the labourer of Northumberland or Lincolnshire, a common standard of daily wages could be adopted, but the truth is that there is as much difference in the value of ordinary labour in different districts in England as there is in the character of labour in different countries abroad, and it is only consistent with economy that this difference should govern the price paid. In making this remark, however, I do not lose sight of the fact, that the price of labour must be regulated in some degree by the cost of maintaining labourers and their families in their own districts, so as to perpetuate the race upon which the produce of the land depends. With respect to the wages of the farm labourer, it has been

my duty for the last seventeen years, when reporting on the agricultural operations of the General Land Drainage and Improvement Company, to inquire into the standing wages of every locality in which works have been executed. In addition to these inquiries, I have recently made others, and have obtained such reliable information, that I believe I am perfectly justified in stating that the present average weekly wages of the farm labourer, excluding extra allowances at hay-time and harvest, and all payments for piece-work and over-time, as well as the value of various perquisites in the shape of beer, milk, fuel, &c., are as follows:—

	s.	d.
North-Eastern district	14	6
North-Western district	14	0
Mid-Eastern district	13	0
Mid-Western district	11	0
Midland district (exclusive of Middlesex)	10	9
South-Eastern district	12	0
Mid-Southern and South-Western districts ..	10	6

These figures include shepherds and horse-keepers, but do not include the wages of bailiffs, where they exist, nor of other special employés, nor the earnings of labourers' wives and children. They include, however, beer and cider when they form a regular daily allowance in lieu of money, but not otherwise.

The mean weekly day-labour wages of able-bodied men throughout the whole of England may be taken at 12s. 6d.

To this must be added the additional gains by occasional piece-work,* extra payments at hay-time and harvest, when double the ordinary wages is frequently given, independently of the increased allowance of beer or cider. In the aggregate, the actual income derived from these employments is equal to from 1s. 6d. to 3s. a week, according to the custom of different districts. Where piece-work can wholly take the place of day-labour, a labourer may earn 25 per cent. more than by the day. The total value of the beer and cider supplied to each labourer as his allowance, at hay-time and harvest, when employed in drilling and machine threshing, and when engaged in piece-work, if spread over the whole year, would amount to from 1s. to 2s. a week, according to locality. With these additions to his direct money wages, the farm labourer gains from 15s. to 16s. per week, taking the mean of England.

But, besides this aggregate, he gets other advantages, which are unknown to the industrial labourer living in a town. The rents of the dwellings of town operatives vary from 4s. to 6s. a week, some having very good dwellings for these rents, while others are obliged to pay as much for lodgings only. Comparing these figures with the 1s. 6d. or 2s. paid by the agricultural labourer for cottages equally as good or better than the dwellings of the town operative, the difference must be regarded as a gain to the former. The town operative seldom, if ever, has the advantage of a garden wherein he may grow potatoes and vegetables. His outlay for these essential articles of food is often great, particularly if he has many children to provide for. In fact, the ordinary payment for potatoes and vegetables by a mechanic, with a wife and three children, living in a town, is stated to be 2s. 6d. a week. An agricultural labourer, if he is fortunate enough to have—what he ought invariably to have—a rood of garden ground as part of his occupation, which he may cultivate after he has done his wage-paid work, will grow upon it vegetables sufficient to yield him a return, after payment of rent and for seed, of at least £4 a year, which is rather more than 1s. 6d. a week. I am assuming in this estimate that he has time and strength sufficient to do all the labour that is required to cultivate it, and that he is careful in storing the refuse of his dwelling, *i.e.*, the ashes, sewage and waste, so that he may avoid any payment for either labour or manure.

Thus it will be seen that from his house and garden the agricultural labourer gains advantages equal to at least 4s. per week, which, if added to his money returns, will raise his wages from 15s. or 16s. to 19s. or 20s. a-week, independent of what his wife and children may make, and this frequently adds 25 per cent. to his income.* I have said nothing about the gains of gleaning, which have been estimated at £1 1s. 10d. to 40s.; nor about the favourable difference in the cost of bread, meat, milk, &c., in the country compared with what it is in towns; nor of the benefit an agricultural labourer is said to derive from the keeping of a pig, as I am doubtful myself whether anything is fairly gained by it; neither have I estimated the great advantage of pure country air in securing the health and strength of the labourer and his family, though all these have a money value which should be considered. I may here state that for several years past I have adopted the weekly wage of 20s. as the basis of payment to the able-bodied labourers employed by the General Land Drainage Company when away from their homes during the draining season, at which time the number has frequently exceeded 1,500. The system adopted when going into fresh districts is to make the earnings of a few good practised hands, of medium capability, who follow the company's foremen wherever they go, the data for paying all other hands. The weekly work of a good gang of drainers will, if divided, give to each hand as much as from 30 to 40 rods of digging, and the price per rod will be fixed by the foreman at such an amount as to apportion to the standard men from 16s. to 22s. a-week, according to the length of the day, after paying for the repair of tools. While these figures are the wages of standard workmen, the local labourers, at the commencement of the work, will seldom earn more than from 10s. to 12s. Of course this is to be expected, and the statement is only apposite to the present inquiry, when it is said that, whenever a turn-out or a strike takes place it is invariably found to have its origin in the local men, and there are many kindly-disposed persons who take their part, though the result invariably shows that if they will only persevere they can, after a time, make as good wages as the older standard hands. With this knowledge it will be understood with what dismay I look upon the proposal of unions which can only maintain inferior work, done at an extravagant cost, and discontent at the same time.

The weekly earnings of different labourers, which fairly represent the class known as industrial operatives, may be stated to be as follows:—

Carpenters and joiners	from	18s. 0d. to 28s. 0d.
Sawyers	,,	21s. 0d. to 26s. 0d.
Bricklayers	average	31s. 6d.
,, labourers	,,	19s. 6d.

* The advantages gained by the adoption of piece-work in the place of day-labour are stated by one of our leading farmers, Mr. Charles Howard, of Biddenham, to be: 1. The work is done more expeditiously, at the proper time and with less supervision on the part of the employer; 2. It is less expensive than day-work, and payment is made for only the work done; 3. The labourer, finding his wage is regulated by the quantity and quality of the work performed, is more industrious, and exercises more skill in what he does; and 4. By placing higher wages within reach, the temptation to leave farm-work for other occupations is lessened.

* Mr. Purdy, in his valuable paper in the *Journal of the Statistical Society of London*, on the rate of agricultural wages, illustrates the assistance a labourer derives from the work of his wife and children by adopting Dr. Kay's figures, given in the same journal, which show the income gained by upwards of 500 families of different sizes in Norfolk and Suffolk to be as follows:—

Families.	Condition.	Average No. of children.	Average annual income.
36	Single men	...	£25 0 0
64	No children at home	...	30 6 0
166	Children under 10	3	32 6 0
120	One child above 10	4	35 4 0
92	Two children above 10 ..	5	40 5 0
44	Three children above 10 .	6	45 6 0
15	Four children above 10 ..	7	50 9 0

Brickmakers	from 24s. 0d. to 30s. 0d.
Masons	average 30s. 0d.
,, labourers	,, 17s. 6d.
Gardeners (exclusive of head gardeners)	,, 16s. 0d.
Smiths	from 26s. 0d. to 28s. 0d.
Painters	average 28s. 0d.
Boot-makers	from 21s. 0d. to 26s. 0d.
Tallow workers (labourers)	average 18s. 0d.
Coal miners	from 17s. 0d. to 27s. 0d.
Quarry men (slate)	,, 18s. 0d. to 23s. 0d.
Carters	,, 17s. 0d. to 19s. 0d.
Railway labourers (maintenance)	,, 15s. 0d. to 20s. 0d.
Butchers' men	,, 16s. 0d. to 18s. 0d.
Police-constables	average 20s. 0d.
Bakers' men	from 21s. 0d. to 26s. 6d.
Cotton workers	average 18s. 6d.
Silk workers	from 17s. to 24s.

The difference between these figures, which, it will be seen, do not cover the highest grade of trade operatives, and the wages of the agricultural labourer, is too great to exist between the two main branches of the wage paid classes without making efforts to reduce it. It accounts for the fact that the population of our leading agricultural counties is decreasing, while that of other counties in which manufacturing towns exist is increasing with more than ordinary rapidity.* It accounts, too, for the deplorable truth, that while the industrial labourers of our towns are known to save money to provide for incapacity and old age, the utmost the agricultural labourer manages to do is by means of provident societies, if he is lucky enough to belong to one which is well managed, to provide for illness during his working age. In the breast of the former there exists a hope of accumulating money, and ultimately becoming a master, while the final prospect of the latter is, I regret to say it, nothing but pauperism and the union. Sad as this picture is, it is a satisfaction to know that the rate of agricultural wages throughout the country has increased within these last 35 years quite as much as 20 per cent., while the prices of those provisions and supplies which constitute the ordinary food and necessaries of life have, on the whole, decreased in the aggregate about ten per cent. The price of meat and cheese has increased within the last few years at an extraordinary rate. This is partly to be accounted for by the prevalence of diseases amongst cattle; and it is a curious fact that just 50 years ago the price of the best meat was the same as at this moment, though if we only go back half that time—25 years—it was about 40 per cent. cheaper. Inferior meat has not been liable to such changes, though there has been a rise of 2d. per pound. Bread, though high in price at this moment, remains at much the same cost as it was before the repeal of the corn laws. Beer, though nominally cheaper, is so much worse in quality that we cannot regard it as actually reduced in cost. Tea, coffee, sugar, and groceries generally are 50 per cent. less than they were 50 years ago. Clothes and shoes are equally cheaper. The cost of fuel, on the whole, is less than it was 35 years ago.

Though I hope I have shown that the position of the agricultural labourer is not so bad as many represent it to be, no one can say that it is quite satisfactory; but with the profits of farming as low and uncertain as they are, it will be acknowledged that the only way to justify an increase of labourers' wages will be by rendering the value of the labour given greater than it now is. Active hands, directed by superior intelligence, already obtain wages above the mean of 16s.; and as there is greater scope in agriculture for the exercise of judgment than perhaps in any other trade or pursuit, in which physical labour forms so great an element, owing to the diversity of its objects and the casualties which may affect them, there is no reason to doubt but that with an increase of knowledge on those points which alone can enhance the value of labour, the earnings of the whole class may be increased.

This directly brings us to the subject of education and its influence on the agricultural labourer by bringing his mind to bear on his physical duties.

The state of education among agricultural labourers was truly indicated by the Royal Commissioners appointed in 1861, to inquire into the state of public education in England, when they said that in the British Army, which, I believe, is chiefly made up out of the agricultural class, "out of 10,000 soldiers examined in 1856, more than one-fourth could not write, and more than one-fifth could not read, while in the British Foreign Legion, raised in 1855, four-fifths of the Italians and 97 per cent. of the Germans, could both read and write." Those, however, who are brought often into contact with the English farm labourer, as I happen to be, require no statistics to prove the almost total absence of education that exists among them. We can only wonder that with a nation so advanced in civilization as our own, such a condition of mind should be allowed to lower one particular class without a general effort on the part of all other classes to improve it. But the want of education is not to be wholly attributed to national apathy and indifference. It is due to various causes special to rural life, but perhaps the most powerful of all is, the belief that existed largely at one time, and still lingers with some few farmers, that education disqualifies a labourer for manual work in the field. This belief had its origin in the little education possessed by the majority of farmers in times past, though at the present time there is no class more quickly awakening from indifference to the benefits of knowledge than the farmers. Moreover, they are not as a class to be blamed wholly for past indifference, for there were many landowners who themselves preferred men as tenants on their estates who were not possessed of those attainments which qualified them to appreciate education in their labourers.

Not many years back it was a common thing to exhibit less care for the comfort of the labourer than for the comfort of cattle; better buildings, indeed, were provided for the cows than for the labourers. But this state of things is happily gone by.

I will not here dilate on the manner in which the children of the labourer should be taught at school, nor enter upon the arguments for and against compulsory education. I am content to express my conviction that primary education at school—consisting of reading, writing, and arithmetic—is essential as the basis of improved practical knowledge, even though it be called forth in the duties of a labourer; and that, as public attention has at last been aroused to the object, the good sense of the country will rightly determine how it shall be attained. To confine our efforts, however, to elementary school learning would, I contend, fail in the object we all desire—which is, to see the farm labourer earning more money by labour of greater value to his employer. To do this, technical—that is, practical—education must be associated with primary school teaching. Technical education, I believe, has been more than once explained in this room to mean, practical tuition in those operations which men are called on to perform in the business of life. It is, however, a term that has been exclusively used in connection with the arts and sciences, and those businesses in which mechanical and chemical science have been mixed up. In agriculture I believe the term has never been used; but perhaps in no calling is technical education—

* The population of Lancashire has increased from ,031,236, in 1851, to 2,429,440, in 1861, and Staffordshire from 608,716, in 1851, to 746,943, in 1861; whereas the population of Cambridgeshire has decreased from 185,405, in 1851, to 176,016, in 1861, and Norfolk from 442,714, in 1851, to 434,798 in 1861. r. David Chadwick stated, in his paper, "On the wages of Manchester, Salford, and Lancashire," that "the wages of nearly all classes of factory operatives appear to have increased from 10 to 25 per cent. during the last 20 years.

if by that term we properly express practical education —more required.

I will endeavour to make this understood. There is not a farmer in the country who, be he engaged in sheep farming or in dairying, in tillage, or in mixed farming, does not know the superior value of a labourer well acquainted with special duties. Take, for instance, a shepherd. The wage of a good shepherd is 16s. a week, besides perquisites; and I venture to say that, at this moment, there is hardly any other description of agricultural service in which there are fewer capable men. A good shepherd is one of the most difficult men to obtain, and the loss to individual farmers, and to the country generally, from the want of them is very great.

Again, good horse-keepers are almost as difficult to obtain as good shepherds. From my own experience I can say that the difference between a good horse-keeper and a bad one is not to be measured by the simple difference between scanty and liberal wages. Any one accustomed to horses knows immediately, by the appearance or the touch of their skin, whether the man in charge of them knows his business; and he will confirm my opinion that any difference in wages will be more than counterbalanced by the saving in the corn which horses will consume, and the service obtained from them when well attended to compared with that when they have been indifferently treated.

The same remark will apply to the tending of neat stock. Speaking again from my own experience, I have found that cattle under the charge of a man who thoroughly understands them, will fatten quicker, and in every respect do much better with less food, than under a man who, from attempting indiscriminately all the duties of the farm, is master of none. In the minor matter of poultry, I have known many pounds lost by the want of proper treatment of them; and many a labourer's wife with a small plot of ground, who has brought intelligence to bear, has raised more poultry in a year than has been produced from a farm of several hundred acres. If this be admitted to be the case with live stock, it will be unnecessary for me to point out the advantages of employing men in the use of implements who have taken pains to understand them. The loss sustained by farmers from the careless treatment of costly implements is great. Few labourers know how to adjust them if they get out of order, and one who thoroughly understands the steam-engine so as to take charge of it when ploughing land or thrashing corn is indeed a prodigy in his parish. And why should we dread the purchase and use of steam-engines on our farms, on the ground that we have not a labourer who could take care of them, when tuition in youth would supply the omission? It is true that my friend, Mr. Howard, of Bedford, now and then undertakes to tutor a farm labourer in the management of the engine, if he is previously assured of his intelligence. This circumstance, while it shows how an individual difficulty may be overcome, must go some way to prove that technical education is to be attained in the lowest grade of agriculturists, as in the more refined artisan class. It would be tedious to pass through all the branches of a farmer's business, to show how technical knowledge in the labourer would apply. There is hardly an operation in tillage that would not be done better, if the operator had early understood it. Take the simple operations of ploughing, drilling, and sowing; is not a good workman worth 1s. or 2s. more per week than a bad one. The same observation applies to hedging, ditching, draining, and thatching, in which there is no comparison between an expert man and an unpractised one. I have myself sent miles for a good thatcher or hedger.

How, then, are these practices to be taught in youth? I will do my best to explain.

The only reasonable ground for keeping the children of an agricultural labourer from school, is the circumstance that, having hungry stomachs to fill, and active bodies to clothe, they must earn something to pay for the food they eat, and the clothes they wear; and so weighty is this excuse with some men of high position and character,, that they are led to doubt the policy of compelling attendance, even for the limited number of hours yearly which it is proposed the children should be at school. Still, so essential is primary knowledge, that we may with certainty assume that this objection, weighty though it be, will give way to general opinion, and what I would suggest would be, that those children who attend school for the limited time determined upon, should, when earning their food and clothes by labour, be placed in a situation to obtain fundamental technical —or, if it be better, to call it practical—knowledge on the farm; not by placing them indiscriminately one day to do one thing and the next another, merely to meet the convenience of the moment, but by putting them for a sufficient time under the shepherd, or the horse-keeper, or the stock-keeper, or the dairyman, or the engineer, or the hedger and ditcher, or the thatcher, that they may learn, as far as such labourers can teach them, the duties of their future calling. The only difference between the present system and that which I would suggest would be, that a youth employed on a farm should be so systematically engaged that he should early learn, by a species of apprenticeship, all that can be practically taught upon it, and that the shepherd, the dairyman, or the engine-man, as the case may be, with whom he should be placed, should receive a bonus for teaching him all he knows. In order to be assured that these teachers deserve their bonus, the youths should, at certain periods, undergo examination, and, where it be practicable, be made to compete with other youths for prizes. All that would be required in the way of national, district, or outside aid, would be the provision of qualified examiners, and the means of paying the teachers their fees, and the youths their prizes. Already we have throughout the country, in the autumn, matches in ploughing, ditching, and draining, and the interest that the labouring men take in the competitions, may be taken as some proof that, under proper control, competitive trials may be extended to farming youths engaged in various agricultural duties. The payments to the labourers for teaching, and the youths for learning, would each act favourably in maintaining superior services on the farm, and thus the farmer himself would naturally become interested, and would give his support to the system. Youths would gain at one and the same time primary education at school and practical information on the farm, and the two descriptions of knowledge would tell with increasing advantage upon each other, and would finally effect what is really wanted—an improvement in the quality of the labourer's work, so that he may command increased wages for that work from his employer.

At present the Beer-shop is a great bar to the improved condition of the agricultural labourer. The influence of drink on an uneducated mind cannot be better shown than by the fact, that beer or cider will go much farther than its equivalent in money in inducing men to exert themselves, although the money could be taken home by the labourer for the benefit of the wife and children as well as himself, while the beer or cider if drunk, is dissipated in selfish indulgence. The quality of the beer and cider sold in the lowest-waged districts is the worst. The beer is seldom if ever genuine, and its effects are not to be measured by its immediate action on the system. It tells equally upon the physical energies of the man as upon the moral powers of his mind. The quantity of beer drunk in the hay and harvest time would surprise many of my hearers, though in the ordinary disbursements of a labourer—as ascertained by Mr. Purdy, of the Poor Law Commission—only one instance appears on record in which an expenditure in beer has been entered. I presume that case was the only one in which the wife had partaken of it as a necessary item of food. It is nevertheless true, that during harvest every able-bodied male labourer drinks beer which costs

from 8d. to 1s. a day, taking the average of harvests in the eastern corn-growing counties. I should be sorry to condemn beer as an article of food when properly made with good malt and hops, but that article is seldom to be met with. The liquid sold as beer in rural districts satisfies thirst at the time, and provokes it as soon as drunk, and it takes more vital strength out of the man than it ever supplies. I cannot speak too strongly against the prevailing excessive use of bad beer and cider. It is the bane of the farm labourer. In those counties in the west of England where cider is used instead of beer, the impoverished condition of the agricultural labourer is even worse than where beer prevails. His inferiority in work is mainly to be attributed to the bad character of the cider, and the excessive use made of it. There is some proof of the injurious influence of excessive drinking, in the fact that in all the worst paid districts—where labour commands the lowest wages, and where those wages are all that the labour is worth—the publican and beer-seller bear a far larger proportion to the number of agricultural labourers than is the case in those districts where the wages are higher and where the labour is more valuable. We often hear mentioned the low rate of wages in the county of Dorset, and comparisons are made with the wages ruling in other counties. When we turn to the statistics giving the occupation of the people in the population returns of the last census, we find that whereas in Lincolnshire, which I select as the best-cultivated county in England, the number of agricultural labourers is 52,871, and the number of people living by the sale of beer is 1,317, in Dorsetshire the number of agricultural labourers is 19,434, and the number of persons selling beer and cider is 582, showing a proportion in the former case of one beer-seller to 40 agricultural labourers, and in the latter, one beer-seller to 33 labourers.

The proportion in Lincolnshire is much too high; but what is to be said of Dorsetshire, where the labourers, earning only two-thirds of the wages of Lincolnshire, support a larger proportion of beer and cider sellers? The figures given, moreover, do not fully represent the real state of things as regards the extent to which the beer and cider is drunk in Dorsetshire, as in that county a great deal of cider is given in lieu of money wages, whereas in Lincolnshire no such regular practice prevails either with respect to beer or cider.

But I can illustrate this important part of the question by stating a case, within my experience, which can hardly fail to exhibit the fact that low wages and inferior work are associated with a preponderating use of beer or cider. In the year 1852 I had the control of some extensive drainage works in Dorsetshire, and at that time the agricultural money wages of the district ranged from 7s. to 9s. a week. Impressed that such pay was inconsistent with suitable labour, I imported into the work some north-country labourers from Northumberland, practised in draining, to afford an example for such local men as chose to enter the trenches and dig by the piece. I guaranteed to the northern men a minimum of 18s. a week, although I could command the services of as many Dorsetshire labourers as I desired to employ at half that price. The result showed that I was right in bringing high-priced competent men amongst low-priced inferior ones, for as soon as the Dorsetshire men knew what the north-country men were getting, and saw the character of the work executed by them, they applied all their energies in imitation. At first they drank more beer, thinking that by such means they could do more work. They soon saw their error, and it was both amusing and instructive at the same time, to see how struck they were when they found that the northern men had for their dinners good meat and bread, while they were living on bread, tobacco, and miserable beer or cider. It was by very slow degrees that the Dorsetshire men realised the truth that butchers' meat was more strengthening than bad beer. Eventually, by the example afforded them, the "technical education" given them by the Northumberland men, and by the effect of improved food, the despised Dorsetshire men were enabled to earn as much as their teachers, and it was not long before I actually removed them into the north of England, to compete with Yorkshire men in the work they had learned; and the first place at which they were engaged was Swine, in Holderness, where there did not exist a publichouse or a beershop in the village!

I have given these details, hoping they will serve two objects—by proving, first, the evil of beer and the good of beef; and, next, the benefit of technical or practical teaching as a means by which the quality of labour may be improved, and the earnings of low-waged districts increased.

If this experience of mine fails to convey what I mean I can perhaps show that inferior work, low wages, and excess of drink are attended by a greater amount of pauperism than belongs to districts where better labour, higher wages, and less beer prevail, by quoting from Mr. Purdy the result of figures he has given in his paper published in the *Journal of the Statistical Society* (vol. xxiv., p. 346), which show that whereas, in an example district in Dorset and Wilts, where the weekly wages were 9s. 6d., the rate of relief to the poor was 8s. 2d. per head on the population, in a similar district in Cumberland and Northumberland, where the weekly wages were 14s. 6d., the rate of relief was only 5s. 5d.

Thus far I have spoken of those means of improving the condition of the agricultural labourer which will depend on himself and the force of education gained at school and on the farm. There are other means, however, by which the higher and middle classes in rural parishes may render material aid while the seeds of education are taking effect. I have said *may* render aid, because all Englishmen resist compulsion; but I feel those words are hardly strong enough when applied to some objects. I would rather say, will be induced to render aid by the influence of public opinion. I refer to four principal objects; first, to a more general substitution of good cottages for bad ones—cottages which will secure health and comfort in the ordinary living department, and provide separate bedrooms for the parents and children of different sexes, so as to secure comfort and decency, which have hitherto been incompatible with the dwelling of the farm labourer; second, the provision of a proper means for the drainage of villages and cottages, and the utilisation of the refuse which may be discharged from them. This is a matter upon which little has yet been done. We have drained large towns, and discharged their sewage into the rivers, a practice which the country has determined shall not be continued. At present we have not entered upon a mode of dealing with the sewage of villages and small communities; and whether it will be by the introduction of the dry-earth system (Mr. Moule's), or by any other process of utilisation, yet remains to be determined. The dry-earth system commends itself to the minds of many as the most suitable for villages, because each resident may preserve the refuse of his own cottage for the benefit of his garden without injuriously affecting his neighbour; and this being a very desirable object, the problem has to be solved how, by combined action, all the residents of a village may be brought into one common system of proceeding. As the wage-paid labourer cannot of himself do this, it would appear positively necessary that the owners of village property should take the initiative. Third, the supply of pure wholesome water in quantity sufficient to secure cleanliness and comfort to villages and cottages. I have already addressed the Society upon this important object,* and will abstain from repetition. The supply to large towns is an easy matter, compared to the provision of villages and small communities. But with our whole water supply undergoing change from causes we cannot

* *Journal*, vol. xiv., p. 17.

control, and our village cottagers called upon to pay as much as a penny per pail for water, the subject must soon receive attention. And, fourth, the provision of ground for the recreation of those children which it is by common consent, determined should be educated.

I will now address myself to those objects in which the upper and middle classes of rural parishes may voluntarily assist the lower class. Foremost amongst them are benefit societies. Of all things which the labouring man most dreads is his condition in his last days. By subscription to local societies (if well managed) a labourer may, under the present state of things, contrive to obtain the means of support if sickness overtakes him, but a provision for old age is an object which very few agricultural labourers secure. If the earnest interest of the upper classes in a parish could be manifested by taking a part in the management of benefit societies, very great good would attend them, and it would no longer be said that out of the 23,000 friendly societies which exist in England and Wales, there are not 20 solvent. By importing into the mode of management the agency of the post-office as a means of securing safety of deposit and of insuring allowances in sickness and old age, as has been proposed by the Rev. J. Y. Stratton, in some interesting articles written by him in *All the Year Round* (April, 1866), and in *The Cornhill Magazine* (February, 1864), the extension of such societies would follow. It was with a view to gain this advantage that the Kent Friendly Society memorialized the Postmaster-general last year, and I believe with good effect. All persons who have given their attention to the matter concur in objecting to the meetings of friendly societies at public-houses; and if the higher classes would really take an interest in them, the practice would be discontinued. "Sometimes," says Mr. Tidd Pratt, "the club is sold with the good-will of the house." Beer-house clubs are indeed a great abomination.

Some few existing societies are excellent precedents for the establishment of others. The Essex Provident Society has enrolled between nine and ten thousand members, and has a capital of between £70,000 and £80,000; and the Hampshire Friendly Society has upwards of 3,000 members and a capital of £35,000. The Hitchin Friendly Institution, established in 1828, is, perhaps, based on as good a foundation as any in the country, as every member who insures against sickness is also compelled to insure for a pension in old age, an object declared by Mr. Hawkins, its founder and great supporter, to be of "vital importance if the wage-paid classes are to be taught the advantage of respectability in providing for themselves when past work without application to the parish."

The next object in which the higher classes can help the lower is in establishing and maintaining garden allotments under a provident system of management, by which a labourer, having allotted to him a rood of land, may pay, during his active life, a rent more than sufficient to satisfy the landowner, but which it is quite worth his while to pay, to secure the profit which the gardening of a rood of land will give. In the majority of cases a landowner who would not let a single rood of land to the labourer, would let a plot of many acres to the parish authorities, and would be quite satisfied in receiving say £2 an acre, tithe free, which is equal to 3d. a pole or 10s. a rood. If the labourer paid 6d. a pole, or £1 a rood, tithe and rate free, he would be paying double the acreage rent that would satisfy the landowner, and if the surplus was invested through the same agency as that of the "Post-office Benefit Societies," it would accumulate so as to provide the rent of the land after a certain number of years, whereby the labourer in his latter days would hold the land rent free. Thus he would insure one means of support. But such an advantage can only be gained by the combination of the more wealthy parishioners, who together might become security to the landowner for the principal rent.

Again, village hospitals and infirmaries, enabling the labouring class who have lived a worthy life to gain proper medical advice and nursing at home, are working well where properly managed, and are fit objects for benevolent co-operation.

But besides these there is still another, in which the upper classes may do much good. We have recently heard much of co-operative societies for reducing the cost of provisions and preventing extortion on the part of London tradesmen. Without entering upon the question of whether such societies are desirable or beneficial for those they were originally intended to assist, it is quite certain that a modification of them may, with great advantage, be carried out in villages for the supply of food and clothing to the labouring population in rural districts. At present there has been very little experience in co-operative stores in villages. There is no doubt, however, that the small wages of the agricultural labourer are much reduced by tribute to the local tradesmen; and with so little to spend as the labourer has, it is indeed desirable that that little should purchase as much as it can be made to do. One condition would be paramount, and that would be, that ready money should be the only means of purchase, but as this requirement would produce provident and careful habits it could not eventually militate against success.

Associated with co-operative stores there might be established a common kitchen and bakery, at which food might be cooked with economy, and a better knowledge of cooking among labourers' wives acquired. Several efforts of this character are now being made in various parts of the country, but I am not in possession of sufficient information to speak of the results.

I trust I may be allowed to close my remarks with an acknowledgment of the assistance I have received from numerous correspondents; among them I may mention Mr. Lawson, of Northumberland; Mr. Briggs, of Yorkshire; Mr. Skelton, of Lincolnshire; Mr. George Jackson, of Cheshire; Mr. Charles Howard, of Beds; Mr. Squarey, of Wilts; Mr. Morris and Mr. Castree, of Gloucestershire; the Rev. Prebendary Brereton; Mr. Sturge, of Bristol; Mr. Fowler, of Bucks; Mr. Mechi; the Rev. J. Y. Stratton; Mr. Charles Whitehead, of Kent; Mr. Whitting, of Cambridgeshire; Mr. Hagger, of Liverpool; and Mr. James Webb, of Worcestershire.

DISCUSSION.

Mr. Frederick Wood said that, much as he admired the masterly and able essay which he had listened to with much pleasure, he must say, at the risk of being considered a Malthusian, that one of the greatest causes of the miserable condition of the agricultural labourers had not been noticed, viz., their early marriages. It was generally the practice of farmers if they had occasion to dismiss any hands, to select those for dismissal who were unmarried, and this, and the miserable condition of bachelor farm labourers, drove them to marry much earlier than they otherwise would. He was afraid there would be no real improvement in the condition of agricultural labourers until they were taught to look with more forethought upon so important a step as that of marriage.

The Rev. J. Y. Stratton could heartily say amen to the remark of Mr. Bailey Denton, that beerhouse clubs were a great abomination. He had also stated that while the manufacturing operative had the hope of bettering his condition, and even of becoming in course of time an employer, the agricultural labourer had no such hope or object; and if he joined a benefit society, it was not one which would render him assistance in old age. The agricultural labourers of England looked upon the poor-rate as a kind of rent charge, in lieu of that rood of land which Mr. Denton very properly wished to see them employed upon; and this was, no doubt, one reason for the early and imprudent marriages which had just been alluded to. He believed that, on the average, farm

labourers married at the same age as members of the peerage, whereas, it would be found that, as a rule, professional men found they must wait ten years longer before they could establish themselves. He did not wish to find fault with the Poor-law, but he believed that in the next session of Parliament a commission would be appointed to inquire into the whole subject. This had been alluded to by Lord Lichfield, in moving the second reading of the bill relating to friendly societies, which bill came to an end on the previous day, after a most interesting discussion in the House of Lords. The usual form of benefit societies in rural districts was what was termed a sharing-out club, which came to an end and was re-constituted every year, a contrivance by which the burdensome and aged members were got rid of and became ultimately dependent on the poor rate. It was easily capable of proof that, on many of these sharing-out clubs, men spent more money than would support them in old age, and in greater comfort than was afforded them under the poor law. It was estimated that even in the present unsatisfactory condition of the vast majority of friendly societies, two millions a year were saved to the poor rates by their agency; and this was enough to show what might be expected if an improved system could be introduced. Knowing pretty well the difficulties in the way, a farm labourers' society, in which he held office, one of the oldest and best friendly societies in England, some time ago memorialised the President of the Poor Law Board, pointing out the difficulties which were experienced in carrying out that law, and a memorial was also sent to the Postmaster-general, asking for some system of Post-office friendly societies. This proposal was worthy the attention of all those who were endeavouring to ameliorate the condition of the working classes. In conclusion, he would refer those interested in the matter to a pamphlet which he had published,* entitled "Friendly Societies *v.* Beerhouse Clubs," which contained many important facts.

Mr. C. S. Read, M.P., as a tenant farmer and a large employer of labour, felt that he ought to thank Mr. Denton for the very excellent paper he had laid before them. He wished such a paper had been read at the meeting recently held at Willis's rooms. He attended that meeting, and from statements made there it might almost be inferred that the English farm labourer was the most down-trodden being under the sun. One of the principal things there advocated was the establishment of trades' unions, which had been so thoroughly denounced in the paper that he need not trouble the meeting further about that question, except to say that, in his opinion, much of the effect of unions was already attained by the general employment of agricultural labourers by the day; the main objects of unions was to do the least amount of work and receive the largest amount of pay, and that was really the effect of employing labourers, as was almost exclusively the case, by the day. Another scheme put forward was that of co-operation. Now co-operation between the employer of labour upon a farm and the employed, was visionary and impracticable; but there was one species of co-operation which would no doubt be successful, and that was the introduction of piece work, by which the greatest amount of work was done in the shortest time, and in the best manner. By this system a farm labourer could easily earn 25 per cent. more than on day work; it was usual in Norfolk to pay £6 a month in harvest time, but in putting out his harvest work by the acre, he (Mr. Read) found that his men could earn £7 or £8 a month. There was another matter which deserved special remark, viz. that although labourers in some districts only got nine shillings a week, and in others eighteen shillings, it was quite possible that the last-mentioned earned his money, and that the former was over-paid for the work he did. It should also be remembered that when men were spoken of as receiving 8s. or 9s. a week in the west of England, they often had perquisites which were worth 5s. a week more. There was no doubt that the old poor laws engendered and encouraged pauperism; and he feared that the present law, as it was too frequently administered, would have the same effect, though in a more limited degree. He believed that since the passing of the Union Chargeability Bill, granting of out-door relief had not been watched with the same careful scrutiny as heretofore, individual ratepayers not having the same interest to look sharply after it; he thought the practice of giving out-door relief was increasing, and ought to be most jealously watched. The people of this country ought to be taught not to look to the operation of the poor law for their support in old age; and to this end the upper and middle classes ought to do all in their power to encourage good, sound friendly societies. Beerhouse clubs were really a curse to the labouring man, instead of a benefit, and generally failed just at the moment when they were most required. On the other hand, they must not go to such a rigid extreme as to disgust the labourers; for to men who had but few holidays, a harmless frolic once a year on club day was very wholesome, and tended much to increase the popularity of the club. There was another fact mentioned in the paper which he considered of some importance, that 25 years ago meat was 40 per cent. cheaper than at present; it was just about that time when they began to import foreign cattle, and the result, therefore, appeared to be that they had introduced foreign diseases, that farmers had lost a vast amount of cattle, and that the public had to pay much more for their meat. Mr. Denton seemed to think it rather strange that agricultural labourers were not admitted to the franchise; but they must remember that while the borough qualification had been reduced only from £10 to about £4, that for counties had been reduced from £50 to £12; and if the present bill was spoken of as a leap in the dark, he considered that one which would give the franchise to the agricultural labourer would be taking a jump into the bottomless pit.

Mr. Howard said the gentleman who had spoken of the evils of over population could hardly have had much experience in rural districts, or, at any rate, he could not have had to harvest some 500 acres of corn. The truth was, that we were beginning to feel the evils of under population. There were so many excellent points in the paper that he was very reluctant to take exception to anything, but he certainly thought that rather too bright a picture of the condition of the rural population had been painted. There were yet sadly too many villages and districts neglected by those whose duty it was to care for them; and the noble example set by the Duke of Bedford and others in covering their estates with excellent cottages and schools had not been followed to anything like the extent it ought to have been. There was no doubt that the condition of the agricultural labourer had much improved during the last 25 years, and this he attributed, in a great measure, to the improved system of agriculture, under which there was much more demand for skilled labour than in the primitive system which it had superseded. The introduction of Swede turnips, and a regular system of root culture, had added millions to the national wealth, by enabling the farmer both to grow more corn and also to feed more stock, and this had improved the condition of the labourer, not only by finding employment for a larger number during the summer, but also by providing them with something to do in the winter, when otherwise they would have been idle. The greater facilities for travelling, our large public works, railways, and land drainage had also had something to do with this state of things, and the introduction of machinery upon farms had had a great influence—having broken down that dead level which so long existed in the rate of agricultural wages. When a man was employed to swing a flail which only cost a shilling, 2s. or 3s. a-week difference in wages was a great consideration; but when

* Ridgway, Piccadilly.

the same man had to attend to a threshing machine which cost £400, a difference of a few shillings to a steady, skilful, and trustworthy man was a mere bagatelle. So with the steam-plough; men were now paid more for sitting on a steam-plough and directing its movements than they formerly were for breaking up the stubborn soil with great labour. The condition of the English labourer contrasted very favourably with that of the French peasant, who, as he had found from frequent observations last year, was generally on large farms, in the receipt of about 1s. 7d. a day, for which he had to work from 4 o'clock in the morning until eight o'clock at night, and under such circumstances it was not very surprising to find that most of the men were unmarried, and their whole condition was about as comfortless as could well be conceived. Notwithstanding what had been said by the hon. member for East Norfolk on the effect of the Union Chargeability Bill, be believed it would have a material influence for good on the future of the labouring population. Under the former state of things landlords had a direct inducement to pull down cottages instead of building them; but under the present system all that was changed, and this was very important, for one of the main things which ought to attract the attention of the landed interest was how to increase, not only the number but the quality of the habitations of the poor. Under the present Act the labourer was freed from the serf-like necessity which bound him to his own parish, and he was able to travel over the union in search of employment, and he (Mr. Howard) hoped the day would soon come when this limit would be yet further extended.

Mr. C. S. READ asked leave to explain that he did not object to the principle of the Union Chargeability Bill, but only to the mode in which relief was too often administered under it.

Mr. J. K. FOWLER (of the Prebendal Farms, Aylesbury) said that Mr. Denton, in his excellent paper, had travelled over so vast an area, that he hardly knew what particular points to touch upon. Beginning with the question of labourers' dwellings, he believed that was one of the most difficult that had to be considered. They had heard what was the cost of a decent house, and he need hardly say that it was impossible for an agricultural labourer to pay, as rent, interest even on £140. He had had through his landlord to build one or two cottages, and he found they cost from £130 to £140 each—for they ought all to have three bedrooms—and this represented a greater rent than the men could pay; but he believed the tenant farmers would willingly co-operate with the landlords in this matter, and take upon themselves the rental of any reasonable number of cottages, to be included in the rent of the farm and buildings, which they would let to their men at a moderate rent, and also give them garden ground to cultivate. He gave each of his labourers half a rood of the best land on the farm, as near as possible to the farmyard, and told them to take whatever manure they wanted, and once a year, when "harvest home" came round, they had a little exhibition of the garden produce. All this had a most excellent effect in keeping them from the beerhouse, and in encouraging habits of independence and industry amongst them. The question of wages was one that would settle itself, especially where a man was no longer tied to his own particular parish, but allowed to go to an adjoining one, where he thought he could find a better master or higher wages. With regard to what Mr. Denton very appropriately named "practical education," that was a point which could not be too much insisted on. Being very anxious that a good ploughman in his employ should be taught even further excellence, he got his friend, Mr. James Howard, to have him taught, and the result was that at the next county ploughing match he won the first prize, and a great deal of attention was excited amongst the other men to see how he set his plough and went to work. He believed that the agricultural labourer, if properly educated, might be made as good a skilled labourer as any man in the manufacturing districts. He (Mr. Fowler) was now using the steam plough, and every man engaged in attending to the machinery, including the one who drove the engine, was, a few years ago, an ordinary agricultural labourer. Mr. Denton had spoken of bakeries for the benefit of the men, but he did not see why they should not have public breweries as well, so as to avoid the bad beer so much complained of, only it would be quite necessary that the present oppressive malt-tax should be removed. The supply of water to the dwellings of the poor was of even greater consequence than that of beer, and should never be overlooked in the erection of cottages.

Mr. C. WREN HOSKYNS said the last speaker had touched a point which he considered of great importance—namely, that he anticipated the time when the tenant farmer would look upon the condition of the labourer as matter for special arrangement and understanding between himself and his landlord. He considered this of great importance, because he regarded the whole question very much from a point of view which had not been touched upon, and which he could not pass by in absolute silence—namely, the position which, in regard to the constitution of the whole order of English society, the agricultural labourer held in the body corporate. They had a body of laws relating to landed property, which were peculiar to England, which they had attempted to enforce upon the colonies and to establish in India and America, but which had broken down in each of these instances, and which existed in no other country in the world with the exception of portions of Austria and Russia; he referred to the laws which tended to the aggregation of land into large and still larger territories — he could not call them estates --of from 5,000 to 10,000 acres, and which it was morally impossible could be farmed by the proprietor. It had, therefore, to be let out in portions to tenant farmers. If these tenancies existed for the term of human life, or even for twenty-one years, or any such term as would give something like a feeling of proprietorship, it would matter little who the owner of the soil might be in reality; but at present the effect was to make all the efforts of the farmer point to those discoveries which suited his circumstances, and would enable him to make the most out of the land in the shortest time. He admitted that this system was very satisfactory to farmers and proprietors; but there was one individual who would raise his voice against it if he had the power, and that was the one whose condition they were discussing—the agricultural labourer, whose position was such, that he did not come in contact with the owner of the cottage which he inhabited, or of the land which he tilled. The tenant who employed him, held his lands under such conditions as compelled him to make the most out of it in a short time, and with the least expenditure of labour; and, under these circumstances, he did not stand on an equal footing with the man who came in contact with the actual owner of the soil; and, in fact, those men who were employed about the gardens of the proprietor, were always in a better position, had better wages and dwellings than those who worked for the tenant farmer. The latter was not able really to influence the condition of the labourer; the cottage in which he lived did not belong to him; the farmer might leave the farm and the labourer stay, or the labourer might leave while the farmer stayed; there was no life-long relation between them of that kind which rendered the man's condition an improving one, because of his labour becoming more appreciated. He thought however their condition was capable of great amelioration, and no doubt machinery operated in agriculture the same as in trade, though the conditions were not exactly alike, because in the one case there was the power of almost unlimited production, while in agriculture the production, though not so limited as some might suppose, had a definite limit. He should most gladly see any

system established which would improve the condition of the agricultural labourer, but he thought more good would be done by commencing at the other end of the chain of causes, and endeavouring to obtain some alteration of that system which was tending to larger and larger aggregations of estates. One point in the paper and discussion he had noticed with much pleasure, the importance of technical or practical education. He had himself seen the work of a farm done altogether inefficiently, simply because every one was trying to do everything, and because the system seemed to be a miscellaneous one by putting any man to any employment. If there were more subdivision of labour on farms he was certain good results would follow, and one of the main advantages of technical education would be that each man would be able to do at least one thing well, instead of a great many things indifferently.

Mr. S. Sidney said this subject had been so often discussed by gentlemen who took merely a picturesque view of it that he felt much indebted to Mr. Denton, who had had great experience, for giving them some facts upon which they might depend. It was not sufficient to point to other countries, where labourers were worse off; our system of government was worth nothing unless we could apply some means of improvement to what was allowed to be unsatisfactory. The great point in which our government excelled was that it was progressive; it appeared that the condition of farm labourers had progressed, and was much better than it was at the close of the great war, when there was a very bad system of poor laws, and when the condition of the agricultural labourers was really nothing better than that of serfs. As to their present position, taken as a whole, although there might be exceptions, the labourer always looked forward to ending his days in the workhouse, and the exceptions were in cases where employers took more than usual interest in their workpeople. As long as this was the state of things it could not be considered satisfactory. He did not believe, however, that it could be suddenly altered by any Act of Parliament or philanthropic movement; he quite agreed with the observations which had been made as to the fruitlessness of encouraging the labourers to combine, and thought the gentlemen who took part in the meeting which had been referred to by Mr. Read were not so wise as well meaning, but at the same time Canon Girdlestone had proposed one of the few things which would really do the labourer good; when he found that in one parish or district the wages were very low indeed, he recommended the men to go elsewhere, and that was just what caused the great superiority of mechanics to farm labourers; they were much better educated, not so much in the way of reading and writing, but in knowledge of the world, and how best to provide for themselves, and improve their condition. The agricultural labourer must not be limited to the mere bounds of his parish, as was now too often the case. In dealing with millions of people the only way to help them was to teach them to help themselves, and the essential point was to give them that sort of education which would make them desire more. Without speaking disrespectfully of his friends, the farmers, it was but too true to say that their predecessors were anything but alive to the advantages of education; they did not like a labourer who had an idea beyond his own parish. The whole system of the poor laws was calculated to produce the same effect, and prizes even were given to the man who had been the longest time in one situation, which was about the most mischievous thing they could offer a prize for, as travelling was one of the best means of increasing knowledge. He did not doubt but that, with the impetus now given to education, farm labourers as a body would learn to read, and then they would soon find the advantage of technical education, and would co-operate with the farmers themselves in becoming more intelligent and useful labourers. There was no question as to the advantage of giving them plots of land to cultivate, but that must come from the farmers themselves. They had heard about the scarcity of labour, and before long he hoped they would hear of farmers meeting to consider, not as they once did, how much they should give to married men, and how much to single, but how they could get more good labourers into the parish. He was rather surprised at the remarks of the last speaker as to our land system, for however detrimental it might be in some respects to have land held in few hands, in countries where it was much subdivided the condition of the labourers was most wretched. In the Flemish part of Belgium the land was cultivated in small holdings, and with the greatest economy; and the peasant submitted, in the matters of food, clothing, and work, to what in England would be considered absolute misery. Another important fact was this, that the English system, whatever defects might be attached to it, had been the author of all the agricultural improvements of Europe; and the reason was obvious; it was only where a man had large capital that he could afford to make the experiments which led to these improvements. The system of drainage was at first stoutly opposed by the farmers, but it was taken up by the Duke of Bedford and other intelligent landlords, and now it had spread all over the world. He remembered a county member addressing an agricultural audience, and sneering at artificial manures, saying there was nothing like "muck," which was received with loud applause. The weak point of the case was that, though our agricultural labourers might be well-off compared to those of other countries, they were not so proportionately to mechanics. The only way to achieve the desired result was for every one to do all in his power to spread education among the labouring classes, for although they had not the franchise, yet there was no doubt but that they soon would have it.

Sir George Jenkinson, Bart., who regretted he had not been in time to hear the paper, said that Mr. Hoskyns had admitted that large owners were the best employers of labour. He understood him to say that in the neighbourhood of large owners the labourers were well paid and cared for, and lived in good cottages, but that the reverse was the case where tenant farmers were occupiers; and what was the inference, but that where there was most capital there would be the best remuneration for labour. He thought the subject of labour was one very much misunderstood, and was fraught with great difficulty. It was said that education would make good labourers, and do away with all the evils now existing; he advocated education, and thought it must be given to the rising generation of labourers, in order to fit them for the duties which would inevitably, at no distant day, devolve upon them; but he did not believe education would enable a man to till the ground better than his fellow who had had no education An exemplification of this was to be found in the case of railway navvies. There were no men in the world who had so much physical ability to do an enormous amount of work; they laboured from Monday morning until Saturday afternoon, and, as a general rule, were drunk from Saturday afternoon to Monday morning. They received enormous wages, and consumed an enormous amount of beef and beer, and did far more work than any agricultural labourer; but what enabled them to do so was not education, but the amount of food which they consumed. In the same way, education would not enable the agricultural labourer to do more work. He was, however, not the less an advocate for education, which it was the duty of the upper classes to give to those below them, but he did not like the question put upon a false issue. This subject could not be too widely ventilated; and he hoped it would be taken up, not only by societies and chambers of agriculture, but by farmers' clubs. He might mention that he knew instances of hovels, not fit for human beings to live in, which were owned in freehold by the occupants, and which nobody could remove; and he did not think this was a feature sufficiently recognised by those who talked on this subject. He had lately seen in

the papers the detailed case of a man with a large family of ten children, the eldest of whom earned 3s. 6d. a week, and when the man was asked about sending the lad to school, he replied, that it was not the question of the penny for the schooling, but of the 3s. 6d. which he earned, and which made just the difference between living and starving. That was the great difficulty which had to be met in reference to education, and which, he thought, it was impossible to get over.

Mr. J. Bennett said the subject was a most important and difficult one. They could improve the land and every animal on it except the most important animal of all—the human labourer. During the last forty years there had been some slight improvement in his personal cleanliness, but they failed to see much improvement in the most fundamental point—the dwelling. He had a farm in Sussex, on which he employed some seventy men, but he found it a growing difficulty to provide habitations for them, and some had to walk four miles to their work. He could not get a bit of land on the roadside on which to put up any cottages, and he did not know how to remedy the evil, which was a very grave one. Mr. Hoskyns had alluded to the land laws, but he thought the game laws had also something to do with the question. The great landowner attached much more importance to the game than to the condition of the labourer, and would not have a cottage in this place or that, lest the game should be interfered with. As to the state of education, he (Mr. Bennett) had offered a shilling to each of his men who could write their names, but not ten of the 70 could do so, and the question was, how this ignorance was to be overcome. In some places the parson would assist them, and in others he would not, or could not, and then the case was hopeless. Some of the clergy were afraid of the men becoming too independent, and thinking for themselves, and the squires thought education would make them saucy, and that if they learned anything beyond the limits of their own parish, they would draw comparisons, and that when improvement once began they would improve themselves off the land altogether, and go where they believed they would be better off.

The Chairman said he could not close the discussion without a remark or two on what had fallen from the various speakers; and he must specially notice the remarks made early in the evening respecting trades' unions, and the effect of the poor laws upon agricultural labourers. It appeared to him that the speaker (Mr. Read) was not sufficiently informed about trades' unions when he spoke of the system of day work having the same effect, which was enabling the men to do the least work and have the highest pay. The object of trades' unions was to bring men together to agree to a uniform rate of pay, which they thought most conducive to the welfare of all; and he could not agree that the effect of trades' unions was such as Mr. Read had stated it to be. Then the same gentleman went on to trace the effect of legislation in introducing foreign cattle, and drew the inference that that had been the cause of the increase in the price of meat, stating the price of meat so many years back; but he forgot that there was an intervening period when meat was quite as high as at present, long before the operation of Sir Robert Peel's Act—certainly long before the introduction of contagious diseases by foreign cattle. The fact was, that if the importation of foreign cattle had been injurious, they must not forget that long before the disease was introduced hundreds of thousands of foreign cattle had been imported, of which the country had had the benefit.

Mr. C. E. Read said he had not alluded to the cattle plague, but to pleuro-pneumonia and other diseases of a similar character.

The Chairman said that if the state of the case was as bad as Mr. Bennett seemed to think, it appeared almost hopeless, but if the labouring classes did, as he believed they would, gradually improve, there would be an increase of produce from the land, and the whole class would rise considerably in the social scale. Mr. Denton had endeavoured to show how they might be improved, but no one seemed to have noticed that which he (the Chairman) principally relied on, the appropriation of a certain number of hours to general education, and a certain number to practical instruction in farming pursuits, so that in a few years they would be in a position to earn the highest rate of wages in their calling. Then there was the question of the improvement of their dwellings, which had been taken up by this Society again and again, plans having been prepared, and every possible scheme suggested for reducing the cost, but they could not bring it within £130; they could build a hovel for a great deal less, but not a cottage fit for a labouring man to live in. If they had improved dwellings, and the other things which had been mentioned, gardens and friendly societies, and co-operative stores which might do a great deal in enabling them to supply themselves on the lowest terms, they would soon be in a much better position; and above all, if they could induce these men, not by legislation, but by showing them the benefit of it, to abstain from the beer shop, their greatest enemy would be conquered. They must not go away with the idea that the navvy was such a deplorable creature as the hon. baronet had painted him; they were not, as a rule (and he knew a great deal more of them than of agricultural labourers) drunken or unintelligent men; they were one of the most intelligent class of workmen in the country. Take a navvy abroad, and he was the most valuable man you could get; place him in circumstances of great difficulty, requiring coolness, intrepidity, and perseverance, and the behaviour of these men was most remarkable. The great works of the country could not have been accomplished but for the energy and discipline which existed amongst them. Most of them had attended national schools, and had a certain amount of real education, and it was this, combined with their practical knowledge, which made them such valuable workmen. There were drunken navvies, no doubt, and in this, as in other cases, people were apt to judge a class by a few. It was too common to attribute to the large proportion of the working classes the tendency to crimes which was exhibited by a few, in the same way as it was common in the present day to say that commercial morality was very low, simply because by the facilities for printing and discussion every instance of fraud was brought prominently before the public over and over again *ad nauseam*. He now begged to move a cordial vote of thanks to Mr. Denton for his very able and valuable paper, and, in doing so, he might be permitted to take the opportunity of thanking the Society on his own behalf for the very kind manner in which they had always received him as Chairman of the Council, in which capacity he now appeared for the last time as presiding at an evening meeting. He had held that office for four years, and during that time he had presided over many meetings, and had always been received with a kindness and courtesy which had led them to overlook those shortcomings of which he himself had been but too sensible. He could only hope that his conduct while Chairman of the Council had met with the approval of the Society.

The vote of thanks to Mr. Denton having been passed,

Mr. Denton said he would only make one remark in reply. There could not be a better illustration of the value of the suggestion he had made as to technical, combined with primary education, than that which the hon. baronet had alleged with regard to the navvy. The drunken navvy was invariably a bad agricultural labourer. At the present moment he (Mr. Denton) had under him about 1,500 men of the same class as the navvy, and many of them had been agricultural labourers until by practical education they became fitted for draining work. The

drunken men were generally those who for want of practical education were unable to earn good wages. Those who had acquired that knowledge earned good wages and very seldom drank. There was no steadier or worthier man than a properly educated navvy.

The Reverend Canon Girdlestone writes:—"I desire to state my conviction that, notwithstanding many plausible statements to the contrary, made chiefly by interested parties, agricultural labourers in all parts of England—some more, some less, but all to a great extent —are in a far more depressed condition than any other class of workmen. It is proverbial, I believe, that there is no one, however liberal in opinions, who would seriously propose to trust the franchise to poor Hodge, as he is called, until he has, by some process or other, been made much more of a man than he is at present. I am inclined to think that the most likely instrumentality for his improvement consists of a system of registration, and removal from low-paid to better-paid districts, and the formation of mutual aid and protection societies, strictly guarded by rule against aggression and violence. If a central committee could be formed in London of those interested in the subject to promote and set on foot the above, and to push forward all such questions as that of education, improved dwellings, better administration of poor law, &c., &c., something practical might result. But I fear the class is at present too depressed to be in a condition, without extraneous aid, to keep themselves."

Mr. Mechi writes:—On the 11th December, 1851, I placed before your Society the labourers' balance-sheet, calculated for man and wife and three children. His wages were then 8s. per week, now they are 12s. per week; but as his nine 4-lb. loaves now cost 9d. instead of 5d. each, and as pork, butter, cheese, soap, and candles are now dearer than then, he is really only advantaged to the extent of about 7½d. to 9d. per week. He saves 1½d. per week in tea, but, as all his clothes and those of his family were of cotton, with a little woollen, he was sorely pinched during the cotton famine. His principal gain is in the more steady demand for his labour, caused by agricultural improvements. On other parts of his condition I have reported to my friend Mr. Denton, with whom I am sorry I cannot be present this evening."

Manufactures.

The Cotton Industry in Italy.—The cotton plant is extensively cultivated in the plains of Salerno, near Naples, and Calabria, also in the valleys of the islands of Sardinia and Sicily. The production of cotton during the last few years may be estimated at 60 millions of francs. This industry, if more developed, would become an immense resource for agriculture, especially in the Southern provinces and Sardinia, where there are immense tracts of land which might be reclaimed. The following are the imports and exports of raw cotton:—

Imports.

	Quintals.	Francs.
1863	40,562	7,545 000
1864	31,543	5,867,000
1865	28,425	5,287,000
Average	33,510	6,233,000

Exports.

	Quintals.	Francs.
1863	16 135	3,001,000
1864	29,250	5,441,000
1865	44,974	8,365,000
Average	30,120	5,602,000

The total number of cotton mills in Italy is 200, with 1,000 machines, and 450,000 spindles, employing 10,000 work-people. Upwards of 143,767 quintals of cotton are spun annually. The following is the annual amount of capital employed in this manufacture:—

	Francs.
Value of raw cotton to be spun	17,400,000
Interest on the capital employed for the machines and buildings, the wear and tear and repairs	3,000,000
Wages to work-people, interest on the capital in circulation, and profits	14,500,000
Value of the cotton spun	34,900,000

This industry is in a comparatively flourishing state in Italy, for the low price of labour and the abundance of water power. The following is the trade in cotton yarn in Italy:—

Imports.

	Quintals.	Francs.
1863	44,310	19,222,000
1864	36,672	16,364,000
1865	69,076	30,831,000
Average	50,019	22,136,000

Exports.

	Quintals.	Francs.
1863	1,328	666,000
1864	1,063	471,000
1865	397	217,000
Average	929	451,000

The capital employed in cotton weaving is as follows:—

	Francs.
Value of 32 million kilogrammes of cotton spun	33,800,000
Wages of the warpers and weavers	30,700,000
Bleaching, dying, interest on capital, profits, &c.,	15,500,000
Value of cotton stuffs	80,000,000

The number of looms employed for cotton weaving in Italy are 86,000,000, which are scattered all over the country. The number of weavers may be estimated at 100,000. The following are the exports and imports of cotton goods:—

Imports.

	Quintals.	Francs.
1863	65,406	56,686,000
1864	60,998	51,289,000
1865	81,807	65,851,000
Average	69,404	57,942,000

Exports.

	Quintals.	Francs.
1863	1,000	843,000
1864	700	665,000
1865	468	580,000
Average	723	696,000

Commerce.

The Cotton Trade.—Messrs. G. and J. A. Nobles' *Circular*, dated May 7th, says:—"The satisfactory state of commercial affairs has continued, and, in fact, increased dring the month of April, and the fatal impressions of the two previous disastrous years seem to have been altogether dismissed from the public mind. We look for further progress in the general prosperity, inasmuch as the deliveries of cotton to the trade are larger than ever, and, so far, fifty per cent. more than last year, though speculation has nearly doubled prices

since January, but stocks, notwithstanding some increase in the importation, are very low, barely more than half of this time last year, and seem to justify the great advance in the value of this staple of our chief manufactures. Deliveries of other commodities are also large; the railway status shows a constant increase, and the season is so unusually fine, that excellent crops may be looked for almost with certainty. For these reasons we make no doubt that large shipments of those commodities to which we devote our attention may be recommended, and that whatever is sent will, as the year advances, meet with improving markets."

Emigration from Italy to South America.—During the month of March 12 ships, with 1,066 emigrants, sailed from Genoa. Of this number 267 were natives of Genoa; 150 of Sondrio; 118 of Como; 96 of Milan; 59 of Potenza; 45 of Cuneo; 44 of Turin; 36 of Alessandria; 29 of Salerno; and 27 of Pavia.

The Production of Oil in Italy.—One of the most important products in Italy is olive oil. The average annual production is upwards of 1,500,000 hectolitres (33,000,000 gallons), representing the value of about 200,000,000 frs. (£8,000,000 sterling). A large amount is consumed in the country, and the exports do not exceed 70,000,000 frs. (£2,800,000). The following is the production in each province:—

	Quantity. Hectos.	Value. Frs.
Neapolitan provinces	629,597	80,600,000
Sicily	307,380	39,350,000
Piedmont and Liguria	283,500	36,300,000
Tuscany	160,000	20,480,000
The Marches	57,300	7,350,000
Island of Sardinia	54,000	6,900,000
Lombardy	48,315	6,180,000
Emilia	9,400	1,200,000
Umbria	2,880	370,000
Total	1,552,372	198,730,000

The exports of olive oil are principally to France, England, Austria, Russia, and to America. About 10,000,000 francs worth of mineral oil is imported to Italy, but in exchange Italy exports to the value of 12,000,000 francs in linseed, nut, rape, sesame, castor, and sweet almond oil.

Agriculture in Hungary.—There is no country which has made such progress during the last few years as Hungary, the population of which has, in twenty years, doubled itself. In 1850 there were 7,864,262 inhabitants, and at the present time the population is not less than 15,000,000. Hungary, from its position and natural advantages, might become one of the richest countries in the world. Up to the commencement of the present century it was only half civilized. In 1852 there were about 10,000 square miles of pasture land in Hungary; at the present time four-fifths of this is under cultivation. The area of Hungary is about 35 millions of hectares of land (86,450,000 acres), of which 6 millions are yet unproductive, and 29 millions of hectares are under cultivation. Of this there are 8,679,273 hectares of woods and forests; 9,751,412 hectares of corn; 4,166,383 meadows and gardens; 5,952,268 hectares of vineyards; and although, on account of climate, the vine can only be cultivated in certain positions, the Hungarian wines, such as Tokay, are well known, and 310 hectolitres of wine from this country were exported in 1864. Hungary is above all a rich pastoral country. With 15,000,000 of inhabitants there are 11,200,000 sheep, and there are 150 horses to every thousand inhabitants. In no other country is there, comparatively, such a large quantity of horses, as on every 1,000 inhabitants in Ireland, there are but 107 horses; 98 in Prussia; 80 in France; and 61 in Belgium. Hungary is also, as compared with other countries, the richest in horned cattle, numbering 410 head for every 1,000 inhabitants, whilst France only numbers 282; Belgium, 278 head; Prussia, 305 head; and Holland, 387. As regards sheep, the proportion is lower than in France and Prussia, the former having 930 for every 1,000 inhabitants, and the latter 943, whilst in Hungary there are 819 to every 1,000 persons; 439 in Bavaria; Holland 260; and 129 in Belgium. Of pigs Hungary possesses, compared with the number of inhabitants, three times the number of Belgium, and double that of France, being 327 for every 1,000 persons; whilst in Holland there are only 81; in Belgium 101; in France 147; and in Prussia 146 for every 1,000 inhabitants. In 1866 there were 2,855,755 landed proprietors in Hungary, or about 1 proprietor out of every 5 inhabitants. Hungary, in many places, suffers considerably from great droughts, and, on the average, every fourth year there is a great dearth on account of the dryness of the season; and in many parts of the country there is only 13 inches of rainfall in the whole year. If irrigation were carried on in this country to the same extent as in Lombardy, and the natural watercourses were made to supply canals for irrigation, Hungary would become one of the richest agricultural countries in Europe. For this purpose a company has been proposed to be formed, with a capital of £4,000,000 sterling, for irrigation. In 1867 the average production of grain in Hungary was 35 hectolitres per hectare (39 bushels per acre), and the quantity produced in that year was 44,000,000 of hectolitres (or 15,131,644 quarters) of grain, of which 28 millions of hectolitres were consumed in the country, and 16 millions of hectolitres were exported, of the value of 300 millions of francs.

Colonies.

Imports and Exports of Victoria.—From the official statement of the Department of Trade and Customs it seems that the imports into the colony of Victoria during the year 1867 amounted to £11,674,080, and the exports to £12 724,427, the exports exceeding the imports by £1,050,347. On only one occasion during the last eleven years have the exports exceeded the imports; this was in 1861, when the excess was £286,154. The cattle, horses, and sheep are valued at £579,314. The imports were £3,880,047 less in the third year of the new tariff than in 1864—the last year of free trade, and £3,676,945 less than in 1866. The principal decrease in the imports is in the importation of grain and flour, which amounts to £995,749. Making allowance for this, there is still the fact that the imports of 1867 fall short of those of 1866 by £2,784,407, and of those of 1864—the last year of the old tariff—by £2,884,298.

Tasmania.—There are 3,403,010 acres of alienated land in the colony of Tasmania. The area is 15,571,500 acres, including dependent islands in Bass Straits, thus leaving 13,374,990 acres of unalienated land. The population is very small in comparison with the territory, being only 98,454 on 31 acres in 1867, or an increase of only 14,034 in ten years.

Opium in Victoria.—A successful attempt at growing opium has been made in this colony. A few plants have been raised this year, and the produce has been pronounced by good judges to be of first-rate quality. The Chinese horticulturists in these districts will no doubt avail themselves of this experience, and it is expected that opium crops will be largely cultivated.

Plants Cultivated in Queensland.—In the Botanic Gardens of Brisbane is to be seen the jute of India, and other fibre-producing plants, growing in the greatest luxuriance, although the land there is not richer than in other parts. Indigo of first-class quality, and with a heavy yield per acre, has, within a short period, been produced from several plants growing in the same garden. The coffee plants there have for years yielded good crops, and a Chinaman, not long since, manufactured tea from the tea plants growing in the same spot. These are only a few of the many products which can be cultivated in different parts of the colony. That

they can be satisfactorily produced to yield a profit has not yet been proved, but the chances are, at any rate, greatly in their favour.

Sheep Washing.—An Otago paper says:—"The new process of sheep washing by means of hot water, followed by the sheep being brought immediately under a strong spout of cold water from a considerable elevation, has been successfully carried out this season at the Deep Well station. The samples of the wool have been examined, and the tips are entirely free from dirt, and the whole fibres very pure and clean, with a fine, soft feeling, rendering it well adapted for immediate use by the manufacturer."

Notes.

Archæological Discoveries at Rome.—The excavations now being made, by the munificence of the Pope, are proceeding with most interesting historical results, and bringing to light a large number of the ancient master-pieces of art, with which the Holy City was once embellished. Two flights of steps, which led from the river, have been cleared, and two passages have been discovered which give direct access to the interior of the adjoining market. At the depôt of marbles, on the banks of the Tiber, was found a large staircase, with sculptured ornaments, in a position exactly corresponding with the anticipations of the learned director of the works. Up to the present time there have been found 111 blocks of African marble, 240 of antique yellow, and as many of serpentine. Other varieties are met with in smaller quantities, as antique red, and green, breccio, and even chalcedony. At Ostia, where the researches are being made by a commission of antiquaries, some remarkable monuments have been found, throwing a new light on the worship of Cybele in that place; amongst other things there is a series of votive offerings on the ground consecrated to that goddess. In the same place were discovered the remains of a temple, designed for initiatory ceremonies, and which forms an edifice quite unique of its kind; also a house very elegantly decorated, on the walls of which was a fresco, representing a festival sacred to Diana. This painting is of extreme delicacy of execution.

Population of Egypt.—According to the census taken last year, the inhabitants of Egypt are 4,911,619. Amongst these are half a million of Copts, descendants of the ancient inhabitants of the country; 400,000 Bedouins; 250,000 Europeans and Syrians; and 500,000 Turks. In Alexandria, at the close of the last century, scarcely 40,000 inhabitants were counted, whereas, at the present time, that city contains 200,000, about half of whom are Arabs and the other half Europeans. The nationality of the latter is ascertained to be as follows:—Greeks, 25,000; Italians, 18,000; French, 16,000; Anglo-Maltese, 13,000; Syrians and natives of the Levant, 12,000; Germans and Swiss, 10,000; people of various other nations, 6,000. Cairo, the capital, contains upwards of 400,000 inhabitants. Within its walls are 140 schools, more than 400 mosques, 1,166 cafés, 65 public baths, and 11 bazaars. The other towns of importance, as regards their population, are—in Lower Egypt, Dalmietta, 45,000; Rosetta, 20,000; and in Upper Egypt, Syont, on the left bank of the Nile, numbering 20,000 souls. The amount of commerce with France was, in 1866, as much as 80,665,172frs. of imports, and 83,810,114frs. of exports.

Correspondence.

Liquid Fuel.—Sir,—I am exceedingly sorry I was not able to attend the meeting at your rooms when the paper on liquid fuel was read by Mr. Paul, that I might have answered the extraordinary statements respecting my process, lately so successfully carried on at Woolwich Dockyard. I must inform you that neither Mr. Paul nor Captain Selwyn have seen my boiler in operation. How, therefore, while admitting that an evaporation of water was obtained, corroborated officially, greater than has ever been effected, and that with little smoke—almost a perfect combustion, in fact—they could announce that my process was the most wasteful, and the one least likely to yield good results, I cannot understand. Will you permit me to make a few observations on the subject? The statement of the American commissioner that the oil or petroleum was beyond a doubt more than twice as effective as anthracite coal in the production of steam, was correct. Mr. Paul knows that the best coal must do good service if an evaporation is obtained of 7 lbs. of water to 1 lb. of coal. The official report stated I had 18·31. Mr. Paul will not allow, like nearly every other chemist, that water vapour can be used advantageously or with any benefit as fuel. Whatever may be the incomprehensible law as to the use of water as fuel, it is quite certain that great advantage is gained by introducing water vapour into a furnace, so that it can be decomposed by the incandescent fuel. Mr. Siemens makes careful provision for water being part of the fuel supplied to the regenerative furnaces. In my first experiments at Woolwich, in 1864 and 1865, when petroleum was burnt alone, an evaporation of only 12½ was obtained, with smoke and soot in great quantity. On the introduction of water vapour the evaporation rose to 18·31; and in February, 1867, creosote only being used, to 18·91, without or with very little smoke or soot. The official report as to the 18·91—or nearly 19—was made after the one published by order of the House of Commons. There is more difficulty in getting the last pound than there is in getting the first eighteen. If I could have gone on longer on that occasion I might have reached a higher figure, because the boiler always evaporated slowly the first few hours. I had come to the end of my creosote, and I cannot bear the fatigue of a longer attendance than eight or ten hours. My own opinion as to the value of water vapour rests upon my constantly viewing its operation in the furnace. It is this that, although it may be of no use alone, it is of great use when used in conjunction with any other fuel —more particularly liquid fuel, to which it seems to have an affinity. It brings out nearly the full theoretical value of that fuel, allowing no deposition of unconsumed carbon to take place. Or, to describe the operation more in detail, the water gases, when separated, do not again unite; the hydrogen, being very volatile, escapes upwards to burn with the other hydrogen in the furnace, both getting their oxygen from the air let into the fire-place. The oxygen of the water gas, being very heavy, remains behind, and busies itself with the escaping carbon of the other fuel, so that the fuel is completely burned. On my turning on the tap admitting the steam all the coating of soot resting on the grate rose up and disappeared; it was consumed. On looking into the tubes, the soot was seen floating in the gas; and being treated in the same way, the fire suddenly brightened, became intense, and without smoke. With American petroleum the effect was beautiful; the instant the steam was turned on, every tube in the boiler was illuminated with light thin flame; with shale oil and creosote the effect was not so great, but the flame where the tubes were filled was much stronger. Of course, success depends upon carrying out the process most carefully; all parts of the apparatus must be properly contrived and properly constructed. These are the words of Professor W. J. Macquorn Rankine, F.R.S., who, of all the chemists, alone appears to back my opinion. He has stated that "the oxygen of the steam combines with the carbon of the hydro-carbon fuel, and the hydrogen of both is set free; there is a mixture thus produced of carbonic oxide and hydrogen, which is sure to be completely burnt as soon as a sufficient quantity of air gets

access to it, and thus the deposit of unconsumed carbon is entirely prevented." By my method of using the steam it is economised. I prefer common steam to discharge into the grate; the operation of super-heating, decomposing, and taking up the carbon is instantaneous and continuous. In my first operation with the common service boiler I did not obtain a proper construction. It had been tried two days with the best hand-picked Welsh coal. This was equalled with oil my first day, but not the second. I only evaporated both days 32,096 lbs. of water, with 2,607 lbs. of oil, against the coal that did the same with 4,260 lbs.; but on the second day's coal trial 39,648 lbs. of water was evaporated with 6,000 lbs. of coal. This I did not arrive at, but the two coal fireplaces were perfect in their make. I could only use one of them with oil my last day, the other being imperfectly constructed. It can hardly be said I was defeated. The operations were not continued, because I was required to be at the expense of the alterations necessary. I considered that, after the amount of success I had obtained, this should not have been put upon me. I was unable to bear it. Advantage has been taken of this by other patentees, to state that my process has altogether failed, which is untrue. It is but fair that they should obtain a result equal to mine before they come forward to put aside my system. Already one of my greatest opponents has had his apparatus tried at the dockyard, without its being considered worth reporting upon at all. Captain Selwyn stated that it was true my process gave an enormous deposit of carbon, and that this was because I did not know how to apportion the air to the supply. In 1846, not having seen my process in action, he sent me down a drawing, showing me how to supply the air. It was something after the American plan, mixing air in the vapour chamber. With the consent of Mr. Trickett, I had the pipes he proposed put in, and I had, in consequence, an explosion every five minutes, first from one pipe, and then from one of the others; there was no harm done, but the mild, pistol-like explosions were annoying, and the pipes were closed up. It is true, that in my last trial, with an oil I had never used before, there was left in the grate a large amount of a friable ash, full eight or ten inches thick; it was hard, and like a very open pumice stone. At that time both the engineers of the yard, as well as myself, considered all these liquid fuels to be petroleums. I had seen the same kind of ash at the works of the Trinidad Petrolem Company, when the manager, experimenting with the oil as fuel, shut up the furnace, not allowing any air to get in at all; he considered the oxygen of the decomposed steam to be alone necessary. On opening the furnace after, as he stated, it had worked admirably, a large amount of this ash was found. On its appearing in my boiler, I considered I had not allowed sufficient air; but on my showing it to a chemist, he assured me that no amount of air or heat would have destroyed it. If Etna cannot destroy her pumice stone, a simple boiler might be unable to do the same. The ash crushed made, the Trinidad manager told me, a very good imitation emery powder. My former boiler had worked for several months without this peculiar ash appearing; the ash it did make was serviceable. It proved that all these liquids were not proper for fuel; that those prepared from bitumen might be found useless. Now, as to creosote, Mr. Paul estimates the quantity made here as 100,000 tons; Captain Selwyn at about three times that quantity. I believe Mr. Paul is about right; but, whatever is the quantity, it is of two kinds, the town creosote and the country creosote, each in about equal quantities. It is only the country creosote that can be conveniently used for fuel. The other is filled with naphthaline salts, which get into and clog the pipes. When Mr. Crow was experimenting with my boiler, he was perpetually washing the pipes with naphtha, and setting it on fire, in order to warm them so that the oil should flow through. Naphthaline is still more difficult to use; I doubt whether a steam-pipe in a tank of this stuff would melt it, and the pipes provided for it to flow through must be almost at a red heat. Captain Selwyn is to make 23 with it; he has a good boiler, and I trust he may succeed. Mr. Young stated that the number of gallons of oil that could be obtained from coal, averaged from 50 to 60 gallons per ton; and that it would be better to distil the coal for the sake of the oil, than use it in its raw state. Now, permit me to inform him that the best Newcastle coal yields so small an amount of oil—hardly two or three gallons per ton—that it is not worth extracting. It is the mineral shale, and that, the furthest removed from coal, that gives the most oil. Some rich specimens yield from 80 to 90 gallons per ton, but the average yield of all the shales is from 30 to 40; at present only the best are used, the oil being wanted by distillers; but when it comes into use as fuel, the common or poorer shales will be used, and shale lands will get up enormously in value. There are other minerals, at present almost unknown, which are richer in oil than the shales; these are the Albertites, the Cannelites, and the like, distributed all over the world, and, like the shales, in immense quantities. I regret to say that most of the visitors at Woolwich to view my process attended with the intention of taking out patents themselves. Some of the latter are clear copies of mine, made without even understanding its principle. My process makes a fiery spray of the oil, a porous material being used with jets of steam. Messrs. Aydon's process does the same. I spread my jets of steam under the porous block; they group them together, and jet them on the top. The only difference between the two systems is, that their process does on a small scale what mine can do on a large one. I could lengthen this, but I fear I should require too much of your valuable space.—I am &c., C. J. Richardson.

21, Carlisle-terrace, Kensington, W., May, 1868.

Fungi as Food.—Sir,—In Mr. Berkeley's interesting evidence on fungi as articles of food, given before the Food Committee, and reported in the *Journal* of May 15th, justice is, I think, not done to *Coprinus* (misprinted "Copirnus") *atramentarius*, which, with its beautiful relative, *C. comatus* (not mentioned at all), both he and Dr. Badham seem to consider only of rather doubtful merit in the manufacture of ketchup. Both these species I have often eaten, and have no hesitation in pronouncing them, if cooked before the dark spores appear, among the most delicate of the tribe, and, I believe, perfectly wholesome. The late Dr. Whewell was here when they were in season, and preferred them much to the *Agaricus campestris*. The dark liquid, resulting from the ripening of the spores, may be used as a fine dark-brown pigment in oil and water-colour painting.—I am, &c., W. C. Trevelyan.

Wallington, Newcastle-on-Tyne, 17th May, 1868.

P.S.—I have no doubt that perfect mastication with bread, which Mr. Berkeley speaks of, will render, not only fungi, but many other species which are sometimes considered poisonous, digestible and perfectly wholesome, and that many cases of apparent poisoning, especially amongst children, result from indigestion, caused by substances, especially small fruits or nuts, being bolted whole, without having undergone the necessary process of crushing or mastication.

Dried Meat.—Sir,—Dr. Hassall's attention has been called to the evidence of Mr. Orr, reported in your *Journal* of the 15th inst., in reference to dried meat in powder from Australia. I beg to inform you that the importation and sale of such an article in this country (without the sanction of Dr. Hassall) would be an infringement of the patent obtained by him for the preparation of flour of meat. The publication of this notice in your next number will oblige.—I am, &c., Henry Sibley.

3, Lincoln's-inn-fields, May 18, 1868.

Gas Lighting.—Sir,—In your report of my remarks on controlling gas lamps by clockwork, I am reported

to say that Mr. Denison approved of the scheme as applicable to public lamps. I limited my remarks as to Mr. Denison's approval to the automatic lighting of public clocks.—I am, &c., JOHN JONES.
338, Strand, W.C., May 15.

MEETINGS FOR THE ENSUING WEEK.

MON......R. Geographical, 1. Annual Meeting.
Victoria Inst., 4. Annual Meeting.
Social Science Assoc., 8. Mr. John Noble, "Suggestions for a Revision of Taxation."
R. United Service Inst. Mr. John Elder, "Circular Ships of War with immersed Motive Power."
TUES ...R. Medical and Chirurgical, 8½.
Civil Engineers, 8.
Ethnological, 4. Annual Meeting.
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."
WED ...Archæological Assoc., 8½.
THUR ...Royal, 8½.
Antiquaries, 8½.
Royal Inst., 3. Prof. Grant, "On Astronomy."
Zoological, 8½.
Philosophical Club, 6.
Mathematical, 8.
Society of Fine Arts, 8. Exhibition of Photographs of the Palestine Exploration Fund.
FRI.......Royal Inst., 8. Mr. W. E. H. Lecky, "On the Influence of the Imagination upon History."
SAT ......Royal Inst., 3. Prof. Grant, "On Astronomy."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 8th May*, 1868.

103. Bill—Poor Law (Ireland) Amendment.
104. ,, Stockbrokers (Ireland).
219. Abyssinian Expedition—Estimate.
243. Exchequer Bonds—Account.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation (No. 2, 1868).

Delivered on 13th May, 1868.

114. (I.) Parishes—Return.
211. Electric Light—Further Correspondence.
Births, Deaths, and Marriages—Twenty-ninth Annual Report.
Trades Unions and other Associations—Sixth Report of the Commissioners.
Ritual Commission—Second Report of the Commissioners.
Public Petitions—Nineteenth Report.

Delivered on 14th May, 1868.

112. Bill—Exchequer Bonds (£1,600,000).
259. New Courts of Justice—Estimate.
260. Abyssinian Expedition (Vote of Credit)—Estimate.

Delivered on 15th May, 1868.

109. Bill—Weights and Measures (Scotland).
113. ,, Promissory Oaths.
114. ,, Indian Railway Companies—Lords Amendments.
248. National Portrait Gallery—Eleventh Report.
255. Registry of Deeds (Dublin)—Returns.
Charity Commission—Fifteenth Report.

Patents.

From Commissioners of Patents' Journal, *May* 15.

GRANTS OF PROVISIONAL PROTECTION.

Aërial locomotion, apparatus for effecting—1005—M. P. W. Boulton and J. Imray.
Bale ties—1346—D. C. Lowber.
Billiards, &c., apparatus for marking at—1349—J. Wetherilt.
Boilers—1381—L. Perkins.
Boilers and furnaces—1371—J. Hepworth and G. W. Bayldon.
Boots, button—1313—T. L. Scowen.
Buildings, concrete, constructing—1364—C. Drake.
Cabs, &c., indicating the distances travelled by—1342—T.T.Macneill.
Carpets, &c.—1385—G. A. Cox.
Cartridges—1352—W. Bartram.
Cartridges—1353—W. Bartram.
Chlorine—1403—H. Deacon.
Coal, &c., getting and hewing—1220—R. Ridley and J. Rothery.
Concrete, impervious—1382—E. McDonnell.
Dress and jewellery fastenings—1350—W. H. Ryland.
Engines, jacquard—1383—J. and M. Pearson.
Fabrics, mixed, treating—1010—A. B. Wollaston and F. Stanbridge.
Fibrous materials, machinery for spinning—1420—W. R. Lake.
Fire-arms, breech-loading—1376—K. V. Barnekov.
Fire-arms, repeating—1344—J. R. Johnson.
Fire-irons, supports for—1368—T. Pemberton and T. Hughes.
Furnaces, blast—1410—W. Ferrie.
Gas engines—1393—G. B. Babacci.
Gas, purifying—1361—P. Spence.
Gas, &c.—1369—F. C. Hills.
Gelatine, manufacturing—1422—J. H. Johnson.
Glass rings employed in spinning, &c.—1246—E. A. Morgan.
Glue, preparing and refining—1388—A. Dietz.
Grain and seeds, scouring and hulling—1004—R. Smith, jun.
Grain, &c., screening—1389—H. Waugh.
Hair seating—1384—G. T. Bousfield.
Hats, &c.—960—I. S. Lister.
Life and property, preservation of, at sea—1354—G. A. Welch.
Locks—1372—S. Tidmarsh.
Looms, healds of—1360—J. and R. Holding.
Manure—1351—J. Dewar.
Matches, &c., machinery for manufacturing—1401—J. J. Long.
Meat, &c., preserving—1405—J. H. Johnson.
Metal plates, ornamenting—1367—J. Atkins.
Meters, valves, and cocks—704—H. Wilson.
Millstones, dressing—1404—R. Scott.
Motive-power apparatus—1391—E. A. Rippingille.
Nails, cut, machinery for manufacturing—1406—R. Heathfield.
Ordnance, checking the recoil of—1357—W. N. Hutchinson.
Ores and minerals, preparing and dressing—1355—J. Bernard.
Paper binders or eyelets—1145—C. E. Turnbull.
Powder, blasting—1375—P. Nisser.
Pumps, steam—1046—S. Holman.
Railway carriages, &c.—1244—C. Burn.
Railway rolling stock—1377—H. Chaytor.
Railway signals, &c.—1356—T. F. Cashin.
Reaping machines—1386—A. Jack, jun.
Screw blanks—1399—C. D. Fox.
Sewing machines—1390—W. Whitworth.
Shackles, &c., iron or steel—1407—A. Homfray.
Shawls, fringe on—1359—J. Craven.
Ships' bottoms, &c., preventing the fouling of—1395—J. Gray.
Ships' bottoms, &c., sheathing—1380—J. Scoffern.
Ships, iron, sheathing—1414—J. H. Cassell.
Steam, apparatus for condensing—1216—A. Barclay.
Steam generators and furnaces—1365—A. M. Clark.
Tapes, &c., retaining the outer ends of—1358—G. Marson.
Telegraphs, electric—1002—J. Lent.
Telegraphy—1370—E. P. H. Vaughan.
Telescopes—889—F. H. and C. A. Elliott.
Umbrellas and parasols—1392—J. Bottomley.
Valves—1362—A. W. Pocock.
Varnishes—1366—A. Parkes.
Wheels, wrought metal—1379—L. Perkins.
Wood, seasoning, &c.—1363—R. Cocker.
Yarns and textile fabrics, preparing materials for sizing—1402—J. McKean and J. Stenhouse.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Albumen, manufacturing—1485—A. C. Henderson.
Books, machine for sewing—1539—A. Holbrook, jun.
Nail machines—1538—J. B. Kingham.

PATENTS SEALED.

3255. R. W. Pearse.	3282. W. H. Richardson.
3257. J. M. Napier.	3290. W. Brewster.
3265. E. T. Hughes.	3323 W. Mort.
3266. W., J., and J. Busfield.	3378. J. M. Napier.
3270. G. Pitt.	3423. R. Porter.
3272. T. Wood.	299. R. J. Moser.
3279. A. Barclay.	332. J. Thompson.

From Commissioners of Patents' Journal, *May* 19.

PATENTS SEALED.

3281. C. Mole.	3318. P. Salmon.
3284. H. H. Lloyd.	3320. W. Macnab.
3286. J. Oppenheimer.	3332. R. Ward.
3287. H. Greene.	3342. C. E. Penny.
3288. C. de Lavenant.	3343. J. A. Hopkinson and J. Hopkinson, jun.
3291. L. B. Joseph.	3348. C. T. Higginbotham.
3293. W. R. Lake.	3357. A. M. Clark.
3295. J. Townsend.	3379. E. Wood.
3299. W. R. Green & J. G. Freeman.	3380. J. R. Pratt.
3300. W. Blundell.	3392. W. C. Houghton.
3311. A. Munro.	3396. A. M. Clark.
3312. G. Welch.	3402. W. Starkey.
3314. G. D. Hughes.	3489. W. Clissold.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1322. W. Chubb and S. Fry.	1357. R. Leddicoat.
1449. G. Elliot and R. P. Clark.	1371. W. Manwaring.
1665 W. Clark.	1392. W. E. Newton.
1341. W. Deakin & J.B.Johnson.	1387. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1226. G. S. Goodall.	1261. A. Allan.
1356. W. Bywater.	1275. J. Hughes.
1225. J. and J. Bullough.	1296. T. Aveling and H. Rawlinson.
1253. D. K. Clark.	

Journal of the Society of Arts.

FRIDAY, MAY 29, 1868.

Announcements by the Council.

Conversazione.

The Council have arranged for a conversazione, at the South Kensington Museum, on Wednesday next, the 3rd June, cards for which have been issued.

Annual Conference.

The Seventeenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Boards will be held on Friday, the 19th June, at Twelve o'clock, noon.

Secretaries of Institutions and Local Boards are requested to send, as soon as possible, the names of the Representatives appointed to attend the Conference, and early notice should be given of any subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Secretaries of Institutions are requested to forward *at once* by book post, copies of the last Annual Reports of their Institutions.

Albert Medal.

The Council have this year awarded the Albert Gold Medal to Joseph Whitworth, "for the invention and manufacture of instruments of measurement and uniform standards by which the production of machinery has been brought to a degree of perfection hitherto unapproached, to the great advancement of Arts, Manufactures, and Commerce."

This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded in previous years, as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

Harvesting of Corn in Wet Weather.

The Council having offered the Gold Medal of the Society, and a Prize of Fifty Guineas, for the best Essay on the Harvesting of Corn in Wet Seasons, received twenty essays, and requested the following gentlemen to act as judges:—Mr. J. Chalmers Morton, Mr. Clare Sewell Read, M.P., and Mr. Chandos Wren Hoskyns. These gentlemen have unanimously recommended the Council to award the prize to Mr. W. A. Gibbs, of Gillwell-park, Essex, and this award has accordingly been made.

The Council, in offering the prize, suggested that the first part of the essay—after noticing the various systems at present adopted in damp climates for counteracting the effects of moisture upon cut corn in the field, and for avoiding such exposure in wet seasons by peculiar harvesting processes—should furnish a practical and analytical exposition of the best available means:—

1st. Whereby cut corn may be protected from rain in the field.

2nd. Whereby standing corn may, in wet seasons, be cut and carried, for drying by artificial process.

3rd. Whereby corn so harvested may be dried by means of ventilation, hot air, or other methods; with suggestions for the storage both in the ear and after threshing.

4th. Whereby corn, sprouted, or otherwise injured by wet, may be best treated for grinding or feeding purposes.

The whole to be supplemented by a statement of practical results, and actual cost of each system described, and authenticated estimates of any process proposed for adoption, based on existing but incomplete experiments.

The above requisitions were given suggestively; not to bind the writer to the order or to limit the treatment of the subject, provided the essay was kept within the scope of practical experience and utility.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

FOOD COMMITTEE.

The Committee met on Wednesday, May 13. Present—B. Shaw, Esq. (in the chair); Mr. Harry Chester, Captain Grant, and Mr. J. Ware.

J. LLOYD, Esq., jun., Huntington-court, Hereford, Member of the Society of Arts, attended to give information as to the causes which retard the improvement of our salmon fisheries.

Mr. LLOYD—I am a magistrate, residing near Hereford, and a conservator of the rivers Wye and Usk, and have been engaged in salmon preservation for fourteen years. I have had considerable experience in the management of rivers, and shall be happy to impart to the Committee all the information I can. In the first place I would say it must be a subject of congratulation to us all that we live in a country where salmon exist in our rivers, as there are but few countries in the world where this noble fish is to be found. Owing, however, to causes which are pretty well known, it was found in 1860, when this subject was inquired into by a Royal Commission, that while Ireland and Scotland still retained an abundant supply, England was rapidly losing hers. That Commission was appointed for the express purpose of making inquiries "with the view of increasing the supply of a valuable article of food for the benefit of the public," and in their published report the causes of this diminution were enumerated. Many of these still exist, and my object will be to point out to you what is still required to be done, and what the legislation on the subject in 1861 and 1865 has failed hitherto to effect. It may be interesting in the first place to state what is the relative production of salmon in England, Ireland, and Scotland. In Ireland there are 22,947 square miles of what may be termed salmon-producing ground, that is the drainage area of salmon rivers, and they produce an annual supply to the value of £330,000. England and Wales together have a like area of 55,080 square miles, from which must be deducted, as unproductive, 20,350, leaving 34,730 square miles which should be productive, according to the same calculation, of salmon to the amount of half a million annually. I should say that this calculation has been made very carefully by Mr. Ashworth, and is, I believe, correct. If Ireland produces £330,000 worth of salmon, England, with an excess of 11,000 square miles, ought to produce £500,000; but what is the fact? The calculation made in 1860 was that it produced £40,000. I believe there has been an increase since that time, but the total annual yield cannot be more than £60,000 at present. Yet one river in Scotland, the Tay, with a catchment basin of only 2,200 square miles, produces salmon to the amount of £30,000 a year. We are gradually, I hope, experiencing the effects of wise laws upon this subject. Every pollution abated, and every weir made passable increases the available area of breeding-grounds, and so directly produces an increase of fish,—but there still remains much to be done. According to the returns which have been obtained from Billingsgate market, there were, in 1861, 442 boxes of English salmon sold there, while in 1867 the number had increased to 2,405 boxes, being an increase of nearly 2,000 boxes, and that increase was gradually progressive from 1861 to 1867. This is very gratifying. My remarks will be chiefly confined to the three rivers of which I have had most experience, the Severn, Wye and Usk; and I have brought two maps, the one a large ordnance map, and the other designed by myself, whereon the district belonging to each river is distinctively coloured. These rivers, as you know, all fall into the Bristol Channel, and, together, have an area of 6,742 square miles. There are three principal causes which are retarding, and which will retard, unless they are remedied, the improvement of our salmon fisheries:—1. Pollution; if the water is destroyed, there is an end to all increase of fish. 2. Weirs generally, especially mill weirs. This is a very serious matter indeed, as I will point out. In some instances they are used in catching nearly all the fish, while in others they block up the river or its tributaries, so as to prevent the salmon having access to the breeding grounds. 3. The discontent of the upper proprietors, which, I believe, one of the members of your Committee knows something about. When the nets catch too large a proportion of the fish the proprietors who hold the upper parts of the river are not so willing to render active assistance in preserving the salmon.

The CHAIRMAN—That would be connected with the second cause, would it not?

Mr. LLOYD—Not altogether. The second cause refers chiefly to the prevention of the salmon going up the rivers to breed; the third, to the upper proprietors' not unnatural discontent at the fish which have been bred in their waters being nearly all caught in the nets in the lower part of the river. 1. The pollutions.—There are pollutions of two kinds which injure our rivers very much. Liquid pollutions perhaps you are aware of, but solid pollutions also do much injury; they consist of scoria from iron works, slag, cinders, small coal, and refuse of that kind. Here are two of my maps, one showing the three districts I have mentioned, and another presenting a very different appearance, only that portion which remains good and productive being left white, and that is very little. What is coloured black shows the portion which is polluted, and the red that which is shut off by cause No. 2—the mill weirs. Both those large areas might be made good and productive. The main lines of the Severn, Wye, and Usk are productive of salmon; some of these little tributaries along their course are not, but where they are not shut off I have left them uncoloured. Taking first the liquid pollutions, the one which does the most harm, and which is of very serious moment in South Wales, is the vitriol used in the tin-plate manufacture.

The CHAIRMAN—Are the solid matters deleterious in themselves, or are they only destructive?

Mr. LLOYD—I will allude to them presently. The great South Wales coal basin comes in at the edge of the Usk district, and there are about 112 tin-plate mills in the neighbourhood. Indeed, South Wales is the seat of the tin-plate trade, there being only two or three other places where it is carried on; while there are 112 tin-plate mills in South Wales and the adjacent district, there are only seven in Staffordshire, one in Cumberland, and one in Scotland. The value of the tin-plates made in South Wales is said to be £2,000,000 annually. In the process of making these tin-plates vitriol is used in order to prepare the iron for receiving the coating of tin, and this vitriol, when it becomes surcharged with the oxide of iron, is rendered useless for acting upon the tin-plates, and is thrown as waste into the river. A process, however, has been discovered by which this waste vitriol, or "black pickle," as it is called, instead of its being run into the river, where it discolours the water and kills every fish, can be utilised. Simply by boiling it in a particular manner, one-third is rendered fit for use again in the tin-plate manufacture, as pure vitriol, and the other two-thirds are converted into sulphate of iron or copperas, which is a marketable article. The process is patented, and is called Pughsley's process, I think [producing specimens of the "black pickle," and of copperas]. There is nothing to prevent its being generally adopted, as the charge made for using it is very slight. Several works have already adopted it. The calculation made is that £33,000 worth of vitriol is used in this district in the course of the year, of which, if this process were generally adopted, the whole, less one-fourth (the cost of conversion) might be saved, and at the same time the rivers made pure as they were before. Where it has been introduced salmon have been seen under the water-wheels of the very mills

where the poison formerly came from. I hardly know of any other instance where such plain and easy steps may be taken to remedy a great evil.

The CHAIRMAN—What steps can you suggest in order to make this process general?

Mr. LLOYD—I would make it compulsory. I would not allow the vitriol to be thrown into the water. I know it is to the manufacturers' own interest to adopt this process, and I think they ought to be made to do so.

The CHAIRMAN—Why do you not apply for an injunction to prevent the waters being polluted?

Mr. LLOYD—No doubt that is one course which might be adopted, but law is very expensive, and we, as a board of conservators, are very timid even in dealing with a miller. Here there are very large interests involved, and if the owner of the works says to his neighbours, "I do not want to go to the expense of this process, and if they persist I will stop my works," then it is a serious thing to the whole population. There are manufactories upon the Avon-llwyd brook, whose refuse would entirely destroy the river Usk, only that fortunately it comes in just at the tide-way, and is carried off. I and my brother conservators have been to some of these proprietors over and over again, and now we shall have to prosecute one of them.

Mr. CHESTER—I can see there might be a difficulty in commencing legal proceedings against an influential man employing a large number of workpeople, but suppose the Court of Quarter Session, under which you hold your appointment, were to direct you or some other officer to make a communication to the owners of these works, pointing out that if this process were used it would really be an advantage to them as well as the public, do not you think that would expedite matters?

Mr. LLOYD—If we had a little more power given us by the Act, we should be able to do so. I will show you presently where, in my opinion, the deficiency lies. I will now allude to one or two other sources of liquid pollution. In some parts we suffer from refuse from paper-mills. I am not prepared to say whether this can be utilised in any other form than as manure. It contains a great deal of chloride of lime, and, if it were run out into catchpools, would form valuable manure. A paper-manufacturer at Llangrwyney, on the Usk, told me this himself. The important point to be observed is to keep the refuse from the manufacture separate from the large bulk of water flowing from the water-wheel. Pollutions, however poisonous they may be, are easily dealt with, if the bulk is small. Then, at the head of the Severn there is a serious source of pollution in the lead mines, on the Clywedog and the Ceryst brooks. The Ystwith and the Rheidol are entirely destroyed from this cause; and in the Dovey, which also flows into Cardigan Bay, and in the Tees, the quantity of refuse from the lead-mines is very great, and does an immense amount of injury to the fish. I am afraid there is no process of utilising this, at least I am not aware of any at present. The only way of remedying the evil, therefore, is to have catchpools one below the other, so as to filter the water coming from the lead-mines until it passes away pure. That, I believe, is quite feasible, and unless something is done on many of our rivers they will be destroyed as salmon streams in a very short time, just as the Ystwith and the Rheidol have been. I went to see the Tees, and found the water quite thick and dark-coloured, and a man told me that the day before it was white like milk. We suffered much formerly in some parts from gas refuse, a good deal of the substance known in London as "Blue Billy" being found floating on the water. There is not so much annoyance from this cause now, as it is found that the tar can be utilised in at least half-a-dozen ways, and is even used in making fresh gas. There has been a great improvement in many of these things which formerly caused serious injury. The very noxious property in all these pollutions which destroy our fish, is that which should be saved and utilised; its destructive powers prove its value, and from every point of view it would be a direct national gain, if manufacturers were compelled to utilise their waste and refuse. Sewage we have not found injurious to the fish, except in very large quantities indeed. It is very injurious to health, and I should certainly recommend that in all future powers given to Boards of Health the condition should be annexed, that they prevent the flow of sewage into rivers.

The CHAIRMAN—That is virtually decided.

Mr. LLOYD—I am very glad to hear that. It is very important that these things should be properly done at first, and at Abergavenny a very simple and inexpensive process has been adopted. In the city of Hereford they have spent a great deal of money to make a sewer into the Wye, and if they have to alter the system now, the alteration will cost double as much as if it had been done at first. The sewer was made in 1858. I will now bring before you some of the solid pollutions I have mentioned [producing specimens of slag, scoria, &c.]. This iron slag is very injurious indeed to the spawning grounds; it is not, of course, soluble in water. At one works they tip in nearly 10,000 tons of rubbish a year into the river; they tip it in as regularly as if it were on to a spoil heap; this comes down the river on the first flood, and covers over the spawning beds; the salmon, instead of turning up nice pebbles and gravel, turn up this sort of stuff, which certainly is not the natural material. I do not think Mr. Buckland would like to use it to hatch salmon on.

Mr. BUCKLAND—Certainly not.

Mr. LLOYD—It has become so bad on the Usk, that the Newport Harbour Commissioners sent Captain Alridge to report on the matter, and I will read a short extract from the report:—"I have to notice the accumulation of stones, scoria, and other matter below the powder-house point and at the entrance of the river Ebbw, which must come down from above on the ebb tide. I have taken up several of these apparent stones, and on handling them, been surprised at their lightness, until, on a closer examination, I have found them to be scoria or cinders, rounded and smoothed through the action of the water, and continual rolling downwards on the ebb until met by the flood tide, when they become deposited and accumulate, from the fact that they will not roll up hill again. This is a great evil and injury to the river, and powers should be obtained, if possible, to prevent it. I produce one specimen, picked up from under water, where my boat touched the ground, of what the rest is like. The river becomes almost ponded or barred (upwards) from just below the powder house point, and where there is a slight fall at low water." He then suggests that an examination should be made every year of the harbour with respect to this matter, as it affected the whole river from beginning to end. Then, again, there are large quantities of small coal in addition to slag thrown into the river. 40 miles up the Usk, at a place called Clydach, there are some iron works, and 30 miles below that, a blacksmith digs up small coal to burn in his smithy from the sand at the river side. The main bulk is however washed out to sea. I will now give you shortly my suggestions. In any amendment in the act of Parliament, I would suggest that all these offences, such as turning pollutions into a river, should be dealt with in a summary way before the magistrates, and that there should not be the power of carrying it to a higher court, where the expense of the improved process is alleged to exceed £100. That stops us in many cases, and prevents our taking action.

The CHAIRMAN—Do you not think the course of legislation is always to get the law settled by decisions of the higher courts, and then the inferior courts will follow those decisions?

Mr. LLOYD—That is not exactly the point. I do no wish to remove the right of appeal, but at present the Act says if the estimated cost of the preventive process shall exceed £100, then the case may be taken, almost

in the first instance, to a superior court. Another difficulty in our way is that we have to prove that fish have been actually poisoned; I think it should be sufficient to show that the substance is of a poisonous character.

The Chairman—Have you looked at the Nuisances Removal Acts, to see if they will assist you; there are two or three Acts?

Mr. Lloyd—We are pretty sharp on our board, and there are one or two good solicitors amongst us, but it has never been suggested that these Acts would assist us.

Mr. Foster—Would not the Commission on Rivers Pollution listen to you? There is a new Commission just appointed.

Mr. Lloyd—I have no doubt they will when they come to our district. To go on with my suggestions, I think a complete stop ought to be put to the tipping of rubbish into the rivers; that is a clear and gross case of injury. As regards boards of health, I think they should utilise the sewage; and I would advise all conservators to attend to these nuisances when they first appear, and when the remedy is much more easily applied. It would be a good thing if landlords would have clauses inserted in their leases, restraining their tenants from turning pollutions into the rivers. The Duke of Northumberland and Lord Tredegar invariably do this on their properties, and very great advantage has resulted. Connected with this subject is the abstraction of water by canals. The Usk is a river which I have been connected with from my birth. There is a canal there, the trade on which has dwindled away almost to nothing, and yet they take as much, and probably more water from the Usk now than they did when the trade was in full vigour, when, in fact, they were the carrying company for the whole district. They take eighteen millions of gallons a day, which in summer time absorbs nearly the whole of the river. They have no reservoirs or anything to equalise the supply. Their powers are to make and maintain a navigable canal; but what do they do with the water? They part with it to docks, and sell it to iron works, railway companies, saw-mills, and so on, and derive a revenue from water, which, I maintain, is misappropriated. Sometimes the river is dry, and of course where there is little water there can be few fish. This evil is of great magnitude in some districts, and I think it is really worth the attention of the Legislature. There might be a return moved for of what water is actually taken from rivers by canal companies, and whether they really make a proper use of this water.

Mr. Chester—Can you tell us what the state of the law is about this? Can anybody prosecute them for taking away the water?

Mr. Lloyd—The law seems to be that if the canal company has done any act colourably within their powers within 21 years, then it is legal. We have taken Mr. Manisty's opinion upon it; if once they take the water into their canal it is not our business to inquire what they do with the water.

Mr. Jenkins—I believe there was a case in point where the Swansea Canal Company were taking away the water from a mill, and nothing could be done to stop it.

Mr. Lloyd—The evil is one of great magnitude, for it prevents the fish ascending the rivers. That is the difficulty we have to contend with in the Usk. The fish will not ascend beyond a certain point, because the river is constantly dwindling away. There is a point five or six miles below the weir which they will not pass except on high floods. This large abstraction of fresh water is the cause also of the river stagnating and becoming foul, and in other ways does serious injury to the property of riparian owners. I think something might be done on this head; and even if these water companies were restricted, as they should be, to taking a certain quantity of water only, and then applying that to legitimate uses without waste, they should be obliged also to make storage reservoirs for summer use. The drain now upon some rivers in dry weather is more than they can bear. The mills in some cases take nearly the whole river. In one extreme case, I have seen the river dry for quite a mile between the weir and where the leat comes in; what fish there were there were like tench in a pond, not like salmon or trout in a river. The mills should always allow some water to pass, in order to keep the fish alive and the stream fresh. I come now to cause No. 2—the obstruction by weirs generally, and especially mill weirs; and in the particular rivers I am now alluding to this evil is even greater than that of the pollutions. Here you see a map, on which are coloured in red all those portions which are shut off by mill weirs. In the area of the Wye, of about 1,600 square miles, nearly all productive, 700 or 800 square miles are shut off by these mill weirs. A large portion of the area belonging to the river Severn is cut off in the same way, and on the Usk there is a large tract. I find on the Severn and its tributaries there are 73 weirs; on the Wye and its tributaries 50; and on the Usk and its tributaries 45. All these 168 weirs could be made passable for salmon for less than £5,000; and were this done, an extent of nearly 2,000 square miles of salmon breeding grounds would be made available, and an increased produce of salmon, to the money value of £20,000, would be annually derived. One tributary of the Severn, the Terne, a river 60 miles long, and draining a large district, is entirely cut off from the parent stream in this way. The Lug, 47 miles, and the Monnow, 36, are similarly cut off by high weirs from the Wye. In some districts the pollutions rank first as difficulties in the way of salmon culture, but in the rivers I have specially alluded to the mill weirs are the greater evil. I heard from Mr. George, the clerk of the Severn Board, the other day, and he says they are at a dead lock on the Severn, as to making passes in one of the navigation weirs at Diglis; the inspectors of fisheries will not certify the passes until they are made, and the Navigation Commissioners will not make them until they are guaranteed that they will succeed; and between the two there is a dead lock. Mr. Phillips, from the Ouse, in Yorkshire, writes me word that "proprietors are ceasing to attend our meetings, because as long as Linton and Borobridge weirs are unopened no salmon can ascend; they now take but little interest in the river." Very little has been done successfully to open up such weirs as these since the passing of the Act 1861; and just as they have been the chief cause of the ruin of our English salmon fisheries, they are now paralyzing the efforts made to restore them to productiveness. To remedy this evil we want more power. We do not want to do away with all the weirs, but only to provide passes for the fish. There is a weir on the Dee which you may have seen correspondence in the *Times* about. I have not seen the weir myself, but I know from the description that it must be prejudicial, as it presents an obstacle to the fish going up at low water. It will be quite hopeless to make very much of that river while the weir is in its present condition. I may state what was done within my own knowledge in the case of a weir on the Usk, at a place called Trostre. This weir was very high, and was fitted with cruives. In 1846 there was a flood, which broke the weir down, and salmon were seen at Crickhowell, 30 miles up the river, where they were quite unknown before. The reason was plain; there was a breach in the weir, and the fish immediately took advantage of it. Some gentlemen in the neighbourhood joined together and became tenants of the weir; they took away the fishing cruives, lowered the weir and put passes in it, and from that day the Usk has become one of the finest salmon angling rivers in England. They still kept the mill going, but by opening that weir in 1846 they made the river what it now is. The fisheries from that point up, are worth from £20,000 to £30,000; they are principally angling waters, but the estuary fisheries are also improved. There is no speedier mode of improving the fisheries of a river, than by removing a weir which prevents the fish going up to breed. There are weirs of three different kinds and classes, which are

thus divided in the Act, 1861:—1. Fishing weirs, *i.e.*, weirs used solely for taking salmon. 2. Fishing mill-dams, *i.e.*, weirs made partly for fishing, and partly for milling purposes. 3. Weirs generally, *i.e.*, those used exclusively for milling, navigation, irrigation, and such like purposes, and not in any way for taking salmon. As regards No. 1 and 2, the fishing weirs and fishing mill-dams, I may say at once, that in my opinion there is only one alternative. I am not at all in favour of conferring arbitrary powers on the boards of conservators, but I would certainly give them compulsory powers to purchase these fishing weirs and fishing mill-dams, the same as are given by the drainage act to landed proprietors, at a fair valuation.

Mr. FOSTER—Out of what funds?

Mr. LLOYD—Out of our own funds, which are derived from licenses for fishing in the river. There is a model of the weir on the Usk, showing the passes through which the fish travel as easily as possible; at the same time, as we never can tell what contingencies may happen unless the weir is our own property, we have now arranged to purchase it for £700. We know the value of our river, and the money is almost provided; we are simply waiting for the assent of the Lord Chancellor, the estate being in Chancery, and the weir will be purchased. We then intend to pull the weir down, but there will be no loss to any one on that account, for the grist mill attached to it is only worth £20 a year, and the weir being 273 yards long, it costs more to repair it and the machinery of the mill than the mill brings in. I believe it is to the interest of the country that these fishing weirs and fishing mill dams should be purchased at a fair valuation, they are a continual grievance to the upper proprietors, who therefore will never work heartily with those at the lower part of the river, while these fishing weirs and fishing mill dams are allowed to catch the ascending fish. There is the Dinsdale fishing mill-dam on the Tees, which belongs to Mr. Surtees; I believe he is anxious to do what is best for the river, but he has been troubled a good deal about his weir, and he says "no one shall touch my weir." I think therefore there should be power given to the conservators to say to him and other owners similarly situated, "your weir stands in the way of the improvement of the river, and therefore we will purchase it from you at a fair valuation." The fishing weirs are kept up as stated solely for fishing purposes; the fishing mill-dams for both fishing and milling purposes; in the latter case it might not be necessary at all to pull down the mills or throw them out of use, but by getting them into our own hands, we should be able to provide for the passage of the fish. In some cases, perhaps we might let the mill for £5 a year less, but it would be a great point to be able to say to the millers "we are your masters." When they are our masters they will not give up half-an-inch of water. We should raise the necessary money by subscriptions and by the funds of the board. They represent the whole of the river, and have power to borrow money for any purpose of this kind, and they are quite solvent, and could borrow money if necessary.

Mr. FOSTER—The removal of these weirs would be useful, not only from a fishing point of view, but also as regards drainage, would it not?

Mr. LLOYD—Yes; in many cases weirs injure the land above very considerably. I know an instance on the Trent where there is more injury done to the owner of the mill in respect of land above, which also belongs to him, than he gets from the mill. In some cases, therefore, it would not much matter whether the mill weirs were pulled down or not; but in others, where they injure both the land and the fisheries generally of the river, it would be a manifest advantage to purchase them and take them down. Power might be obtained to purchase any weir at a valuation, if found necessary. I come now to the third class of weirs—mill-dams and weirs—used simply for milling, irrigation, navigation, and other purposes; and in these cases I do not think we ought to be answerable for all damages to the weir and the milling power when we are making a proper provision for the fish to pass. At the present moment, as I understand, we are answerable for any damage which the miller may almost conceive possible, or may be able to prove by the evidence of his own men. (See sect. 23, Act 1861.) The weir is generally a very cranky concern, and we do not like to run all these risks which are sure to overtake us in the case of any obstinate miller. If, on the other hand, the weir is built firm and strong, the owner refuses permission to make an opening in it, and too often obliges us to make our pass on one side of the weir in an unsuitable place. We yield to this through fear of damages, and consequently expend our money on a useless pass. We want to be able to say to the owner of the river, "You must let the salmon pass over the weir; that is a *sine qua non*, and as this must be done, let us put our heads together and see how it can be done with the least injury to you. There must be no claims for compensation." I think the miller would soon find a way of obviating all difficulty. It might be done, on small streams, by having a sluice open at the head of the pass at night and on Sundays when the mill is not at work, but at present all the water is ponded back to have more on the Monday, so that neither at night nor on Sunday does he give the fish a chance. On large rivers the pass could be always left open. Any interference, of course, is to a certain extent an injury, but when we consider how the interests of the whole country are concerned, we think the miller should give way a little; that he should be compelled to let us have the water at night and on Sundays, and in time of floods when he did not want it, and that there must be a pass made for the fish, which we would pay for. We must have greater powers.

Captain GRANT—It appears to me that one quarter of the width of the river should be left free for the fish to pass at all times. As for the Queen's gap, that is of no use at all.

The CHAIRMAN—What is the Queen's gap?

Captain GRANT—It is an opening made in the weirs, which the law requires to be left open so many hours in the week. It is monstrously unfair that the whole river should be shut off from the upper proprietors for six days a week.

The CHAIRMAN—Is this a provision in the English law?

Mr. LLOYD.—In the English, as in the Irish law, there is a provision for keeping open a "free gap" in fishing weirs, but not in fishing mill-dams and ordinary weirs.

Captain GRANT.—The upper proprietors on the Wye raise between £500 and £600 a year for the preservation of the fish, and they are the men who really do preserve the fish, and yet the large proportion is caught by the people at the estuaries.

Mr. LLOYD.—The lower proprietors contribute nearly two-thirds of that sum. But to continue—Many tributary streams are shut off as breeding ponds by these weirs, and I think we ought to have power to make passes for the fish without being liable to all sorts of claims for compensation. Upon some of these rivers, especially on the Ouse and the Severn, some of the weirs belong to the navigation commissioners, and they ought to be the first persons to do what is right and at their own expense—they are powerful enough and rich enough. The next point is, supposing you agree with the millers, or have sufficient powers given you to make these passes, how are you to make them? I cannot add much to what I said at the Salmon Fishery Congress last year. There are three plans known to us. The first is called "the open pass," the second, "the pool system;" the third, "the government ladder." The first, or open pass, is that which is adopted at the Trostre-weir, of which I have a model here [producing model and water colour drawings]. This weir is four feet in height, and the question has been raised whether the fish would ascend in this way if it were a six-feet weir. I should

not like to give a decided opinion either way, as we have had no means of trying. This is not a leap, and in darting up, the salmon never show themselves; it is a straight run through the weir. We made three openings in Trostre-weir, in order to give the salmon greater facilities than if there were only one, and there is still enough water retained to work the mill. The large run is three feet square and twenty feet long, and, being placed in the strongest lead of the river, suits the fish in the lowest water; the other two runs are smaller, and are placed nearer the upper corner of the weir, where in high floods the force of the current is not so great. A pass of this kind was tried at the Dimsdale-dam, which is 6 ft. 4 in. in height, and it has been pronounced a failure; but I do not consider it a fair experiment, as the pass was made at the side of the weir where the water comes with great force against the rock, so that there is really no approach for the fish. If the opening had been made in the centre, the fish would have had a fair chance. [Producing drawing.] I think the question is in this position, that Government ought to make a vote of money for making experiments in this direction, to see what the fish are really capable of doing. They often make a vote to try an experiment on a big gun, which certainly has not the effect of increasing the supply of food. I think they might spare something for an experiment in fish-passes, and perhaps, too, the Society of Arts might give us a little assistance.

Mr. Chester—What would be the effect of a total abolition of all weirs?

Mr. Lloyd—Steam power might be advantageously substituted in many instances; but to do away with all weirs would, I think, destroy a great deal of the commerce of the country.

Mr. Chester—Could not that commerce be carried on in other ways? It seems at present that the interests of the millers are allowed to prevail over all others.

Mr. Lloyd—At present they are masters of the situation. But we could not do away with the weirs altogether, because it is by damming back the water that they gain their water power. And this is not simply a question of corn mills; there are numbers of other mills worked by water power, so that we could not do away with them all. The second class of fish-passes is the "pool system," of which Mr. Buckland gives me the credit of being the inventor. The plan is very simple, as you will see by this model. It is not an open run, but you enable the fish to ascend the weir by making them leap successively from one pool to another, each raised slightly above the other, until they reach the top. This is quite in accordance with the natural habits of the salmon; and you are able in this way to gain height quicker than in any other. The first pass ever made on this plan was on the Cynrig brook, where it succeeded admirably. I have since made another on the Brân, which is equally a success [producing models, water-colour drawings, and engravings]. The model I have here represents a sloping weir, 6 ft. high by 22 ft. broad. The pools are here represented as being 8 ft. square. Each leap is only 18 inches in height. This plan is in practice now in several places besides those named, and I will guarantee it to succeed in every instance. In this model the leap at the top is made a few inches below the top of the weir; but here is another model in which the level of the weir is not touched at all. Side by side I would place a model of the Government ladder of 1 in 8, in which the fish have to pursue a zigzag course; I believe that form of pass is exploded now altogether. You will see here that it is of nearly twice the length of a pass on the pool system, and, while being far from as effective, is more difficult and expensive to construct. One was put up on the Conway, at a cost of £500, and another at Linton weir, on the Ouse, at a cost of £250, and I believe both are entire failures. They will only answer where the rise is not more than 1 in 7 or 8, and they are consequently very expensive to construct. I would suggest that where they are found not to answer, the opening on alternate sides of the run through which the water passes should be closed, so as to form a succession of pools, and the bottom of each compartment deepened, and then the fish might leap from one to the other. In places where the face of the weir is perpendicular, a somewhat different plan must be adopted to those I have shown, the pass on the "pool system" being carried through the weir, and the apex being on the same level as the top of the weir, but necessarily further up the stream. It is fatal to the success of any pass to allow its foot to project out beyond the weir, and hence the difficulty in treating perpendicular weirs. Here is one more model of an entirely new design, though a modification of the pool system. I have copied the plan from nature, and I will guarantee its success whenever it is practicable to make it. You will observe the water passes through a succession of oval pools, which are connected one with the other by a short and narrow neck. By this plan the water is economised, and it comes down with a gliding motion from pool to pool, rather than with a precipitous fall. The third class of fish-passes is that of the Government ladder, originally invented by Mr. Smith, of Deanston. I believe they have in nearly every instance proved a failure, and I mention them here only to express my strong condemnation of them. They are very difficult and expensive to construct at anything like a proper gradient, and they neither afford a good lead of water nor straight course for the fish, which are both necessary. I come now to the last difficulty—the discontent of the upper proprietors. Referring to what Captain Grant has stated on this point, I should like to correct it, as he has rather overstated the case in asserting that there were only 30 fish taken in the Wye with the rod, above Hereford, last year. There were really about 500. There were 94 taken on Viscount Hill's water, at Builth, and I know Mr. De Winton and others took a good many. I am positive that nearly 500 were taken.

Captain Grant—Mr. Baskerville used to take 60, and last year he only took six.

Mr. Lloyd—I know there is a good deal of foundation for this dissatisfaction, and for that reason I think there should be modifications in the weekly close time, which at present is 42 hours in all rivers. Where a river is only netted for a small part of its course that may do very well, but when you come to a river like the Wye, where there are 74 miles netted, and you consider that the fish have to pass the whole of that distance in 42 hours, in order to reach the upper parts of the river, it is plain that the object of the Act is not fulfilled. To meet cases of that kind there should be exceptional legislation. The upper proprietors are now in a very bad position, and by increasing the number of nets the lower men may almost entirely cut off the supplies. There were riots and very wild proceedings last winter on the upper part of the Wye; and I am afraid the gentlemen in the neighbourhood have not taken such active steps to put them down as they should—steps which they would doubtless take, but from a feeling that their own interests are not properly secured. I think, therefore, it would be good policy on the part of the lower men to give a little more to those on the upper part of the river, who could do so much to protect the spawning fish in the winter months. I would propose to meet the case of the Wye and other rivers similarly circumstanced, such as the Ribble (which is also netted for a great length), by having a varied weekly close time. In the Wye, say, I would divide the lower 74 miles of the river into two portions, one extending from the mouth up to Lydrook, a distance of 34½ miles, and the other from Lydbrook to Hereford, a distance of 39½ miles. The weekly close time in the lower division would be from 6 a.m. Saturday to 6 a.m. Monday, and on the upper 6 p.m. Saturday to 6 p.m. Monday, so that the fish in ascending the river would find the nets disappear before them. There would be then in fact a close time of 60 hours, though none of the net

fishermen would lose more than 48 hours, including the Sunday. This arrangement certainly gives an additional six hours' close time, and I cannot think 42 hours is enough with such a length of river. It is 42 hours' work for a fish to get up to Ross, and if there is no more law for him he may be caught before he gets to Hereford, and he will have no chance to get up to Captain Grant's ground at all. I would, therefore, have 48 hours' close time, and the period later at the upper portion of the river than the lower; and by that means I think the fish would have an opportunity of ascending freely. We intend to introduce some such plan on the Wye as soon as we can get authority from the Home Office, and I should say that I think these matters of detail might be left to the Board of Conservators to determine for themselves. For instance, as regards the nets: on some rivers the trammel nets are considered very destructive, but on the Wye we like them. It is my own proposal to ask for six hours' additional, but the majority of our Board approve of the principle of a varied weekly close time at different parts of the river. There is one other little matter I should mention. I think it would be good policy if some fish were sent up from the estuaries where they are chiefly caught for sale in the different towns higher up the river. It would serve to make the fishery laws more popular in the inland districts; and a scheme has been started on the co-operative principle to effect this very object on the banks of the Usk. It is doubtless a matter for the persons locally interested to arrange, but the suggestion here may be of some service.

Captain GRANT—Do you not think it would rather complicate the matter to have different close times in different parts of the river?

Mr. LLOYD—I think not.

Captain GRANT—And more fish run by night than by day?

Mr. LLOYD—In the freshwater, but not in the tideway. I do not think we can adopt a better method of giving the salmon a chance to ascend the river. In conclusion, I have to thank the committee for the attention they have given to my statement. I believe there is a vast field for improvement which is hardly yet touched, and that a very great amount of food can be produced from it. I look upon our rivers as large farms, which if well cultivated would yield large returns; and while we gain an increase in the fish sent to market from our net-fisheries, we can also improve our angling waters, and give more sport to the country gentlemen. Our rivers, however, possess this advantage over farms, that from the time the salmon is hatched until he is placed on the dinner-table, he costs us nothing in food. We simply require our rivers to be free from injurious pollutions and weirs, and to produce a cordial feeling between the upper and lower proprietors, whose interests are really identical. Wise legislation will effect this, and then, with the forbearance and encouragement of the public, we shall be able to give this great experiment of increasing the supply of national food a fair trial. I cannot doubt that the result will then be successful. It is a great point to get the public to understand the difficulties that now retard the improvement of our salmon fisheries, and to this end I trust the present discussion will be of some service. In common with all others interested in the culture of our rivers, I am most pleased to see that the Society of Arts have taken the subject up in the earnest manner they appear to have done.

Mr. F. BUCKLAND—If the Committee would allow me, I should like to add a few words to what has been said by Mr. Lloyd. First as to the pollution by lead mines. We have been very urgent upon Mr. Dymond, who lives upon the South Tyne, to make the catch pools which Mr. Lloyd recommends; he is now laying out several thousand pounds in doing it, and I hope Mr. Lloyd will go and see them. The arrangement is by Mr. Sopwith, the engineer, on the gravitation system, and I have no doubt it will answer admirably. If they succeed we can then go to Parliament and demand that others shall do the same. I agree with what has been said as to throwing slag and refuse into the rivers; it is a most injurious and disgraceful practice. Town sewage is not pernicious to fish except in very large quantities, or unless it contains gas refuse, in which case, as happenned at Llangollen, the fish will be killed. We shall be very glad if the Society of Arts will help to put down these pollutions, and say it shall not be done. Why should dirty water be allowed to flow into the rivers? Mr. Walpole and myself have been making a new act, and have submitted it to the Home-office lawyer, and we have made the clause about pollutions as stringent as we possibly can. We quite agree with Mr. Lloyd that it should be more peremptory.

Mr. JENKINS—In most of the acts under which gas companies are constituted there is a clause about the disposal of their refuse.

Mr. CHESTER—Would it be well for the Society of Arts to petition Parliament in favour of that Bill?

Mr. BUCKLAND—I wish they would. You are about the only people who support us in this matter, and we have a hard fight against the manufacturers. At Herne Bay the manager of the gas works has found that the strong liquor which comes from the retort, when diluted with water, makes a most valuable manure for grass land. As regards the abstraction of the water of rivers by canals, I may say that on the Dee there is a weir (or lock) which is built right across the river, and stops all the water, only about an inch flowing over the top. The whole water of the Dee, you may say, is turned down that canal; and little fish, which my friends the conservators have been at great trouble and expense to rear, are carried through the grating into the canal, and go nobody knows where. When they come back from the sea, if they were allowed to get there, they would be worth £1 a piece. They get down into the Shropshire Union canal, and some say they get out into the Severn, but it is very doubtful; very likely they get into the sewers of Chester or Liverpool. We went before the House of Lords, but they declined to hear us, on some technical point. Then as to the weirs, I quite agree with Mr. Lloyd that they are very detrimental, worse than pollutions, because these may be diluted by floods, but the weirs are what I call permanent sentries, always on duty. The conservators should have power to purchase these. If anybody wants to invest £1,700, let them buy that mill at Chester; they would immediately get the right over the weir, and could let the fish pass up to the upper waters, and in two years it would pay. I think great credit is due to Mr. Lloyd and his friends, for their good example in buying Trostre-weir; and I should much like to see the same thing done elsewhere, particularly at Dimsdale. As to the millers, they ought to be obliged to let the water pass at night and on Sundays. Mr. Chester's observation was quite correct; they are masters of the river. It is a question of bread *versus* fish, but there is no reason why we should not have both. The question of compulsory powers is one which Mr. Walpole and I have been considering with the Home-office lawyer, but it seems a very difficult one. We have done all we can in the matter. As to the question whether steam could not be made to supersede water power in these mills, I would recommend Mr. Ashworth's little book to the consideration of the committee; he shows that in many cases it would pay well to pull down the weirs and use steam for the mills. Mr. Lloyd made a very valuable suggestion as to the granting of money for the purpose of making experiments on fish ladders. The pass on the pool system at Cynrig Weir is the first I ever saw made on that plan; it succeeds admirably, and Mr. Lloyd is entitled to much credit for having designed a fish-pass at once so simple and efficient. There is one on the pool system also at Llangollen, and the local fishermen say they can now get no fish, which shows its efficiency. If we could get

a small grant from Government for the purpose of making these experiments—we do not ask for thousands—it would do a deal of good, or, perhaps, the Society of Arts might assist us.

Mr. CHESTER—What do you mean by a small grant?

Mr. BUCKLAND—£200, or even £150. We are now in a state of doubt as to the Dimsdale pass Mr. Lloyd has mentioned. If we had from Government, or the Society of Arts, a grant of £100 we could solve that question, and having solved it, it would be a precedent for all Boards of Conservators to act upon hereafter.

Mr. CHESTER—The Society of Arts always like to call out local exertion; do you think, if we offered to contribute so much, and the Government so much, the Board of Conservators would add something to it?

Mr. LLOYD—I am not connected with that Board, but I feel confident they would.

Mr. BUCKLAND—Mr. Lloyd's models do him a great deal of credit, and he has promised to lend them to me for my museum at South Kensington; I hope the fact will be announced. My man will be there to explain them, if I am not. As regards the bye-laws which Mr. Lloyd has proposed, I am convinced, after seeing a great many rivers, that no two are alike, and that, therefore, universal legislation will never act well. I therefore agree that the Local Boards should have power to regulate the mesh of the nets, the weekly close-time, and matters of that kind, subject to the approval of the Home Secretary—in fact, to make bye-laws.

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—The twenty-first Annual Meeting will be held in the city of York on June 3rd and 4th. The conference of Delegates will commence in the Institute of Popular Science and Literature, St. Saviour-gate, York, on Wednesday, June 3rd. Mr. E. Baines, M.P., President, in the chair. In addition to the transaction of the ordinary business, the following subjects will be discussed.—

1. The increased importance of primary education in order that our members may be prepared for receiving technical education.
2. How can Mechanics' Institutes be made available for technical education?
3. The propriety of commencing a Magazine under the direction of the Central Committee.
4. Female Education.
5. How to get the employers of labour to associate more with us in the working of our classes.

The Conference will adjourn, at 2 p.m., for half-an-hour, during which time refreshments will be provided by the committee in the Library of the Institute. The central and local committee invite the delegates to tea, in the Merchants' Hall, at 5 p.m. After tea the testimonial to Mr. James Hole will be presented by the president. His Grace the Archbishop of York will preside at the public meeting, the chair to be taken at 7.30 p.m. On Thursday morning the delegates will assemble at 10 a.m. A visit will be paid to York Minster, the Castle, the Museum of the Philosophical Society, the ruins of St. Mary's Abbey, and to several manufactories. A concert will be given in the afternoon by the inmates of the Wilberforce School for the Blind.

Fine Arts.

MOSCOW MUSEUM OF APPLIED ARTS.—The new Museum of the Fine Arts applied to Industry, established in the Strogonow School of Design of Moscow, was inaugurated last month. The general plan of the Museum was drawn up by M. Boutowsky, on the basis of a plan drawn up for the Lyons Chamber of Commerce by M. Natalis Rondeau, which has been very generally approved. The Museum is divided into three sections:—Fine Arts, Industry, and History; and it includes—Collections of Flowers and Plants remarkable for beauty of form or colour, collections of Animals, Birds, and Insects; a cabinet of Drawings and Prints; a special Library of Illustrated Works relating to the Fine Arts; Decorations, Ornaments and Architecture; and an atelier and workshop for the use of the pupils of the school and of the public.

Manufactures.

PROPOSED EXHIBITIONS AT LYONS.—It is said that measures are being taken for the holding of industrial, artistic, and agricultural exhibitions at Lyons next year, to open in May, and close in August. The three exhibitions will be separate from each other; the first to be held on the new Cours Napoleon, the second in the Museum or Palais des Arts, and the third in the park of the Fête d'Or. A great festival of the orpheonists and of the musicians of the Rhone and the neighbouring departments, is proposed to be held at the same time.

MANUFACTURE OF PAPERHANGINGS IN ITALY.—At Turin there are two manufactories of paperhangings, the first employing 25 workmen, and the second 16; the products of both these manufactories are distinguished by the excellence of the work and the brilliancy of the colours, and at the same time by their cheapness. They produce annually about 50,000 kilos. of paperhangings, at prices varying from 60 centimes to 3 francs per metre. At Milan there are nine establishments, employing in all 60 workpeople and 48 children. The average wages are 1fr. 50c. per day for the adults, and 44c. the children. The colouring is done by hand, and the quantity of paper used yearly is 30,000 rolls of 7 metres each, and 200 reams of paper, called *leone*, for ceilings. There is also another manufacture at Fibreno, in the Neapolitan provinces, which produces excellent qualities of paperhangings, such as flock, gilt, marbled, and glazed, which can compete with foreign productions. The following are the imports of the best qualities of hangings to Italy, and the trade is almost exclusively with England and France:—

Plain coloured paper.

	Kilos.	Francs.
1863	209,100	657,000
1864	82,400	247,000
1865	10,800	151,000

Flock and other fancy sorts.

	Kilos.	Francs.
1863	132,200	327,000
1864	306,200	756,000
1865	408,700	1,009,000

Commerce.

MINERAL STATISTICS OF ITALY.—The following is the average annual produce of the mines and metal works in Italy at the present time:—

	Mines.		Works.	
	Quantities.	Amount.	Quantities.	Amount.
	kilos.	frs.	kilos.	frs.
Iron..................	143,499,300	2,053,330	57,004,900	16,444,000
Copper	32,010,100	1,551,692	1,012,200	2,793,706
Lead and Silver	16,047.700	2,935,285	{ 12,936,100	5,986,758
			6,626	1,409,235
Gold { ore	103,800	9,100 }	125	236,331
Gold { native ...	94	226,551 }		
Mercury	4,760,800	56,600	29,600	126,040
Zinc	282,800	10,000	80,000	36,000
Antimony	100,000	50,000	50,000	60,000
Nickel	7,000	1,043	37,600	131,631
Iron pyrites	4,750,000	25,900	...	...
Manganese	826,000	41,670	...	...
Coal and other fossil fuel	119,870,700	1,022,868	20,000,000	800,000
Sulphur	168,681,700	18,671,781	8,225,000	1,346,000
Boracic acid	...	...	1,805,500	1,445,890
Total		26,655,823		30,815,591

Colonies.

The Wheat Crop in South Australia.—The wheat statistics have now been collected of the greater part of the colony, and an estimate of 308,000 bushels allowed for the south-eastern district. The returns state that the average yield throughout the colony will not be above four bushels, or 42lbs. to the acre, against 14 bushels reaped last harvest. The cause of this great deficiency is the red rust which attacked the crops just before they were ripe. The total area under cultivation for wheat had increased nearly 100,000 acres against last year. The total yield this year is 2,605,972 bushels, and no less than 55,399 acres had not been reaped. The estimated quantity of flour for export during the year is from 20,000 to 30,000 tons.

The Forests of Victoria.—A board has been appointed to consider the best means of protecting and improving the state forests, and the report has been made. Under the Land Act of 1862, 8,567 acres were then set aside, with 24,000 more specially for a supply of timber. Under the Amending Act of 1865 the total reserve is 82,866 acres. There are only two forests of considerable extent included in the list, Bullarook, of 4,200, and Dandenong, of 2,500. But the board rightly recommends that from time to time particular tracts of country which may be found unsuitable for settlement shall be added and duly protected and planted. Near Melbourne all the good trees have long since been cut down, and the citizen unacquainted with the bush has no idea of the magnificent timber to be seen in the more secluded and moister mountain regions. Among the several important objects of these reserves is a permanent timber supply. There is an enormous consumption of wood in this colony. The report states that since the discovery of the gold-fields it has paid over eight and a half millions sterling for imported timber; and it is recommended that there be extensive plantations of pine, as the wood most in demand by the builder. On the gold-fields there is already great inconvenience as to the supply of wood suitable for underground drives. The adjacent woodlands being used up, the article has to be brought long distances. It has become a serious item of mining expenditure; and if by-and-bye scarcer and dearer, the circumstances will seriously interfere with mining enterprise. State forests, if properly managed, will prevent this failure of supply.

Pearl Shell Fishery.—On the coast of Western Australia this fishery has been most prosperous, and a large number of boats are engaged in it. The returns average a ton of shells per 27 days for every white man employed; but, it must be observed, that much of this beach combing work, for it is little more, is done by natives, but even then the gain must be great, considering that a ton of shells will readily sell in the colony for £100, giving £25 a week for each white man engaged in the venture. Such good results cannot last long; and the simple means and small craft now so successful in the shallow waters along the coast will soon find they have gathered in all the harvest within their reach, and the field of deeper waters will require larger craft, fitted with proper diving apparatus, the employment of which will, in all probability, produce equal if not better results.

Notes.

Paris Exhibition, 1867.—The following paragraph is quoted from the letter of the *Times* Paris correspondent, which appeared in that journal on Thursday, the 21st inst.:—"The dispute between M. Bernard, to whom was accorded the concession for placing chairs in the Universal Exhibition, on the one hand, and the Imperial Commission on the other, has only now received a settlement. The former last year brought an action against the latter to obtain compensation for the loss which he pretended to have sustained by the proprietors of the restaurants in the outer gallery being permitted to place seats before their establishments. M. Bernard then estimated the prejudice done to him at 541,093f.; the Commission contested that amount, showing, among other reasons, that the infringement complained of ceased on the 22nd of August. The Civil Court, in consequence, postponed its judgment, and appointed experts to calculate the damage. On the report of these latter, the judges have now condemned the Imperial Commission to pay plaintiff 229,071 fr., with interest and costs."

Exhibition of Insects in Paris.—An exhibition of useful and destructive insects is announced to take place in the Palais de l'Industrie, under the patronage of the Minister of Agriculture, during the month of August. It will be remembered that an exhibition of the same kind, on a small scale, was held in the same building in the year 1865, through the efforts of the Central Society of Apiculture; that first attempt gave rise to the formation of a new society of agricultural insectology, and it is this latter association which is entrusted with the organisation of the coming exhibition. The committee includes Dr. Boisduval, M. H. Hamet, M. Guérin Méneville, M. Focillon, and several other entomologists and scientific agriculturists. The exhibition is to be made as comprehensive as possible, the scheme including the propagation of useful insects, methods of curing or preventing disease, and economical management; and the illustration of destructive insects, with means for opposing their ravages. It is desired that each class should, if possible, be exhibited in all its transformations, from the egg to the perfect insect, together with the matters on which it feeds. Printed or written memoirs are also to be admitted, even without specimens of the insects to which they refer. As regards destructive insects, the society has determined on a practical instead of a scientific classification, the sub-divisions being formed by the plants upon which the creatures feed. Two additional divisions are added to the programme of the exhibition; one including carnivorous insects, and small mammiferous animals, such as the mole and hedgehog, which feed on insects; the other being devoted to the illustration of the ravages committed by snails and slugs. Some idea of what this amounts to in the vine-growing districts of France, may be formed from the fact that thousands of bushels of snails are collected in the vineyards and sent to various markets all over the country; during the summer months the supply of this popular article of food is large and continuous all over France. As upon the former occasions, conferences on various subjects connected with insectology, will take place in the exhibition. Foreigners are invited to take part in the coming exhibition, applications to be sent in before the 20th of July, to the secretary of the society, No. 1, Rue Cadette, Paris, or at the Palais de l'Industrie. The insects or other objects of exhibition are to be sent in before the 25th of July, and the exhibition opens on the 1st, and closes on the 31st of August. The following are the principal heads of classification:—First division—Useful insects:—1st class: Silk producing insects. These will form the most important feature of the exhibition; the malady of the *gattine*, which has existed amongst the silkworms ever since 1848, is estimated to have caused a loss amounting to more than 60,000,000 francs, or nearly 2½ millions sterling per annum; 2nd class: Insects producing honey and wax; 3rd class: Insects used in dyeing and for colour; 4th class: Edible insects, crustacea and mollusks; 5th class: Insects employed for medical use; 6th class: Insects used as ornaments. Second division—Destructive insects:—Ten classes, viz., those which attack cereals, the vine, plants used in industry, forage, vegetables and ornamental plants, fruit trees, forest trees, timber used for building, truffles and fungi, dry organic matters, and, lastly, para-

sites of man and domestic animals. The third division includes three classes—carnivorous insects, parasitic insects, destructive of chrysalides, and insectivorous animals, birds and reptiles. The fourth division includes —insects and other creatures destructive of mollusks; and notices respecting edible snails and the benefit that cultivators may derive from them. Lastly, optical instruments for entomological purposes, and special apparatus connected with the rearing or destruction of insects. Medals and honourable mentions will be awarded for the most remarkable objects exhibited.

EULOGIUM ON FARADAY, DELIVERED AT THE PARIS ACADEMY OF SCIENCES.—At the annual meeting of the French Academy of Sciences, of which Faraday was an Associate, a brilliant eulogium of the late philosopher was made by M. Dumas, recently appointed perpetual secretary in the place of the late M. Flourens. "On the labours of Faraday," said M. Dumas, "on his immortal discoveries, rests the doctrine of the eternity of the forces, and of their incessant transformation in the inexhaustible loom of time. Faraday did in the domain of modern physics what Göethe did in that of morphology. The name of Faraday, one of the purest of England's glories, will live in history, not only as the symbol of the genius of investigation, but of the true British self-made philosopher, formed in the rude school of poverty." M. Dumas declared that science had its poetry, and that even Dante, in his terrible *enfer*, could not conceive the idea of that carbonic snow, which burns like a red-hot iron, and changes mercury into a substance as solid as lead; he could not tell of those volatile liquids compared with which water seems like a syrup and alcohol like thick oil, with such facility do their atoms roll over each other. The orator terminated his brilliant eulogium by comparing Faraday with his peers—with Ampère, Œrstedt, Arago, Léon Foucault—pointing out the resemblances and the differences in the minds of these "creators of modern physical science, that science," said M. Dumas, "which will one day culuminate in the production of its Newton!"—In the presentation of the various prizes of the Academy, a touching incident occurred:—M. Bour receiving a gold medal in honour of the analytical labours of his son, snatched from science at an early age.

Correspondence.

ENGLISH LABOUR.—SIR,—Since the discussion at the Hall of the Society of Arts, on the evening of the 20th instant, I have referred to some memoranda which I kept from January, 1864, to March, 1865, when I occupied a farm of 62 acres, in Devonshire, near Barnstaple. It appears that I paid 9s. a week for each out-door labourer, without extras, except for my bailiff, to whom I gave also coals, candles, and his rent. I paid extra during the hay-season and during harvest. I paid for my female labour at the rate of 9d. a day. Upon an average, during the said 15 months, wheat sold at 5s. 6d. a bushel when these wages were paid. I allowed the out-door labourers a quart of cider each daily (except Sunday) all the year round, or the weekly wages would have been 10s., not 9s., as to males, and 5s. 6d. instead of 4s. 6d. for females. They worked well from 7·30 a.m. to 6·0 p.m., daily, deducting an hour for dinner and rest. The year 1864, in Devon, was a good cider year, and I sold mine at the press for 10s. per hogshead, readily. This cider, although much consumed in hot weather, quite agrees with the natives. It is strong and hard, having undergone vinous fermentation, but its acidity causes occasional flatulency and colic to strangers. The sweet cider is exported—the usual fermentation having been checked, but it is less nutritious and potent than the fermented cider. It appears, from the "Chronicles of the Canongate," vol. iii., p. 3, that cider was known in Scotland in the 14th or 15th century. Orchards are not mentioned in Doomsday Survey, nor in later records; but orchards and cider fruit are mentioned in Hooker's MS. "Survey of Devon" in the 16th century, and in the 17th century in "Risdon's Survey" of Devon. Sometimes the cider is boiled, whereby two hogsheads are reduced to one, which plan increases the strength and improves the taste of the cider. See further, in "Mac Culloch on Wines." The Americans are now making a light wine, called "Vin de pomme," from apples.—I am, &c., CHR. COOKE, Member of the Society of Arts.

London, May, 23, 1868.

THE AGRICULTURAL LABOURER.—SIR,—Giving way to a stranger, who simultaneously rose, and then from the length of the discussion I did not make the few observations I intended, and consequently will trespass on your columns, and that as shortly as possible. Having taken some pains to obtain and reduce to a tabular form the wages and perquisites of at least nine counties, I find their average so approximates those of Mr. Bailey Denton as to preclude the necessity of an especial place; but as the letter of one of my correspondents in Norfolk* is eminently interesting, I extract a portion of it. He says: —"I am sure any person who has known this county for the last 20 years must willingly testify to the fact that a great improvement in the moral and social condition of the labourer has taken place within that period, and is still going on; the causes which have led to this desirable result are improved cottages—the allotment system—the abolition of mixed gangs, and the practice, now becoming general, of keeping the children at school, boys until 12, girls to 13 or 14 years of age. The greater part of the land in the county of Norfolk is in the hands of large landowners, who, almost without exception, have in the matter of cottage improvement nobly done their duty. I know of several estates where considerable sums have been annually devoted to the building of new and the remodelling of old cottages; all the new cottages have two good rooms and pantry on ground floor, three bed rooms on the chamber floor, with detached shed and convenience to each; in many cases two of the old cottages have been made into one. The alteration in the law of settlement and rating from parish to union rating will lead to cottages being erected where they are most wanted, viz., contiguous to the farm on which the labourer is employed. The allotment or spade farm is, under proper supervision, a substantial benefit to the working man. In this and adjoining parishes nearly every respectable married labourer has half an acre of good land for a yearly payment of 12s. (12s. including rent, rates, and all other charges). The rents are punctually paid, arrears being unknown; and when one of them becomes vacant the applications for it are numerous. The large companies of young children of either sex working together under the odious name of gangs, were pretty generally broken up and abolished long before legislation on the subject was thought of, owing to the grievous immorality consequent on the system. Gangs are now only to be found in the fens, and on a few damp farms in West Norfolk; the work for which gangs used to be employed, such as picking couch, weeding corn, cleaning root crops, &c., is now done as efficiently (although it may be more expensively) by women and girls, who prefer outdoor work and liberty to the comforts and restraints of domestic service. A good deal of summer weeding is now done by men—a few boys, as young as ten, are employed for a few weeks at bird-keeping, spending the rest of the year at school—but as a rule no children of a less age than 12 to 14 are put to any sort of hard work, at least, I have never met with instances to the contrary, except on paper. Cottage rents are 1s. to 1s. 6d. per week, usually with good garden. The harvesting is generally done in this way:—A company of men are hired to cut (with scythe or machine), carry, stack, and thatch all the corn; on land producing bulky crops, one man for every 12 acres; on light land one to every 15 acres, is the calculation; rate of wages of

* The steward of Lord Sondes, Elmham-hall.

late years £6 to £7 for the harvest, with assistance of women, old men, and lads to bind the wheat, gather barley, etc., given in; the harvest in nine years out of tne, begun and finished in 18 working days; cost per acre, 12s. to 18s. The plan has this great advantage, that the interest of the employer and servant are identical—the farmer seeing that his crops are not too hastily carted." I quite agree with Mr. Bailey Denton that the improved execution of work will be the cause of advanced wages, and from experience am of opinion that the condition of the agricultural labourer is chiefly to be improved as follows:—1st, By practical education, producing prudent forethought and economy on his part; 2nd, By piece work where possible instead of day work, the utmost employment being given by the farmer, who should be a man of skill, enterprise, and capital; 3rd, The tenant should require long leases, with very few restrictions, a sufficient number of substantial cottages for his labourers, with gardens attached to or near the same, large enough to grow sufficient vegetables required for his family. With respect to improvements made by the tenant, the long lease or compensation for all unexhausted improvements should be made. Drainage of strong, wet lands has worked wonders. I have been over a field of beans in September, one part drained the other not; the drained division was just as high again as the undrained; the crop was in the same proportion. I am of opinion that though 8 or 10 millions have already been expended in draining, probably ten times that amount might be spent profitably to the capitalist, landed proprietor, tenant, labourer, and general public, to say nothing of its immense sanitary importance. In conclusion, I will add that amongst the many subjects of interest brought under notice this session, few are of greater value than the one under review; it reminds me of an emphatic observation made to me 35 years since by the venerable and patriotic Earl of Radnor, which ran thus, "I consider the legislature is acting in its most legitimate capacity when legislating for those who cannot do so for themselves."—I am, &c., WM. BOTLY.

MUSHROOMS.—SIR,—A Norwegian landscape painter, a friend of mine, staying with some other friends of mine at Sorrento, on the Bay of Naples, many years ago, in his artistic wanderings in the neighbouring woods, found a very fine specimen of a fungus, which he recognised as similar to those which are eaten in his native country. It was an elaborate specimen, like a cauliflower, and he took it home to be cooked. There were some demurs on this point from the others of the party, but he assured them of its wholesomeness, only he must superintend the preparation. Under his supervision it was boiled in three waters, the two first being thrown away, and the cooking completed by the third, and it was served with that universal British sauce—melted butter. All the party partook of it, and without any ill effects, and it was pronounced excellent. Some German friends of the artist, however, having heard of this culinary success, obtained from the wood some similar specimens, but in consequence of omitting the preliminary two boilings they were very ill. This illustrates the results produced by different treatments of the same vegetable, and the care that may be required in fitting some of these esculents for the digestive organs. I have no scientific knowledge of mushrooms, but have been a great gatherer of them in different parts of Britain, and well know that there are several sorts, even of those universally recognised as mushrooms. The best are those found on downs and open hilly country. There is a brown sort, which is perfectly wholesome, but not so fully flavoured as the others. The horse-mushroom requires more cooking than the other sorts, as its texture is more firm and leathery. In the country there are often fanciful tests as to whether such as have been gathered are true mushrooms; such as whether the top skin will peel off readily; and also whether they are pink beneath. These seem to me fallacious; the best test appears to me to bite off and taste a small piece, which, even if of unwholesome sorts, will do no harm, when the flavour at once tells whether the mushrooms in question be of the right kind. I have often eaten the fairy-rings with the light-brown laminæ beneath, and they are very delicate, though not so full-flavoured as the usual mushrooms; but in most parts of the country I have found a great prejudice against them. When staying in Somersetshire some years ago, I brought home a small basketful, and had great difficulty in inducing the landlady of the little inn where we were staying to let them be cooked for supper; and from her expression of countenance the next morning I believe she felt some disappointment in seeing us perfectly well, after eating what she called "pixie-stools," a provincial variation of the name fairy rings. But rustic people are wonderfully prejudiced sometimes, and are characteristically not at all obliged to you for dissipating their unfounded notions. I recollect a country boy bringing me with great care in a basket a lizard, and he was horrified when I took it out with my hand, exclaiming it was poisonous. Thus also does the poor blind or brittle worm constantly meet with an unmerited fate from being kindred in shape to the viper, although a more harmless creature does not exist. I think we are very much obliged to the Rev. Mr. Berkeley for the useful and interesting information he recently gave to the food committee, on the subject of esculent fungi; and the circulation of this in the *Journal* will be of service, as I believe many people are prepared to look on fungi with a more favourable eye, if they had clear and precise information with regard to them. Unfortunately, I believe that one of the most unwholesome kinds is very much like the common esculent mushroom; indeed, to a cursory view exactly like them as you see them growing, only that on gathering them you find they are white beneath. But, then, there is an easy test of these. If you bite a piece off it is pungent in the mouth, which pungency is I believe in a general way a good test of unwholesomeness. By pungency, I do not mean a pungency like cress, but a pungency like pepper, only more burning, lasting on the tongue for some time. In the New Forest, in Hampshire, two or three years ago, I heard of a gentleman who was a rigid vegetarian, and whose "meat" was solely the fungi of the forest, of which I was told he used almost every sort, varying their preparation. I did not see this thinker for himself, but I have met by the woods, near Cliefden, on the Thames, a well-known medical gentleman of London with a whole basketful of various fungi he had just gathered, on which he promised himself an epicurean repast.—I am, &c., JOHN BELL.

MEETINGS FOR THE ENSUING WEEK.

MON......Entomological, 7.
Victoria Inst., 8.
R. United Service Inst., 8½. Mr. J. R. Hamilton, "The American Navy: its Organisation, Ships, Armament, and recent Experiences."

TUES ...Anthropological, 8.
Syro-Egyptian, 7½. Rev. G. Williams, "Explorations in Palestine."

WED ...Society of Arts, 8½. Conversazione at South Kensington Museum.
Geological, 8. 1. Mr. James Thompson, "On some Carboniferous Corals" (communicated by Dr. P. Martin Duncan. 2. Mr. S. V. Wood, jun., "On the Pebble-beds of Middlesex, Essex, and Herts." 3. Mr. W. Topley, "On the Cretaceous Rocks of the Bas Boulonnais." 4. Mr. C. H. Weston, "Note on the Mendip Anticlinal."
Obstetrical, 8.

THUR ...Royal, 8½.
Linnæan, 8. 1. Prof. Rolleston, "On the Homologies of the Muscles connected with the Shoulder-joint." 2. Prof. Williamson, "Contributions to the History of *Zamites Gigas*."
Chemical, 8. 1. Messrs. E. T. Chapman and Smith, "On Isomerism in the Organic Cyanides," and "On the Artificial Formation of Pyridene." 2. Dr. B. H. Paul, "On Testing Mineral Oils used for Lamps."
R. Society Club, 6.
Society of Fine Arts, 8. Mr. F. Y. Hurlstone, "A Criticism upon Art Criticism in England."

FRI.......Geologists' Assoc., 8.
Philological, 8.
Royal Institution, 8.
Archæological Inst., 4.
R. United Service Inst., 3. Col. A. H. Lane Fox, "Primitive Warfare: Section 2—On the Resemblance of the Weapons of Early Races; their Variations, Continuity, and Development of Form."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 16th May, 1868.*

115. Bill—City of London Gas (as amended in Committee, and by the Select Committee).
117. ,, Established Church (Ireland).
266. Contagious Diseases Act (1866)—Memorial.
Public Petitions—Twentieth Report.

Delivered on 18th May, 1868.

89. Bill—Married Women's Property.
241. Voters (Oxford and Cambridge, &c., Universities—Return.
258. Taxes (Courts of Appeal)—Return.
272. Electric Telegraphs Bill—Further Correspondence.
North German Confederation and Spain—Despatch.

Patents.

From Commissioners of Patents' Journal, May 22.

GRANTS OF PROVISIONAL PROTECTION.

Advertising vehicles—339—H. A. Bonneville.
Alarums—1192—J. Fitter.
Aniline, new colouring matter from—1424—C. D. Abel.
Apparatus for separating mixed, &c., substances—1427—A. B. Childs.
Armour or armour-plating material—1373—D. Geraci.
Axle-boxes—1463—C. D Abel.
Baths, &c.—1502—R. Harlow.
Bearings, shafts, or pivots—1498—R. A. Green.
Bells—1454—T. and G. A. Pemberton.
Bird-cages—1394—S. Robotham.
Boilers, &c.—1421—T. Beeley.
Bolters used for dressing flour, &c.—1508—J. Bruce and R. Evans.
Bolts, screw—1450—A. Vickers.
Boots and shoes—1259—W. E. Gedge.
Boots and shoes, button-hook for—1312—T. D. Scowen.
Bottles, retaining stoppers in—1448—H. Glover.
Boxes, wooden—1425—E. Leheup.
Buildings—1319—H. D. Chard.
Candlesticks, &c.—1276—T. A. Warrington.
Castors—1518—J. C. Bowler.
Canisters, &c., soldering—1418—B. F. Weatherdon.
Carpets, printing—1476—J. Wilkinson, jun.
Carriages—1455—E. and G. H. Morgan.
Chimney-tops—1452—C. P. Aston
Clothes, attaching to the person—1477—A. Scott.
Coal, &c., getting—1482—C. J. Chubb.
Combs—1488—W. E. Newton.
Copper tubes, &c.—1429—W. E. Everitt.
Copper tubes, &c., casting—1520—W. E. Everitt.
Creosote, &c., apparatus to be used in connection with furnaces for burning—1441—A. Smith.
Dynamometers—1447—W. R. Lake.
Engines, motive-power—1464—F. W. Gerhard.
Engines, steam—1465—J. Dawber.
Engraving, heliographic, plates for—1499—A. C. Henderson.
Fabrics, textile—1431—J. H. Johnson.
Fabrics, woven—1411—J. Dendy and J. R. Beard.
Fabrics, woven, finishing—1378—R. Holt, R. Burlison, & H. Sampson.
Files, renovating—1500—A. C. Henderson.
Fire-arms, breech-loading—1261—J. Erskine.
Furnaces—1432—J. Heaton.
Furnaces, glass, &c. 1480—T. Warren.
Furnaces, increasing draught in—1494—J. H. Johnson.
Gas, &c.—1098—H. H. Doty and G. Graveley.
Gold, &c., compositions for cleaning—1484—H. J. Davies.
Grain, &c., separating impurities from—1491—J. G. Walker and C. Stein.
Ice preservers, &c—1469—G. Kent.
Iron and steel—1397—W. Wright.
Iron and steel—1516—J. A. Jones.
Kilns for burning lime, &c.—1439—H. Y. D. Scott.
Lace, &c., clipping—1456—W. Marshall.
Ladders—1471—W. Beale.
Lamps and lanterns—1493—W. Harvie.
Lead, white—1341—I. Baggs.
Liquids, measuring, &c.—1423—J. Lillie.
Lockets—1453—J. Wertheim and L. Hirschhorn.
Looms—157—J. Batchelor and J. Smith.
Looms—1438—L. Binns.
Looms—1474—J. Lamb and S. Tovey.
Looms—1495—M. A. Muir and J. McIlwham.
Machinery, portable, for screw-cutting, &c.—1252—H. G. Fairburn.
Mallets used in croquet, &c.—1437—E. G. Camp.
Matches and fusees—1483—J. and J. B. Palmer.
Mattresses and seats, spring—1496—H. A. Bonneville.
Metal sheets, corrugating—1290—J. Woolfield.
Metallic articles, preserving from oxidation and decay—1467—J. Hickmott.
Millstones, dressing—1492—J. G. Walker.
Needles, machinery for polishing—1514—A. James.
Omnibuses, &c., prevention of fraud in the collection of fares in—1486—S. Drummond, J. Clare, and R. Hughes.
Pails, unspillable—1433—F. Barnett.
Paper-cutting machines—1409—J. Gough.
Petroleum, &c., warehousing—1451—I. Mathei.
Pickaxes, &c., machinery for forming—1475—W. E. Newton.
Pictures, photographic, exhibiting minute—1443—J. H. Johnson.
Pipes and tubes, fastening for—1428—J. Warne.
Potatoes, preparing for preservation—1473—F. J. King.
Rafts, &c.—1234—B. and A. B. Blackburn.
Railway tickets, &c., carrying—1417—J. W. Goundry.
Railways—995—E. Gray.
Railways—1342—J. Armstrong.
Railways, preventing accidents on—1490—S. Holt and J. Kearsley.
Rock-boring machines—1512—W. Husband and F. B. Dœring.
Safes—1415—S. Chatwood.
Sails, reefing—1387—A. Baal and C. Gann.
Seed and manure drill—1436—T. Hawkes, F. W. and G. Spencer, and J. Stenner.
Seeds, &c., expressing oils from—1472—W. Walker and H. F. Smith.
Sewing machines—1504—J. H. Johnson.
Shipbuilding, &c.—1412—J. Betteley.
Ships, iron and steel—1460—W. Taylor.
Silver, coating with—1449—W. E. Gedge.
Soup, method of preventing the moustache from dipping into, when eating it from a spoon—1398—A. Geary.
Spindles—1322—D. Skeoch.
Steel, cast—1462—C. W. Siemens.
Steel, iron, &c.—1489—M. Henry.
Taps—1459—D. P. Wright.
Throstle frames—1506—W. E. Gedge.
Tobacco, twisting—1413—R. Ward.
Tools for planing, &c.—1419—M. A. F. Mennons.
Traps for receiving sewage matters, &c.—1468—J. Court.
Umbrellas and parasols—1442—J. E. Boyce and R. Harrington.
Umbrellas and parasols—1479—R. Lublinski.
Vegetable and bituminous products, preparing, &c.—1336—J. Rogers.
Vegetable medicinal compound for scalds, &c.—1340—M. Z. D'Aschau.
Wood-cutting machines, &c.—1461—W. Sketchley.
Wool, &c., drying 1445—J. L. Budden.
Wool, &c., screw-gill boxes for preparing—1466—J. Clough.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Churns—1619—M. A. Hamilton.
Engines, steam—1559—J. W. Chamberlain.

PATENTS SEALED.

3325. M. A. Hamilton.	3521. G. H. Nick.
3326. T. Barton.	3689. W. E. Newton.
3327. F. Brown.	3690. W. E. Newton.
3328. G. Turner.	296. W. R. Lake.
3333. T. Chalmers.	307. W. Snell.
3337. W. Sim.	308. W. Snell.
3339. J. P. Smith.	337. J. H. Johnson.
3340. J. P. Smith.	389. S. G. Taylor.
3425. G. Breen.	599. W. R. Lake.
3443. N. Grew.	677. C. E. Brooman.
3482. P. R. Hodge.	753. J. J. F. Stevens.
3495. E. Keirby.	1110. W. R. Lake.

From Commissioners of Patents' Journal, May 26.

PATENTS SEALED.

3356. W. Fowler and J. Griffiths.	3399. W. E. Gedge.
3360. H. F. Gardner.	3409. R. Clay, jun.
3370. E. T. Hughes.	3415. E. Price.
3371. T. & B. Carter & J. Lisle.	3439. W. Brown and C. N. May.
3372. W. Cotton.	3440. J. Gjers.
3374. E. T. Hughes.	3491. C. M. Barker.
3382. J. Scholefield.	3498. W. Clark.
3387. J. Fraser and G. Duncan.	3507. W. Palliser.
3388. T. Rose and R. E. Gibson.	3616. J. Kerr.
3391. H. S. Cowan.	3719. J. H. Johnson.
3394. A. Turner & W. E. Newton.	1037. W. Manwaring.
3397. J. J. Parkes.	1075. B. Mitford.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1393. J. A. Coffey.	1501. F. and J. G. Richmond and H. Chandler.
1398. J. Armstrong.	1734. W. E. Newton.
1452. C. Frazer.	1423. G. Ashcroft.
1941. A. V. Newton.	1456. R. A. Brooman.
1425. J. Ramsbottom.	1480. J. Hibell.
1440. H. E. Newton.	1656. W. Clark.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1286. G. E. Donlsthorpe.	1339. G. Asher.
1302. G. E. Donisthorpe.	1306. C. Nuttall.
1379. R. C. Ransome.	

Journal of the Society of Arts.

FRIDAY, JUNE 5, 1868.

Announcements by the Council.

Annual Conference.

The Seventeenth Annual Conference between the Council of the Society and the Representatives of the Institutions in Union and Local Boards will be held on Friday, the 19th June, at Twelve o'clock, noon. William Hawes, Esq., F.G.S., Chairman of the Council, will preside.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the results of the Examinations; and the Programme of Examinations for 1869 will also be considered by the Conference.

The following suggestions of subjects for discussion have been received from various quarters, it being understood that in putting them forward the Council express no opinion whatever upon them:—

1. How can the Institutions best aid in the advancement of technical education?
2. Would it be desirable for the Society of Arts to promote the issue of a series of text-books in relation to technical education, especially suitable for working men?
3. How far can the Society and the Institutions cooperate with the Department of Science and Art, in carrying out the objects of Mr. Whitworth's munificent endowment?
4. What further efforts can be made by the Society of Arts to obtain the co-operation of other societies, and of the great public companies, in its educational movement?
5. How far is it possible to unite in one system, or to establish any connexion between the various systems of examination which are now available for the working-classes in different parts of the United Kingdom?
6. How can the Society aid in promoting visits of working men to various foreign centres of industry?
7. How far would it be desirable for working men to take their holidays all at once rather than piecemeal?
8. What arrangements would enable the working-classes to make more extended use of the public museums and galleries which may be available for their instruction and amusement?
9. Under what arrangements could collections of useful and interesting objects of art and nature be sent to country institutions, in circulation from the metropolitan national museums?

Secretaries of Institutions and Local Boards are requested to send, *immediately*, the names of the Representatives appointed to attend the Conference, and early notice should be given of any other subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Secretaries of Institutions are requested to forward *at once* by book post, copies of the last Annual Reports of their Institutions.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Conversazione.

A Conversazione took place at the South Kensington Museum, on Wednesday evening, the 3rd instant, when 4,800 Members of the Society and their friends were present. The company was received on entering by Mr. William Hawes, Chairman of the Council, supported by several of the Vice-Presidents and Members of the Council. The bands of the Royal Artillery and of the Grenadier Guards were in attendance, and performed selections of music during the evening. The former was placed in the North Court, and the latter in the open Quadrangle, which was lighted for the occasion by coloured lamps.

Food Committee.

The Committee met on Wednesday, May 13. Present—B. Shaw, Esq. (in the chair); Mr. Harry Chester, Captain Grant, and Mr. J. Ware.

At the conclusion of Mr. Lloyd's evidence, published in the last *Journal*,

Mr. George Brooke attended to give information as to the breeding and feeding of poultry.

Mr. Brooke.—Messrs. Broome and Company are large poultry, butter, meat, and provision salesmen, at Nos. 10 and 11, Newgate-street, Newgate market. I am the manager of the poultry business. I have been all my lifetime in the poultry trade; my father was a dealer in poultry in Norfolk, and I have been a salesman from the age of 18. I have been in Leadenhall market 30 years, and in Newgate market 8 years, and the whole class of trade has come under my notice. I have also given evidence on the game laws in 1846, and have been consulted by the Government in reference to the markets; when I was a member of the Corporation of the City of London, I took a prominent part in the removal of Smithfield to the Metropolitan market, as well as in the establishment of markets for supplying food for the people. I have been particularly anxious in reference to my own trade (that of a poultry salesman), to endeavour to increase the quantity and improve the quality of poultry in the country, and after many years I was sent by Messrs. Broome to France, to examine for myself the markets of Paris, as well as to go through different parts of the country which supplied poultry to the Paris markets, which markets in the country are so well regulated by the local authorities as to be worthy of consideration by those who take an interest in the growth and value of our home-grown farm produce. The time of sale is regulated—tolls are paid—no sales take place outside the markets, and all is order and open trading—besides which all the goods are sold—none are taken home. (The Paris (wholesale) markets cast into the shade any we have in London; the system of order is complete, but the exaction of *octroi* is odious.) This takes place at Houdan, Dreux, La Flêche, Le Mans, Nugent Le Roy,

and a great many other parts, where poultry is fed largely. These markets are held weekly, and very large quantities, to the extent of from 3,000 to 6,000 fowls and turkeys, are brought, besides other articles of farm produce. I was induced, in consequence of seeing this, to try if I could introduce something of this small farmer system into England and Ireland, because I find that in Ireland large quantities of poultry—which I may call the raw material—are produced cheaply, but they do not fetch to the breeders anything at all equal to what they might if properly fattened. In some parts of Ireland the fowls are very inferior, and yet if it were not for the quantity of poultry which comes regularly from Ireland, fowls would be worth in London at present season half a guinea each. I need not say the mode of producing poultry is one well worthy of attention, because we find that fowls weighing 4lbs. might be produced just as easily and as cheaply as fowls weighing only 2lbs. each, if attention were paid to having good breeds, such as the Dorking, Cochin, and the best French breeds, with the Malay, crossed with the Essex or Lincolnshire fowls. I find that the fowls which have been sent into Lincolnshire and Yorkshire, (from whence we get large supplies), have completely changed the breeds—thirty years ago they were quite small, and now they are large and fine. This was all brought about by Mr. Charles Clarke, of Boston, who bought the best stock and gave away the eggs to the farmers and cottagers.

The Chairman—The size depends upon better breeding and better feeding?

Mr. Brooke—Exactly. In Essex, likewise, the quantity of poultry is kept up, whilst in Norfolk, some parts of Cambridgeshire, Suffolk, and other counties, poultry had gone completely out of cultivation, in consequence of the absorption of commons and waste lands, as well as that small cottagers are not allowed to produce poultry; while the English farmers' wives and daughters have forgotten the habits of their ancestors, in sad contrast to the French farmers' wives, whose greatest pride is their dairy and their poultry. The suggestion I would make would be simply this—that where there are cottagers and small farmers the gentlemen in the immediate neighbourhood should find a supply of good stock, and then distribute the eggs for breeding purposes, the cost of which could not be more than 5s. or 10s., and by that means the recipients would do as they have done in Sussex, where a very large quantity of chickens are raised all the year round, in the district of Heathfield, in a radius of about 20 miles; during the next three months we shall have sent to London from that part of the country £1,000 worth a week, which will show what can be done by industry and method. The supply for London is of very great importance, because we must not only consider that there are 3,000,000 of people to supply food to here, but we also supply a radius of 50 or 60 miles round London when our supplies are above the demand for home consumption, in consequence of the railways being so accessible. That is not the case in France; the poultry, nearly all, go to Paris, and there is hardly any demand in other towns. In this country the supplies are required constantly. At Brighton, and all round the south coast, especially at Oxford and Cambridge, as well as at other large towns, it is not likely the price will decrease, as a more general use would, I am persuaded, lead to an unlimited consumption. The advantages of increasing the food supplies of a people so numerous as ourselves must be apparent; if it would be considered a boon, that where one blade of grass grew anyone should produce two, how much more so at the present time, when meats of all kinds are found to be deficient in quantity, to enable every one to have a mouthful, that some one should step forward, and by the simple introduction of a cheap process (which is hourly in operation in France) should induce the great landed aristocracy and gentlemen of England and Ireland, as well as the large farmers, to determine that on their own estates a better system of breeding and fattening poultry should commence now. The Emperor of France is, at this time, through the length and breadth of that wonderful country, stimulating, by large rewards, the breeders and feeders of poultry to greater exertions. This ought to be to us a lesson, that unless some general effort is made, poultry as an article of food will disapppear, and, like game, only become a luxury for the very rich. Game is increasing in value yearly. The price of hares last year (wholesale average) was not less than 3s., partridges 1s. 6d., woodcocks 3s., snipes 1s., every pheasant made 3s. 6d.; the price of pheasants is very much affected by the great demand there is in France, where a great many are sold for the plumage; they make the bodies into pies; thus they make more of them than we can. A large number are sent by our firm weekly for this purpose to Paris.

Mr. Chester—Could they not make pheasants into pies here, and send the plumage to France?

Mr. Brooke—I have not heard of its being done. Some feather merchants do buy them, but they do not seem to me to be able to make use of the bodies. In France I do not think they are cooked any other way. With regard to wild ducks, teal, widgeon, plover, ruffs and rees, snipe, and other kinds of wild fowl, there is an increasing demand (and they have almost become extinct in our country), except in severe weather; there is a demand also for their feathers, for ladies' bonnets, and other uses, so that the more birds of this description there are taken away, the more demand there is for poultry. Poultry might be increased rapidly, for surely the quantity can never be too large, there are times now when we find it difficult to supply our customers, and of course, whilst that is the case prices cannot come down. To find out the best means of improving the quality of the supplies, especially from Ireland, was chiefly the object of my visit to France; and I believe that this generous method of making known to the public, more especially to the farmers and the small cotters, as well as to the breeders and feeders of poultry, will influence them gratefully to remember who has been their benefactor; and that the public will not allow us, as men of business, to be overlooked. At the first glance Messrs. Broome thought it prudent to conceal this new system from the public, and take advantage of it for themselves; but, remembering that they were, and had ever been, purely commission salesmen only, and that they daily received very large consignments of meat, poultry, game, butter, and other kinds of provisions, they resolved to throw broadcast upon the waters the entire knowledge of the system, and they are resolved that I, as their manager, should visit the markets, and explain practically what, they make no doubt, will prove the era of a new system, which is making such rapid strides in France, and which, they believe, will equally benefit their own country, especially the poor cottagers and peasant farmers of England and Ireland. I have recently paid a visit to South Wales, and I find that in some parts the cottagers and small farmers are increasingly producing poultry, and this ought to be extended through the length and breadth of Ireland. I have suggested to Messrs. Broome that I should go to the different markets of England and Ireland, and call together the farmers' wives and cottagers, and market people, on market days, and tell them exactly what they might do, and show them how to do it.

The Chairman—Do you happen to know the French mode of feeding? I think that is very important.

Mr. Brooke—Yes; I have written that down, in order to make it thoroughly known. By the plan I propose I think we could introduce a new mode of breeding and feeding poultry. Thus, chickens two or three months old will fatten in seven, fourteen, or twenty-one days, at a cost of fourpence or sixpence per week. I do not think there is a possibility of raising any kind of vegetable so quickly as that, so as to produce a fat article out of a lean one in about seven or fourteen days.

The French seem to me to have acted very wisely in one respect—they never, as a rule, send a very small, young, or lean article to market. Now, in our markets, we have large quantities of lean goods, not only poultry but meat, which I consider to be criminal to the community at large. The French actually fat the old hens as well as old Turkeys; they are sold in France for the purpose of being made into soup, *bouilli*, and other kinds of food, which, according to the French system of cooking, are very nice. Generally farmers, directly they have done with an old hen, sell her for a trifle. The Essex people are wiser; they have managed in the same way as the French; they get the eggs out of the fowl and then they fatten them, and sell them for 2s. 6d. or 3s. each. They shut them up and feed them twelve or fourteen days. The way in which the people round about Heathfield, Cuckfield, Uckfield, and other parts of Sussex have improved within the last ten years, is marvellous; and they now make from 3s. 6d. to 5s. 6d. for chickens not more than three months old. The chief point is the labour; the only expense there can be is rearing, until they get about two months old, which should be by the side of a hedge, or where there is grass, which cannot cost more than 1s. to 1s. 6d.; strong, healthy, well-fed chickens are very soon fattened. I think that is a power of manufacture which is worthy the consideration of the country, as the profit must be at least from fifty to seventy-five per cent. The means of feeding are simply these:—Barley or oatmeal, ground fine, grease, fat, or suet mixed with it; new milk, or, if not procurable, meat broth, mixed with it to the consistency of thick soup, and administered twice or thrice daily for seven, fourteen, or twenty-one days. Fowls from four to six and nine months old should be fed on this food with the funnel, and kept in the dark on clean straw. All kinds of animals kept in the dark, and quiet, always fatten quicker than when they have too much room or light; that is a very important part of the French system, to keep them in the dark. But what I would wish to point out is this—the French fowls which are fed with a funnel are a particular breed—the Crevassieur, La Flèche, Le Mans, and Houdan; a small chicken would not bear the funnel to go down its throat. This class of fowl are now selling wholesale, in Paris, at from 6s. 6d. to 15s. each.

The Chairman—I have been much struck with seeing the plan of cramming geese at Strasbourg; the geese seem to like the first few mouthfuls very much, but they afterwards get much disgusted. It was a most extraordinary sight.

Mr. Brooke—The French fowls seem to get quite fond of it, and are quiet; they struggle very much at first, but they soon get used to it. I think it would be rather difficult to introduce this system of feeding by funnel at first amongst the farmers, as it is a process which requires some dexterity and patience; but it is very simple. To make a coop for 24 fowls, with a small trough, to be kept clean, to peck the chickens (as they do in Sussex) for 7 or 14 days, is what any one could undertake. The chickens must only have food enough to fill themselves full; then they must be kept in the dark, and quiet. The food must be made into a consistency similar to soup; boiled eggs are sometimes given to them during the last two or three days; and as fowls well fatted fetch such a price, it is worth while to bring them to the highest perfection. I have never seen such fowls in England as I saw in the Paris market and the Palais Royal, each weighing 10 or 14 lbs., which fowls were eight and ten months old. They must be large to be fed with the funnel; while chickens from ten weeks to four months old must have this special food in coops (holding 12 or 24 each), provided with troughs, which must be daily cleared. There is a difference, of course, between a chicken fattened in this way and fowls fattened for an especial purpose, as is done with a funnel. I would make one remark here with reference to hatching by steam. We repudiate it altogether. I know there is not anything of the kind of any value to anybody. I never saw a single fowl which was ever produced by steam hatching which could be fattened. It is a positive impossibility, and those who advocate it are quite in error; to contravene nature is beyond the power of man.

The Chairman—You may hatch them, but you cannot rear them?

Mr. Brooke—That is just it. You may get them a good size, but in some the legs would be about six inches long, and they would be very thin bodies; some with one eye, and some with crooked backs. There would always be an imperfection in some way with regard to them; neither can they breed. Thirty years ago, when Mr. Cottle was trying this, I told him I would give him one guinea each for every fatted fowl he could produce by steam. Fowls require to be very healthy before you can fatten them at all, and for that reason I think none of these poultry companies will ever be successful, because the fowls do not do well huddled together. Our own supply of poultry can be only increased by giving plots of land to farm labourers, stimulating the cottagers and small farmers to breed and fatten poultry, for, wherever it is mixed and crowded together, disease is sure to follow, and it is impossible to produce them to advantage. We did think at one time it would be well to have a depôt at Holyhead or Milford Haven, where the poultry might be brought over from Ireland and fattened; but even with that short passage of 10 or 12 hours there is a danger of the poultry getting into a kind of fever, which would prevent them fattening properly. We therefore consider it is much better to import the poultry dead than alive. If we could only get the gentry in Ireland to adopt the simple plan of getting a stock of the very best poultry, and giving away a clutch or two of eggs to the small cottagers around them, and taking care to remove all inferior breeds (and this could be done at a very small expense), in twelve months the whole country might be covered with a fine breed of poultry, to the advantage of all concerned.

The Chairman—Can you suggest any mode by which these country gentlemen can be stimulated to assist the farmers and cottagers in this way, and to insure to the producers a good market for the poultry when they are reared? I understand that in Wales poultry do not fetch more than 3s. a couple, whilst here I give about 7s. and 8s. a piece for fine fowls.

Mr. Jenkins—The price has been very much raised of late in South Wales.

Mr. Brooke—I may say that I have just returned from South Wales, where I have established this system. We have one man there who is carrying it out to some extent, and his poultry costs 2s. and 2s. 6d. each. Then at Llandilo there is a man to whom I have introduced this system, and he is carrying it out to a certain extent; but the people are so stubborn you cannot get them to have faith in trying a new system. I have no hesitation in saying that it is quite possible for me to go down to any part of England, and show the system myself, as I did in Wales, and make such an impression as will induce people to try it; but, if you introduce it to one or two, they always want to keep it to themselves. We rather believe, however, that we should be invited down; if we are willing to do people a service, the least thing they can do is to pay travelling expenses, and if that were done I should be very glad to spread this knowledge as widely as possible.

The Chairman—Can you suggest nothing to the Royal Agricultural Society, in order to spread this knowledge which you have acquired?

Mr. Brooke—The only way in which it could be done would be by giving me an opportunity of speaking, or giving a kind of lecture, and then let them put questions, and then let it be printed and made public by the press throughout the country. I should have very great pleasure in doing it, because then it would be published in an authorised manner. For instance, I think

of going down to Boston in Lincolnshire, but unless something of this sort is done, one has to introduce oneself, which is not the most pleasant thing in the world. If something were done beforehand it would attract public attention, and show them exactly what to do.

The Chairman—I understand, from what you say, that notwithstanding the climate and soil of England, you are of the opinion that the production of poultry might be very much increased under better management.

Mr. Brooke—Certainly: I am quite certain that the supply of poultry might be increased at least ten, and eggs fifty fold, and when you seriously consider the matter you will see how important this is. I do not know how many cattle there are in this country; but when you come to fowls, you can count them by millions, and then if you increase the weight of each fowl which is eaten by only half a-pound, you will see what an important effect you produce. But that is putting it at the very lowest point; by properly breeding and feeding fowls, the weight may be increased, not half-a-pound, but from 1 to 2 lbs., according to the breed and the system adopted.

The Chairman—Do you see any objection to poultry being sold by weight?

Mr. Brooke — None at all, especially geese and turkeys. About four years ago there was a great glut of poultry at Christmas time, in consequence of large quantities being sent to London. All the dealers were supplied, but on about the 26th or 27th of December, I think it was, not only our shops, but the cellars and warehouses were crammed full, most of which was sold by weight and by auction.

The Chairman—Is there much difference between the price of poultry of the same quality in different parts of London—in the West-end and City, for instance?

Mr. Brooke—Very little, if any. It may be slightly cheaper in the City, because the men are a little closer to the markets. But I do not think there is much difference for the same quality. Sometimes you cannot get good poultry in the neighbourhood of the market. The best West-end tradesmen will take off a large supply early in the morning, because they must keep a stock; whereas, if there is any unusual demand, it is all absorbed in the City.

The Chairman—Does the importation of wild fowl from Canada, the United States, and Norway and Sweden extend?

Mr. Brooke—No; we do not have any. The only peculiar kind of game we have is the prairie bird, from America, and they are very few, and the ptarmigan, from Norway. The brent-goose we hardly ever see now in the market. I may mention that about thirty years ago waggon-loads used to come from the Essex coast. Many of the birds, which were formerly very plentiful indeed on our coast, have disappeared, and come now entirely from Holland. That arises from cultivation and drainage; and I understand now that they are even disappearing from the internal part of Holland; and they have to go almost to the confines of Germany. All this will show what a great field there is in this country for poultry. Pigeons, too, have nearly all disappeared from this country in consequence of the improved state of cultivation. They now come over from France; they are brought over here, and fattened by men in different parts of London. We have just sent an order over to Amiens for a large quantity for the races; there will be 50,000 next week from France for our two markets. The men feed them with their mouths, and will feed 1,000 an hour. With regard to geese, the goose has disappeared entirely from this country. They used to feed on the commons. It has been said, "What shall be done unto the man who from a goose steals a common?—Nothing. But what shall be done to him who from a common steals a goose?—Why to prison with him, to be sure." Now there are no commons nor geese.

The Chairman—Where do we get the geese from?

Mr. Brooke.—In winter time we have live geese coming in thousands to this country from Ireland, Holland, and Germany. They go down to Norwich and other places in the neighbourhood, where they are fattened. Mr. Bagshaw, at Norwich, fats 12,000 or 15,000, and after they are fat they come back to London again. We formerly got them from Norfolk, Suffolk, Cambridgeshire, Lincolnshire, Yorkshire, and Essex.

The Chairman—A gentleman who spent the winter at Pau, informed me he had seen there very large geese indeed; but that they boiled them down for their fat, and did not eat them.

Mr. Brooke—Formerly we never got geese from Normandy, now we have them by thousands. They come in boxes regularly; Messrs. Foucard, Mabire, and others supply these geese. We cannot expect an increased quantity of geese in this country, for where a goose goes it is impossible to get animals to feed; but with respect to poultry there is neither nuisance nor injury. With respect to poultry, therefore, I earnestly contend it is the duty of the people of this country, who have at heart the true interests of the industrial and working classes, not only to give them a good cottage to live in, and a small piece of ground to cultivate, but also to give them a brood or two of good fowls, which would answer the purpose of a bank. This would be a bank of the best kind, because the children can so much improve it. It is watchful labour which is particularly required to produce poultry, and we should then find, as is found on the Continent, that where people have this opportunity of employing their time, and their children, it makes them careful and saving. But it is of the utmost importance to have a good breed. I take this matter up, not only as a matter of business, but from benevolent motives. I am engaged now as a guardian of the poor, and I have been always connected with associations for the practical benefit of industrial populations, especially the agricultural labourer; and I have been much interested in Canon Girdlestone's project for improving the condition of the agricultural labourer, especially as I come from Norfolk myself. I feel that if the method of improving the breed of poultry were put before the people, it would enable them to help themselves; and that is really the most satisfactory way of helping them. I have been informed, in one district where the breeding of poultry has been much increased, the poor rates have sensibly diminished.

The Chairman—I think it is a matter of the greatest importance.

Mr. Brooke—I should not be afraid to go before any body of men and convince them that here is a kind of El Dorado, and I should be very happy to show them how to work it out practically. In conclusion I would say that if what I have stated could be printed and put before the public, it would be of the greatest possible advantage, as it is found to be in many parts of our own country, in Belgium, Holland, Normandy, and many other parts of France, and wherever there is conceded to the industrial agricultural poor some advantage, such as the keeping of poultry would be considered, these habits of economy and thought would ensure the surest pledge of order and virtue among any people.

1st at 6 a.m.; 2nd at 12 noon; 3rd at 6 p.m.

1. Barley or oatmeal ground fine.
2. New milk if obtainable. Skim do. (boiled) with some sugar.
3. Meat Broths—if milk is not procurable.
4. Pork lard, suet, or grease.
5. Boiled eggs for high feeding during the last 3 days.

Time of feeding in coops for chickens 7 or 14 days; time of feeding by funnel large fowls or turkeys 21 days: 3 times daily.

OPENING OF THE HAVRE EXHIBITION.

The inauguration of the International Maritime Exhibition took place on the 1st inst. with great *éclat*. Besides the representatives of the Imperial Government,

the authorities of the department and of the city of Havre, and the Commissioners of the exhibition, there was an immense attendance of visitors and exhibitors, and a large number of representatives of the French and English press. The company assembled in the great room of the club-house erected in the grounds of the exhibition, a building admirably adapted for its purpose, and thence proceeded in a body to the entrepôt, where a very large building was fitted with a great platform and orchestra, and gaily decorated for the occasion. The number of persons present was very large, probably six thousand or more, and on the platform was a brilliant show of uniforms and decorations. The proceedings were opened by M. Ozenne, director of the Department of Commerce, and delegated by the Minister of Agriculture and Commerce, who pronounced a glowing eulogium on the exertions and success achieved by M. Nicole, the promoter and director of this bold undertaking; the enthusiastic reception which M. Nicole received when he addressed the assembly, must have been a most gratifying popular acknowledgment of M. Ozenne's eulogium. The sous-prefect and the maire of Havre also addressed the meeting. Before and after the speeches, some excellent music was performed by a powerful and well-conducted band, a lady and two gentlemen vocalists, and an efficient orpheonic chorus. The great feature of the entertainment, however, was the recital of an ode, entitled "Discovery," to which a prize of 500 francs had been awarded to its author, M. Paul Delair, whose verses had been selected from among sixty fine poems sent in. The composition is a very remarkable one, but its value was greatly enhanced by the fact that it was recited with great taste and effect by an accomplished actor, M. Taillade, who is best known for the success which he lately achieved at the Odeon, in Paris, by his performances of *Macbeth* and *Edgar* in "King Lear." M. Taillade certainly achieved an immense success in the powerful recitation.

In the evening there was a dinner given in the great room of the club-house, already mentioned, the Prefect of the Department presiding. There were at least two hundred persons present at the dinner, which was served in a manner that spoke volumes for the management of the Havre authorities.

The exhibition itself occupies a large quadrangular piece of ground, the galleries forming the sides, and the garden occupying the centre; an arrangement that deserves well to be studied for future occasions; it certainly presents great advantages. In the garden, besides the club-house, there is a magnificent aquarium, by far the largest yet formed; it represents Fingal's Cave, and the tanks are large, admirably arranged, and well lighted; the number of specimens of the finny tribe is large, the flat fish and whiting being specially remarkable. The other portions of the exhibition are not yet completely arranged, but all may be finished in a few days. Connected with the maritime exhibition, is an exhibition of fine arts, but the unexpected extension of the programme has made it necessary to build an additional gallery for the modern pictures, which is not yet ready.

The general impression of the visitors seemed to be that the exhibition promised to surpass the expectations formed of it, especially in the practical sections; and the simplicity of the arrangement of the parts is a great advantage. The four faces of the building towards the garden are furnished with verandahs, beneath which are cafés and shops of various kinds, as at the Paris exhibition. Nothing could exceed the courtesy displayed by the Chief Commission and all the authorities towards their visitors.

AERONAUTICAL SOCIETY'S EXHIBITION.

The proposition to hold an exhibition in London, of objects of an aëronautical character, having met with encouragement, the Council of the Aëronautical Society have determined to act upon the proposition, with the hope that the guarantee and prize fund will be materially increased.

The objects hitherto announced by members for exhibition promise interesting features for the engineer and mechanic, and there will not be wanting experiments of a practical character, which can scarcely fail to interest the general public. The objects are classified as:—

1. Light engines and machinery.
2. Complete working aërial apparatus.
3. Models.
4. Ditto—working.
5. Plans and illustrative drawings.
6. Separate articles connected with aëronautics, including objects of interest illustrative and commemorative of previous experiments.
7. Kites and other similar apparatus proposed to be used in cases of shipwreck, traction, or in the attainment of other useful ends.
8. Painting and drawing of cloud scenery and landscape as seen from a baloon.

The exhibition will be opened on Thursday, the 25th of June, at the Crystal Palace. There will be no charge for space. Each exhibited article must be accompanied by a large card or placard in duplicate, having conspicuously printed its name and object.

Arrangements have been made, by order of the Treasury, for facilitating the passing of goods intended for the aëronautical exhibition, through the Custom-house, upon the production of a document specifying the mark, number, and contents of each package. It would be advisable that all packages should be shipped direct to London, where practicable. Goods will be received at the Crystal Palace until the 20th of June, unless the term be prolonged by special arrangement. It may be observed that there is no duty upon philosophical instruments or machinery of any kind.

The fund out of which Prizes will be apportioned has not attained that amount which will allow of complete specification; but the Council are gratified in being able to state that the Shipwrecked Mariners' Society have devoted £50 as a prize for "The best form of kite or other aërial arrangement, or modification thereof, for establishing a communication from a wreck on shore, or between two vessels at sea."

The Crystal Palace Company have also declared their intention of giving a prize of £50 to the exhibitor of a machine to carry and be worked by a steam engine or other motive power, which shall sustain and move itself in the air, at a height of not less than ten feet from the ground, for a period of not less than twenty minutes.

The Duke of Sutherland offers a prize of £100 to the inventor of a machine which, not being of the nature of a kite or balloon, shall ascend with a man to the height of 120 feet.

The Aëronautical Society offers a prize of £55, aided by the contributions of several members, to the exhibitor of the lightest engine in proportion to its power, from whatever source the power may be derived.

Smaller prizes, as far as the guarantee fund will allow, will be given to exhibitors of other machines, according to merit.

During the exhibition, daily experiments and partial ascents will be made in a captive balloon, upon the plan lately pursued in Paris by Mons. Giffard. This gentleman's experiments, confined to an altitude of 1,000 feet, were greatly appreciated by the higher classes, who crowded to take the opportunity to ascend to that height. Messrs. Domango and Delamarne's "Ballon Captif" has been engaged for this purpose, under the management of Mons. Delamarne, who will inflate it with gas especially manufactured under his superintendence; and it is proposed to make successive ascents to at least 1,000 feet. The car of this aërostat is three yards square, and will accommodate fourteen persons. Mr. Glaisher will largely avail himself of the opportunity here afforded

for meteorological experiments during the captive ascents both by day and night. During the latter, the power of the magnesium lamp will be tested, both as to the distance from which it can be seen at different elevations, and its own powers of illumination. Similar experiments, not confined to the magnesium light, will be conducted.

Balloons for free ascents it is hoped will also be held in readiness, under the guidance of experienced aëronauts, for the accommodation of visitors, who may engage to make an aërial excursion.

During the nine days that the exhibition remains open under the auspices of the Society, arrangements will be made for evening meetings of members and their friends, for explanation and discussion relative to the merits of the various objects exhibited. It is believed that those gentlemen who are to be appointed as adjudicators of the prizes will receive much assistance from these discussions. Throughout this period members of the Society will be admitted to the exhibition without payment. For further particulars application should be made to the Hon. Sec., Mr. Fred. W. Brearey, Maidenstone-hill, Blackheath.

ANNUAL BUDGET OF THE CITY OF PARIS.

The administration of a city containing, with its environs, nearly two millions of human beings, must always be a subject of great interest, and in the case of Paris, which may almost be said to be in the course of reconstruction, the interest is of an unusual character.

The ordinary expenses for the present year are set down as follows:—

Interest and charges of debt,	21,044,364	francs.
Administration of the Prefecture of the Seine	65,662,259	,,
Prefecture of Police	15,965,072	,,
Total (£4,106,868) ..	102,671,695	,,

This total is £253,840 in excess of that of the year 1867.

Amongst the memoranda relative to the ordinary expenditure we find the following:—The clearing the streets and roads of mud and rubbish, which created great difficulties last year, can only be effected now by a relatively large expenditure. The farmers who formerly undertook this work, often with profit to the municipality, have mostly thrown up their engagements, while those who are willing to renew demand increased remuneration. On the other hand, the general adoption of the system of watering the roads by means of jointed hose and fixed hydrants has diminished the cost of that important service. The extension of public squares or gardens, of the plantations of boulevards, and the consequent necessity of an increase in the nursery grounds and hothouses of the city, necessitates an increase of more than four thousand pounds under the head of "Promenades and Plantations." The extension of the sewers and water-service gives rise to an augmentation equal to nine thousand pounds. The pipes and conduits for water, laid down during the past year, amounted to nearly eighty miles in length, and the new sewers to little less than half that quantity.

The gross total of the Budget of extraordinary expenses is 61,412,623 francs, or £2,456,505; of this sum nearly £360,000 is required for paying off portions of the loans, commencing with that of 1852; and £92,012 to pay for the purchase of certain toll-bridges; of the rights and privileges of the General Water Company, of the Canal St. Martin, of the old abattoir of Batignolles, of the waterworks of St. Maur, and of the Cab Company.

After deducting these sums from the total resources in hand, there remains a sum equivalent to very nearly two millions sterling, which is proposed to be applied in the following manner:—

Extraordinary allowance to the board of public charity, for building purposes	£40,600
Architecture and works of fine art..	45,142
Roads and bridges	199,400
Completion of demolitions, reconstructions, and other great works in hand	1,000,000
Improvements in the public ways..	600,000
Balance for sundry expenses	103,866

The charity board receives also another million of francs from a new loan, in order to erect or complete the following, amongst other works, viz., a hospital for incurables at Ivry; a new hospital in the arrondissement of Menilmontant, in the outskirts of Paris. The rebuilding of the Hôtel Dieu is not included in this estimate, but is provided for by a special fund. It is expected that all the buildings will be covered in during the current year, and that the following year will see the new hospital completed.

It must be mentioned that the above does not represent the whole of the expenditure, but only that of the municipality; the state also contributes a considerable amount not included in the city budget.

The budget is completed by a third and fourth division, those of supplementary and special receipts and expenses, amounting to £3,445,110, but of which the particulars are not given. Thus we arrive at the following *resumé* of the city expenditure for the year:—

	Francs.
Ordinary expenditure	102,671,696
Extraordinary ,, ...	61,412,623
Supplementary ,, ...	20,000,000
Special ,, ...	61,127,740
Total......	245,212,059

or £9,808,482.

The special public works include several new churches and the repair of many others; the erection of two synagogues; of two colleges, and many educational and other municipal buildings; one theatre; two barracks, and two other military buildings; forty barracks around Paris for the employés of the octroi; the completion of the new general abattoirs in connection with the great cattle market at Villette; the concluding portions of the great general market of Paris, and eight new local market places.

The new roads and streets opened during the past year in old Paris amount to about five miles in length; and in the recently-annexed portions of the city 5,884 mètres of new and 30,857 mètres of old roads, making a total of more than twenty-three miles, have been levelled, macadamized, and paved. The total length of roads dealt with in the new zone of the city to the present time is stated as equal to nearly sixty miles, of which one-third have been newly created. There remain at the present time nearly thirty miles of road either unmade or in a very unsatisfactory condition, depending on the completion of the levels of main lines or other circumstances.

As regards public gardens and promenades. One very handsome new park was lately opened on the Buttes Chaumont, as well as two large squares planted; and another large park is commenced at Montsouris.

The works executed in connection with the supply of water to Paris have been very important, but most of these, including the great reservoir of Menilmontant, have already been described in the *Journal*.

The total cost of the whole system of new boulevards and streets, made and to be made, is stated at more than thirty-nine millions sterling, and the work is expected to be completed in the commencement of 1869. The cost of the public buildings, promenades, squares, sewers, &c., has been defrayed, with the exception of two millions sterling, out of the ordinary revenues of the city. The extraordinary expenses consequent on the extension of the limits of Paris amounted to nearly twelve and a-

half millions sterling, of which more than one-third was taken from the ordinary receipts of the municipality. "These works," says the report, "have not cost the population of Paris any increase in taxes, and yet not more than half the enormous amount expended on them is left to the future to pay, because they have increased the value of the property of the city to more than twice the extent of the capital employed."

The remainder of the long document in question is occupied with the statement of a subject which has created considerable difficulty and excitement in Paris, and which, moreover, has a general interest as a matter of political economy. The zone which was taken within the limits of the city of Paris in June, 1859, contained a large number of factories of various kinds, the proprietors thus enjoying the combined benefits of proximity to the capital and immunity from octroi duties. The Act which made this zone a portion of the capital provides that no octroi dues shall be levied on the then existing factories until the following year, 1860, and that for seven years they should not be charged any higher duties than they paid before the annexation, either on raw materials or fuel. The period to which this latter saving clause applied elapsed with the year 1866, and during last year the octroi duties were charged in their case as in others, with this exception, that the materials and fuel were allowed to be laid in in bond, the duties only being charged on consumption.

The manufacturers complained loudly of the burden which thus fell upon their shoulders; many factories were closed, and the workmen discharged, and the subject created great excitement. The question was a serious one for the manufactories, but the municipal authorities enforced the duties, and the document under hand gives the reasons which prevailed with them, with the statistics of the case.

It appears that factories availed themselves of the right of admission of materials and fuel in bond in 1860, but that in January 1867 only 200 retained it; some of the remainder had been removed beyond the limits of the city. In December last only 144 factories who kept the right of entrepôt, or, excluding gas works, which are on a special footing, 135; of these 11 only receive raw materials, 47 both materials and fuel, and 77 fuel alone.

It does not appear that the question of the octroi duties on the raw materials employed in these factories presents much difficulty; the grand question in dispute is the taxation of fuel.

The octroi duties are from 18d. to 2s., the stere on wood; 5d. per hectolitre (22½ galls.) on charcoal; and 3d. per cwt. on coal, coke, and peat.

A committee, to which the subject was entrusted in 1864, recommended that small coal, to be used in factories, should be admitted into the city at half the existing rates of duty, and that the loss should be made up by a small increase on large, or domestic coal; but the prefect, in his report, repudiates this recommendation, and argues that any such arrangement would be unfair to the population at large, and that it is just as illogical to exonerate fuel used in manufactories from duty as to apply the same rule to the food of the workman. It is therefore on principle and not on fiscal grounds, for the amount in question is less than £40,000 per annum, that the prefect rejects the claims set up by the manufacturers. Another objection put forward is, that if any such exoneration from duty were carried out, manufacturers would flock to Paris from all parts of France, in order to enjoy the advantages which a capital affords. The extent of the question, from the manufacturers' point of view, may be judged of by the following figures given in the report:—Of the 124 factories which received fuel in entrepôt in the year 1866, ten paid upwards of £800 a year octroi duty on their combustibles; one sugar refinery, £4,080, another £3,600, and a third £2,440; one ironworks, £2,160; a sugar, an iron, and a chemical factory, each, £2,080; another refinery, £1,640; a copper foundry, £1,200; and a third ironworks, £920; ten others paid between £400 and £800; fourteen between £200 and £400, and so on down to thirty-four, which paid less than £40 a year each.

The final settlement of the question is not yet attained, but the conclusion of the prefect is, that that no general measure can meet the case in a satisfactory manner, but that each claim for diminution of amount must be argued on its own special merits.

Fine Arts.

Paris Exhibition of Works of Art. — The Paris *salon* has been closed, according to custom, for a few days, to enable the jury to settle the awards, and to make some few changes in the places of certain pictures, and was opened again on the 30th of May. The Grand Prix d'Honneur in Painting has been awarded to M. Gustave Brion, who took a second-class medal in 1853, a first-class medal with the Cross of the Legion of Honour in 1863, and a second-class medal at the Universal Exhibition last year. The work which has obtained for this artist the blue ribbon this year is a painting of very sterling serious character, the subject—the Reading of the Bible in a Protestant Household in Alsace. A grave old man, of the peasant class, sits beside an immense stove of white earthenware, and reads from the holy volume; opposite to him is a group of a dozen persons, principally women, who listen attentively to the words he utters; the faces of the women especially are exquisitely natural and charmingly contrasted, while those of two or three stalwart peasants and a little boy give additional variety to the scene. There are literally no accessories, the dresses are sober in the extreme, and the whole force of the artist's talent has been concentrated upon the faces, which, though not refined, are intellectual and full of vigour. The painting is remarkably solid and honest, and presents an admirable example of the French school, while the sentiment and composition seem to belong to a more thoughtful school. It is a mark of progress, perhaps, in taste, that the highest reward has been given to a work so serious in character, possessing so few intrinsic claims, and making not the slightest appeal to patriotic or popular feeling. The award will probably be much questioned, and the popularly-elected jury will perhaps be considered somewhat puritanic in its decision. Of the forty ordinary medals there is now no distinction of classes; two are awarded to female artists, one to Madame Eléonore Escallier, who exhibits two admirable specimens of flowers and birds, painted on *faïence;* the plaques are circular, and of large diameter, nearly two feet, thus presenting great difficulties in execution; some large reddish-brown leaves and crysanthemum flowers are admirably rendered, and a bird of brilliant plumage in each case makes up a beautiful harmony of colour; the blue has run a little in one place, but, with this exception, Madame Escallier's work is nearly perfect; the other lady to whom a medal has been awarded is Mademoiselle Nélie Jacquemart, who sends two capital portraits, one of a lady, the other of M. Benoît Champy, President of the Civil Tribunal of the Seine. The gentlemen to whom medals have been awarded are:—M. Appian, for two landscapes; M. Beaulieu, a pupil of E. Delacroix, for a curious composition, a Pierrot cooking, or making what is called œuf d'Autriche; M. E. Breton, a landscape and a snow-scene; M. Brun, a beggar woman; M. Paul Cellier, for an admirable portrait and small genre picture; M. Cermak, a native of Bohemia, an excellent composition, representing a number of Christian girls being carried off by Bashi-Bazooks to be sold at Adrianople; M. Chenu, a view of a public promenade by the side of a river, evening; M. De Connick, a Gallic mother proving her constancy by launching her new-born infant on her husband's shield on the waters of the Rhine; M. Daubigny, fils, a land-

scape and girls winnowing corn; M. Delierre, dead game; M. H. Dubois, Erigone attracted by Bacchus in the form of a bunch of grapes; M. Erhmann, a large and decorative panel of a pretty little figure called the morning star; Victor Giraud, the return of the husband, one of the most remarkable works in the exhibition; the husband supports his fainting wife, while the lover lies wounded at the foot of the stairs upon which the former stands; the position is one of the most difficult that could have been selected, the wounded man having fallen on his back with his head in the foreground of the picture and his feet on the stairs; the same artist exhibited last year an admirable work, the slave market, of quite another character, which was purchased for the Luxembourg gallery; M. Glaize, jun., two portraits; M. Hanoteau, a noble woodland scene, noticed in a former article; M. Harpigniés, two landscapes; M. Héreau, women collecting seaweed in Brittany, a charming composition; M. Hugrel, nymph and cupid; M. Jundt, a pretty rural scene, a girl arranging her hair by the water; M. G. Jacquet, army of German mercenaries of the 16th century; M. Klagmann, Medea; M. L. A. Leloir, baptism of natives of the Canary Islands in the year 1404, a vigorous work; M. Jules Joseph Lefebvre, a remarkably powerful but not graceful study from the nude, and an admirable portrait; M. Legros, whose pictures we have not seen; M. Lobrichon, portraits; M. Alphonse Muraton, two hermits, and a monk at prayer, a fine head; M. Emile Michel, hunting and snow-scene; M. Méry, two curious compositions of birds and wasps; this artist paints insects with remarkable effect; M. Mouchot, Egyptians with monkeys and fellah women; M. Parrot, a charming nude figure, seated by the sea, and entitled, Elegy; M. Regamey, military piece; M. R. Thirion, death of St. Paul; M. Tourny, a portrait; M. Vibert, a curious work, the monks of a Spanish convent being drilled by an officer, in 1811; M. Vollen, collections of arms and armour; M. Worms, the romance à la mode and la ronda, which we have not seen; and M. Zo, a very pleasing picture, full of sunshine, the tribunal of the Moorish kings in the Alhambra. The large proportion of landscapes and portraits in this list is remarkable; it includes no great historical and very few imaginative works; on the other hand, it must be noted that all the medallists but one are natives of France, and that one is the pupil of a French artist. It must be remembered also, that many of the artists exhibiting are *hors concours*, having before received three medals, or the cross of the Legion of Honour. The prizes in the other classes are not yet published.

Manufactures.

Silkworm Disease.—The terrible suffering that has been caused in the South of France, by the disease which has attacked the silkworms for the last twenty years,—it made its appearance in 1848—has drawn the attention of scientific men to the subject, and M. Pasteur, the great authority on ferments, has taken up the subject. He is of opinion that the value of the eggs, or seeds, graines, as the silkworm's eggs are called in France, may be tested by means of the microscope, and he has published a clear account of the appearance presented by the sound and diseased eggs. Several proprietors and others have tried experiments with eggs thus selected with marked success. Amongst others, M. Henri Marès, of Montpelier, who has an immense breadth of land under vines in the plain of Launac, near Frontignan, and to whom France is indebted for the application of sulphur as a preventative of the *oidium* or vine disease, has tested M. Pasteur's plan on a considerable scale. Before the middle of May, many of the worms had undergone all their transformations, and some few were busy spinning their cocoons; they looked perfectly healthy and were of great size, and everything promised well for the experiment. The fact must not, however, be overlooked, that the fine appearance of the worms cannot be attributed to the selection of the eggs alone; M. Marès' lofts are well supplied with mulberry leaves, and kept carefully clean the experiment is, in short, carried on by a man of high education, scientific attainments, and active habits, and thus the causes of success are double microscopic selection of eggs and sanitary arrangement. The poor silkworm breeders generally present a very different spectacle; their chambers are kept at a great heat, without any careful arrangement against draughts, while the supply of food and the cleansing often suffer from want of sufficient hands to carry the operations out properly. M. Marès is not of opinion that the stripping of the mulberry trees causes the leaves to lose their value as food for the worms; his trees are reduced to bare poles during the season, and yet they present a most vigorous appearance. It is to be hoped that the efforts of the government, aided by men like M. Pasteur, M. Guérin Méneville, and M. Marès, will soon eradicate the silkworm disease, which has cost France and other countries so many millions.

Furniture and Cabinet-making in Italy.—The manufacture of furniture is one of those industries which have been carried on in Italy successfully from an early period up to the present time, without having fallen off in importance or declined in any way. During the middle ages, and especially at the Renaissance, the national as well as foreign palaces, royal dwellings, and museums, were filled with *chefs-d'ouvres* due to the skill and taste of Italian artisans who were worthy of the name of artists. Although wood-carving in Italy does not seem to have aspired, as in northern countries, to infinite richness—and perhaps heaviness—of the ornaments, and to crowded minuteness of detail, it has always preserved that good taste in design, purity in outline, and good proportion, which it has inherited from antiquity. Sienna may be considered as the first cradle of the art, and, up to the fourteenth century, was famous for its wood carving. During the seventeenth and eighteenth centuries this art fell somewhat into decline, but of late years has been revived by many distinguished artists. Amongst the wood carvers whose rich and varied works are an honour to Italian industry, must be mentioned MM. Barbetti, of Sienna, whose vast establishment at Florence, opened about three years ago, employs upwards of 100 workmen, and produces furniture and articles of cabinet-making to the extent of 100,000 francs (£25,000) per annum. In Piedmont and the province of Genoa a good deal of turning is carried on, and for this purpose from 30,000 to 40,000 kils. of box-wood are imported yearly. Another important branch of industry is that of chair-making, at Chiavari. These chairs are extremely light and elegant, and were formerly imported from France, under the name of Paris chairs; at the present time they are exported to France instead. The stalls of choirs, confessionals, baptisteries, lecterns, organ cases, book cases, wainscoting, &c., executed at Genoa and Turin will rival anything of their kind that has been produced in other countries. The manufacture of common and cheap furniture is likewise carried on to a great extent, and the trade in furniture made of native wood, without veneering or gilding, has of late made great progress. At Milan, and throughout the whole of Lombardy, the manufacture of furniture has made considerable progress. At Milan alone there are thirty manufactories, in which 250 men are employed, whose earnings range from 1·76 francs to 3·52 francs per day, and more than 100 children. While conforming to the requirements of luxury and of fashion, the Milanese manufacturers make furniture of excellent design in fine woods, such as the mahogany and walnut, which are often richly carved; also in marquetrie work, inlaid with metal in rich and varied design, and others in fine woods, such as rosewood, Hungarian ash, enriched with bold ormolu ornaments, with incrustations of differently-coloured stones, or with miniatures

in majolica. The articles manufactured at Milan are in no way inferior to those made in the fourteenth century, and are remarkable for the elegance of their form, beauty, and good taste of design, and solidity and good workmanship. In various parts of the province of Milan, and especially in the neighbourhood of Monza, Como, Lissone, Cesano, Boisio, Barlassina, Lazzate, Seveso, Mede, this industry gives employment to upwards of 350 families, and the number of workmen is never less than 600 in the summer, and exceeds 1,000 in the winter, with average wages of 1·76 francs. The furniture made in this country is chiefly of walnut, and, so far as their price is concerned, they are within reach of all classes; that of Mede is distinguished for its cheapness. In the province of Brescia there are seven manufactories of furniture, producing annually about 400,000 francs (£16,000). In the principal towns in the Venetian provinces the manufacture of furniture is carried on to meet the demand. There are many excellent manufacturers at Venice and Vicenza. In the provinces of Emilia, Umbra, and the Marches, a good deal of furniture of gilt wood and ordinary work is made. The manufacturers of Naples execute work of every kind suitable to the requirements of all classes. The raw materials employed in this manufacture are as follows:—Indigenous woods, such as walnut, maple, oak, cherry, jujuh tree, lime tree, elm, alder, &c.; of foreign woods—the Indian walnut, ebony, rosewood, black oak, mahogany, and sandal wood; silk and woollen stuffs, cotton cloths, leather, and oil-cloths, from England, France, and America, as well as from national manufactories; trimmings, principally from the manufactories of Milan and other towns in Italy, and some from England, France, and Belgium; varnishes, from France, England, and Switzerland, as well as from national manufactories. The foreign woods used in this manufacture are estimated at 11,019 quintals, of the value of 400,000 francs (£16,000) annually. At the principal manufactories at Florence, Milan, Turin, and Naples, wood-working machines, driven by steam power, are used. The wood carving is executed by hand. The designs are principally original, in the style of the best periods of the art. The progress made in the manufacture of furniture in Italy since 1862 consists in a greater elegance in the form, and in better modes of mounting; a lower price, resulting from the introduction of machinery into the manufacture. The trade in articles of furniture and cabinet-making during the last few years is as follows:—

	Imports.	Exports.
1861	119,000	474,000
1862	302,000	897,000
1863	451,000	2,781,000
1864	536,000	882,000
1865	893,000	1,156,000
Average	478,000	1,238,000
	£19,120	£49,520

In 1865 these figures were compared in the following manner:—

	Imports.	Exports.
Furniture in wood (common)	344,000	694,000
,, carved, incrusted, or veneered	108,000	288,000
,, cabinet-making	341,000	174,000
Total francs	793,000	1,156,000

This shows that the export trade is chiefly supplied from the common furniture, and from carved and incrusted work.

Ramie a Substitute for Cotton.—The *New York Shipping List* says:—"We have received a pamphlet on the origin, propagation, culture, and cleaning of ramie, from a Mr. Lefranc, of New Orleans. This plant, it appears, was originally found in the Island of Java, where its fibre, which is said to closely resemble Sea Island cotton, has long been used by the natives in the manufacture of cloth in a primitive way. About ten years ago the plant was introduced into Mexico by a distinguished botanist, and thrived so well that its cultivation was last year attempted in Louisiana, and, it would seem, with entire success. The principal conclusions established by the Louisiana experiments are:—That the plant can be very easily cultivated in both the alluvial and upland soil of the South-western States; that its fibre is as strong and as fine as that of flax or cotton, and that it is worth in Europe double the best Sea Island cotton, and four times the best Upland; that it may be made, in the climate of Louisiana, to yield four crops a year, each crop of more pounds to the acre than in any ordinary yield of cotton; that it is not liable to be destroyed by the caterpillar or other agencies so commonly destructive to cotton; and that it requires but little labour after the ground is prepared, and will extend its roots and propagate itself almost indefinitely in any direction that may be marked out for its growth. It is said that a few mills in France and England have secretly introduced the fibre by mixing it with cotton for superior tissues, such as lace fabrics. But the quantity thus used has been light because of small supplies, consequent upon the difficulty of extracting the fibre in India. It appears that a machine for extracting and clearing the fibre has been invented and patented, and that they are afforded at the moderate price of 225 dollars at New Orleans. The Commissioner of Agriculture at Washington has examined specimens of cloth made from the ramie fibre, and testifies that they 'fully indicate that superior goods can be manufactured from this valuable plant.' It is said that Manchester and New York houses are calling in advance for all that can be produced in the South, and it seems altogether probable that a sufficient supply will be afforded this year to enable manufacturers to test it on a large scale. The present price of the fibre in Louisiana is said to be about 60 cents., but it is thought that it can ultimately be afforded at 25 cents., and perhaps less, in which event it will assuredly be cheaper than cotton."

Commerce.

Beet-root Sugar.—In his Circular, dated April 28th, Herr Robert Burger, of Magdebourg, states that the cultivation of beet-root for sugar-making in Europe is everywhere on the increase, the reports from Poland and some parts of Germany being particularly favourable. The attempts made to introduce the cultivation of the beet-root into Spain have also been very successful, so far as the culture and manufacture of sugar are concerned; but the real obstacle to its further progress in that kingdom is owing to the entire absence of a spirit of association amongst the commercial classes, and this, coupled with the state of Spanish trade, which is still in its infancy, will effectually prevent the further extension of the beet-root industry in that kingdom.

Sugar in Tahiti.—The *Trinidad Chronicle* says:—"Letters from Tahiti have been received, giving some interesting details of the cultivation there of the sugar cane having been greatly extended, and the produce, which is of excellent quality, being in much demand in the markets of the American coast, as also in those of Australia and New Zealand. Europeans now possess upwards of 15,000 acres in the island, and are continually making additions. The colonisation has extended to the Marquesas, in which some 10,000 acres have been placed under cultivation, and the beneficial progress is extending."

The Railways and Small Parcels.—*The Produce Markets Review* says:—"It is satisfactory to find that the agitation on the question of the conveyance of small parcels has been successful, and that the monopoly aimed at by the railway companies has been defeated. From

the reply given by the Duke of Richmond to the influential deputation which waited upon him at the latter end of April, and from that given in the House of Commons by the Vice-President of the Board of Trade to Mr. Foster, we now learn that no attempt will be made to interfere with the carrying trade, which has been so enormously developed of late years by individuals (as distinguished from railway companies), and which has been so useful an adjunct in extending and enlarging the commerce of the country. It is only natural that the railway companies, with their increasing expenditure, moderate traffic, and diminishing dividends, should be anxious to grasp so valuable a prize as the carrying-trade of small parcels has proved to be; but the railway companies have yet to prove their capacity for managing their present traffic in such a way as will be to the advantage both of the public and the shareholders, before they can be believed capable of enlarging their sphere of action. The actual state of things was concisely described by the chief speaker in the deputation, when he spoke of the railway companies as being 'good carriers but bad deliverers.' Another speaker gave an example in point, showing what would be the respective cost of a certain number of parcels, when conveyed by private carriers, and by the railway companies; the cost of an average number of thirty-five parcels a day, conveyed from London to Liverpool, according to present arrangements, is £145 per annum; according to the railway scale of prices it would be £1,000 per annum."

The Movement of Shipping at Antwerp.—Antwerp is not only the principal port of Belgium, but also the emporium for the greater part of Germany. Since the peace of 1815 the trade of Antwerp has continually increased. In 1824, the number of ships that arrived at this port was 681; in 1825 the arrivals amount to 800; in 1836 to 1,426; in 1861 to 2,786; and in 1866 the number of arrivals amounted to not less than 3,085 ships, of the aggregate tonnage of 885,052, and the departures to 3,031 ships, of 885,052 tons.

Sale of Fungi as Food in Milan.—The sale of fungi in Milan is under great restriction, and is only allowed in the public markets, so as to be under the immediate eye of the market inspectors. The sale of all fungi prejudicial to health, as also of those but little known, even if not poisonous, is strictly prohibited. The following are the only varieties of fungi which are permitted to be sold in the Milanese markets:—

Name in Milanese dialect.	Italian names.	Botanical names.
Funsg ferrée	Fungo porcino	Boletus edulis.
Funsg cocch	Uovolo	Agaricus cæsareus.
Spongignœura	Spugnuola	Phallus esculentus.
Trifola	Tartufo	Lycoperdon tuber.

Any infringement of these regulations is punished by fines and imprisonment.

Colonies.

Gold and Silver in Victoria and California.—Subjoined is a statement of the amount of gold and silver produced in Victoria and California since the discovery of these metals in these countries. In the past seventeen years 33,910,952 ounces of gold were raised in Victoria, representing a money value of £135,643,808; and the yield of California for the eighteen years ending in December, 1866, was 696,658,331 dollars' worth of gold, or 36,944,890 ounces, or, at £4 per ounce, £147,779,650. In Victoria the maximum yield was attained in 1856, and there has been a gradual decline since. The gold yield of California reached its culminating point in 1853, and the exportation of treasure gradually fell until 1861, when the silver of Nevada and the gold of Idaho began to come in, and the amount of the shipments rapidly rose again. The last estimate of the annual yield of gold of California was 27,000,000 dollars, or 1,421,050 oz., which is less than the lowest yield of Victoria since 1851. The falling off in the gold yield, however, was amply compensated for by the discovery of the silver mines of Nevada, in 1859. There is of course no comparison between the silver yield of the two countries, there being no silver returns for Victoria but those from the mine at St. Arnaud, at which work cannot fairly be said to have commenced as yet. The silver mines of Nevada prove more productive every year, and in 1866 they produced silver to the value of 16,500,000 dollars. Up to the end of that year the total yield, from the first discovery in 1859, was 70,725,000 dollars. In California the falling off in the gold returns has been more than balanced by the later discoveries of silver. The following are the gold and silver returns of California and Victoria, but as to the former country so little care seems to have been taken to preserve reliable statistics that the figures can only be said to be approximately correct:—

Annual Gold Return of Victoria.

Year.	Oz.
1851 (for three months)	145,146
1852	2,218,782
1853	2,676,345
1854	2,150,730
1855	2,751,535
1856	2,985,991
1857	2,762,460
1858	2,528,478
1859	2,280,950
1860	2,156,660
1861	1,967,420
1862	1,658,207
1863	1,626,872
1864	1,544,694
1865	1,543,801
1866	1,479,194
1867	1,433,687
Total	33,910,952

Silver Return of Victoria.

The following quantities of silver have been raised and smelted in the colony:—

	Silver Ore. Tons.	Silver. Oz.	dwt.
Previously up to Dec. 31, 1864	4,480	6,786	4
From Jan. 1 to Dec. 31, 1865	1,400	3,379	0
From Jan. 1 to Dec. 31, 1866	2,139	2,348	2
From Jan. 1 to Dec. 31, 1867	665	—	
Total	8,684		

Annual Gold Return of California.

Year.	Dols.
1849	4,921,250
1850	27,676,346
1851	42,582,695
1852	46,588,434
1853	57,330,034
1854	51,328,653
1855	45,182,631
1856	48,880,543
1857	48,976,097
1858	47,548,025
1859	47,649,462
1860	42,203,345
1861	40,639,080
1862	34,704,866
1863	29,824,245
1864	26,653,099
1865	28,553,525
1866 (probable production)	25,415,401
Total	696,658,331

Annual Yield of Nevada Silver Mines.

1859	50,000
1860	100,000
1861	2,275,000
1862	6,500,000
1863	12,500,000
1864	16,000,000
1865	16,800,000
1866	16,500,000
Total	70,725,000

WHEAT IN VICTORIA. — The total number of acres under wheat last year was 556,818, against 457,628 the year before, an increase of 99,190 acres. Had it not been for this great increase, the year's produce would only have been just sufficient for the wants of the colony. Breadstuffs are higher, both at Sydney and Adelaide, than at Melbourne, but it seems a mistake to have forced prices so high in South Australia, as there is a moderate if not so large a quantity as usual for exportation, and the colonial markets for wheat and flour are limited. Prices are so high that it will not pay to export to England. The cry of a failure in the grass crops, raised just before harvest in this colony, coupled with the knowledge that wheat was so high and scarce in Europe, caused many to think that extreme rates must be reached, and the Adelaide holders think that by holding they can raise the price to whatever they like, but this is a mistake, as New South Wales alone wants to import any quantity; and if prices rise materially at Adelaide, the Sydney merchants will, of course, order cargoes from Valparaiso. From the statistical returns it would appear that only 20,000 tons will be available for export from South Australia this year; allowing six bushels for the consumption of each of 175,000 people, 1,050,000 bushels, and 687,500 bushels as seed for 550,000 acres of land, there would remain only a surplus of 868,427 bushels at 45 bushels of wheat to the ton of flour, equal to 20,000 tons. The quantity allowed for consumption is always too much, and it is not likely that so many acres will be sown with wheat this year; besides, there must have been a considerable quantity of old wheat and flour on hand at the commencement of harvest, so that we may expect more than 20,000 tons to be sent away from Adelaide, notwithstanding the failure.

Notes.

POST OFFICE STATISTICS.—From an official return recently published of the gross revenue, cost of management, and net revenue of the Post Office for each year from 1838 to 1867, it appears that since 1841 there has been a gradual increase in the gross revenue until last year, when the sum realized was £4,548,129; but there has also been a corresponding increase in the cost of management, which last year amounted to £2,421,004; so that the net revenue during the last two years has shown a decline, being £2,127,125 in 1867, against £2,134,867 in 1866, and £2,194,854 in 1865.

GERMAN EXPEDITION TO THE NORTH POLE.—The German expedition to the North Pole, the cost of which is estimated at 15,000 thalers, will definitely leave Bergen (Norway) on the 15th May. The greater part of the crew have already quitted Hamburg for that port. The vessel which M. Coveldog, the leader, has purchased there is one of the new Danish yachts specially constructed for Polar voyages. It is furnished with beams and iron plates in such a way as to augment its power of resistance. The name is the *Germania*, and it sails under the flag of the Northern Confederation. Its burden is 80 tons, and it will be manned by a crew of 12 to 14 men.

IMPROVEMENT OF THE PATENT OFFICE.—A very influential deputation, introduced by Mr. Dillwyn, M.P., consisting of many M.P.'s, civil and mechanical engineers, and other men of science, waited upon Mr. Disraeli a short time since, to bring under his notice the great inconvenience and expense, both in time and money, incurred by those who wish to take out patents, and by the public in general, who wish to ascertain what is new and what is old in the history of invention. Mr. Dillwyn stated that the difficulty and expense arose in the main degree from the want of proper "subject matter indices." He mentioned that the matter had been brought before Lords Romilly and Cairns, who had promptly signified their willingness to recommend the appointment of three additional commissioners of patents. The main object of the deputation was to secure from the Government the means for the expenses involved by such appointments, and the preparation of the indices. Mr. Dillwyn, supported by Mr. Gregory and Mr. Horsfall, strongly urged that the Government should give the requisite assistance, if only on the ground that the annual surplus arising from the patent fees was £54,000. Mr. Disraeli expressed himself duly sensible of the importance of the subject, and intimated that the representations of a deputation consisting of men of such eminence and distinction as those he saw before him would receive the utmost consideration from the Government.

Correspondence.

FUNGI AS FOOD.—SIR,—A mistake was inadvertently made by me in the remarks on fungi, published in the *Journal* for May 15. Mr. G. W. Smith's "Charts of Edible and Poisonous Fungi" are published by Mr. Hardwicke, not by "Groombridge." My observations as to their hardly doing justice to the drawings applied to the colouring only, for the drawings were made on stone by Mr. Smith himself. I beg to add that fungi have been much more used in London during the last fourteen years than formerly. Amongst other uses they enter sometimes into the composition of bread, as appears from a communication from Professor Friès.—I am, &c., M. J. BERKELEY.

MEETINGS FOR THE ENSUING WEEK.

MON......Social Science Assoc., 8. Mr. Chisholm Anstey, "On the Inequality of the Administration of Criminal Law in cases of Fraud."
Geographical, 8½. 1. Mr. C. R. Markham, "Last Memoir on Abyssinia: Antalo to Bashilo, and Topography of Magdala." 2. Mr. D. G. Neumeyer, "Scientific Exploration of Central Australia."
British Architects, 8.

TUES ...R. Medical and Chirurgical, 8½.
Photographic, 8.
Ethnological, 8. 1. Mr. C. B. Wade, "On the Chinese Notation of Time." 2. "On the Migration and History of Coffee, Tea, Cocoa, &c." (By the late Mr. J. Crawfurd.)
Royal Inst., 3. Dr. M. Foster, "On the Development of Animals."

WED ...Microscopical, 8. Dr. Thudichum, "The Relation of Microscopic Fungi to great Pathological Processes."
R Literary Fund, 3.
R. Society of Literature, 4½.
Archæological Assoc., 8½.

THUR ...Royal, 8½.
Antiquaries, 8½.
Zoological, 8½.
R. Society Club, 6.
Royal Inst., 3. Sir J. Lubbock, "On Savages."
Society of Fine Arts, 8. Adjourned Annual General Meeting.

FRI.......Astronomical, 8.
Royal Inst., 8. Prof. Frankland, "On the Source of Light in Luminous Flames."

SAT ......R. Botanic, 3¾.
Royal Inst., 3. Sir J. Lubbock, "On Savages."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 19th May*, 1868.

111. Bill—Land Writs Registration (Scotland) (amended).
Colonial Bishops—Returns.
New Zealand—Papers.
Public Petitions—Twenty-first Report.

Delivered on 20th May, 1868.

267. Australian Mails—Memorials.
268. Volunteers (Devon Association)—Letter.

Trades Unions and other Associations—Seventh Report of Commissioners.

Session 1867.

582. Parliamentary Papers—List and Index.

Delivered on 21st May, 1868.

118. Bill—Pier and Harbour Orders Confirmation, &c.
119. „ Divorce and Matrimonial Causes Court (amended in Committee).
120. „ Local Government Supplemental (No. 2).
121. „ Local Government Supplemental (No. 3).
122. „ Unclaimed Prize Money (India).
124. „ West Indies.
125. „ Medical Practitioners (Colonies).
228. Roman Catholic University (Ireland)—Correspondence.

Delivered on 23rd May, 1868.

130. Bill—Vagrant Act Amendment (amended).
132. „ Metropolitan Police Funds.
257. Customs (Landing Department)—Minutes.
262. Reformatory and Industrial Schools—Return.

Crete—Correspondence.
Public Petitions—Twenty-second Report.

Delivered on 25th May, 1868.

136. Bill—Duchy of Cornwall Amendment.
269. Telegraphic Communications (East India)—Memorials.
295. Merchant Service—Return.
296. Police (Scotland)—Tenth Report.

Patents.

From Commissioners of Patents' Journal, May 29.

Grants of Provisional Protection.

Albums—1576—O. König.
Axles and axle boxes—1568—W. E. Newton.
Bale ties—1512—T. Briggs.
Bellows—1613—W. Allday.
Bevel gearing—1594—F. Hyde.
Blow-pipe apparatus—1546—S. P. Armstead.
Boilers—1554—H. B. Barlow.
Boilers, &c., preventing the radiation of heat from—1596—S. Chambers and C. Broadhead.
Bottles, &c., cleansing—1558—C. Farrow.
Boxes for holding bottles—1567—F. Dixon.
Braces—1566—W. E. Newton.
Bricks—1590—H. C. Crofts.
Bricks—1591—J. H. Johnson.
Brushes and pencils, protecting the points of—1510—G. Bowden and J. R. Dickinson.
Brushes, scrubbing, device for holding—1537—W. R. Lake.
Buildings, heating and ventilating—1527—G. T. Seydel.
Capsules, &c., colouring—1574—G. S. Marie.
Carding engines—1575—T. B. Kay.
Casks, &c., supplying finings, &c., to—1535—A. M. Dix.
Combs, curry—1545—T. Pope.
Cooking apparatus—1523—R. Waygood.
Cooking apparatus, &c.—1609—R. Rayner.
Cooking ranges—1611—J. A. Adams.
Dead bodies, enbalming—1602—W. R. Lake.
Door knobs, &c., moulding—1533—A. D. E. Boucher.
Dress ornaments—1573—J. Ashford and W. H. Collins.
Engines, steam—1569—W. Tasker, jun.
Engines, steam—1581—W. E. Newton.
Engines, &c., locomotive—1582—V. G. Bell.
Envelopes—1543—G. A. H. Dean.
Fabrics, &c., machines for drying and tentering—1585—E. Ashworth.
Fans—1544—W. R. Lake.
Fibrous materials, treating—832—R. Cocker.
Fire-arms, breech-loading—1526—J. H. Crane.
Flax, &c., breaking the refuse portion of—1553—F. W. and W. J. Crossley.
Fuel, artificial—1528—S. Hall.
Furnaces—1536—C. E. Brooman.
Furnaces—1540—R. Leake and J. Beevers.
Furnaces—1577—J. Driver.
Furnaces—1599—J. Robey.
Gas meters—1600—W. and G. B. Smith.
Gauges—1606—H. J. H. King, J. Auchinvole, and A. Patrick.
Guns, breech-loading—1612—C. Golden.
Harrows—1565—R. M. Clunes and F. W. Davis.
Hats—1547—C. Vero.
Hats, felt—1580—W. E. Newton.
Hides, &c., removing hair from—1617—W. E. Gedge.
Hydrotherapic apparatus, portable—1597—A. Pelard.
Letter-boxes—870—N. Jacobsohn.
Liquid meters—1598—A. V. Newton.
Looms—1531—J. Crossley.
Looms—1562—W. Baldwin.
Looms—1572—W. Gadd and J. Moore.
Looms—1595—T. Singleton.
Millstones, dressing—1507—R. Evans and J. Bruce.
Musical instruments—1593—J. Hicks.
Oil presses, &c.—1550—J. H. Nutt.
Ores, &c., calcining, &c.—1519—J. Norman.
Paper pulp, knotters for straining—1509—R. K. Miller, A. B. Herbert, and H. Watson.
Parkesine—1614—A. Parkes.
Pens—1541—S. Buxton.
Photographers' head and waist rests—1532—W. Webster and R. W. Barnes.
Photographs, &c., frames for—1592—J. H. Johnson.
Pianos, &c.—1615—G. Price.
Pipe joints and ends—1548—T. Shinton.
Pipes for smoking—1503—A. Strauss.
Projectiles—1584—N. Basevi.
Railway signals—1607—T. Briggs.
Railways—1601—A. M. Clark.
Railways—1603—J. Price.
Rasps—1557—S. B. Allen.
Reaping and mowing machines—1549—W. D. Brown.
Reaping machines—1608—A. J. Murray.
Rocks, forming tunnels and galleries in—1511—H. N. Penrice.
Ships, iron and steel—1561—W. Taylor.
Ships, &c., signalling or giving orders on board—1280—L. M. Ruiz.
Shutters—1521—H. H. Hazard and W. Grimwood.
Steam, &c., regulating pressure of—1621—E. Billington & W. Jolley.
Stone, dressing—1587—J. G. Walker.
Sugar, crushed, treatment of—1530—R. Moore.
Thimbles—1564—C. Iles.
Timber, loading, &c.—1552—S. B. Boulton.
Tobacco, moulding, &c.—1396—T. and G. Cope.
Tools, entrenching—1501—K. H. Cornish.
Types, cases, &c.—1525—W. H. Wilkinson.
Upholsterers' trimmings—1555—G. Dixon.
Wadding, &c., apparatus for manufacturing—1571—H. Marsden and T. H. Blamires.
Weights, raising and lowering—1623—G. Watson.
Wool, dyeing—1440—J. Maistre.

Inventions with Complete Specifications Filed.

Furnaces—1693—C. Delafield.
Harness—1721—W. R. Lake.
Nautical instruments—1665—C. Chapman and J. Lilley.

Patents Sealed.

3310. T. G. F. Dolby.	3432. J. Collingham and T. E. Smith.
3413. J. C. Woolfield.	3464. J. G. Scott.
3414. G. Heiron.	3512. G. Holcroft & W. N. Dack.
3420. D. Barker.	3515. A. Camme and F. Delpech.
3421. W. Black & T. Hawthorn.	3628. E. Lord.
3429. W. B. Leachman and J. Holroyd.	1078. J. H. Johnson.
3431. S. Vaile.	1083. C. S. Tyson.
3437. J. Thorpe.	1130. J. H. Johnson.

From Commissioners of Patents' Journal, June 2.

Patents Sealed.

3430. J. H. Wilson.	3517. A. M. Clark.
3447. T., G. B., & B. Stephenson.	3529. R. W. Brownhill.
3450. R. R. Gray.	3530. N. Paxman, jun.
3451. E. T. Hughes.	3621. H. A. Bonneville.
3453. E. Walker.	200. J. H. Johnson.
3456. J. F. Clarke.	215. J. H. Johnson.
3462. J. Mabson.	405. W. E. Newton.
3463. S. Perkins and W. Smellie.	493. W. R. Lake.
3468. T. J. Leigh.	1085. J. Jordan.
3470. E. A. Pontifex.	

Patents on which the Stamp Duty of £50 has been paid.

1407. J. M. Clements.	1602. T. Routledge and W. H. Richardson.
1445. W. Clark.	1714. J. H. Johnson.
1498. T. Summerson.	1494. H. Monier.
1503. W. J. Burgess.	1497. F. N. Gisborne.
1508. T. Brinsmead.	1512. H. Mallet.
1245. G. Davies.	
1466. W. Settle.	

Patents on which the Stamp Duty of £100 has been Paid.

1245. G. Davies.	1499. W. H. Walker.
1461. J. Howard & E. T. Bousfield.	1352. J. Ronald.
1358. W. Hunter.	1386. H. N. Penrice.
1430. S. Hawkins.	1411. E. C. Stanford.

Registered Designs.

4945—April 24—A detachable shirt frill—H. J. Smith and R. Davidson, Bromley-street East, Commercial-road, E.
4946—April 30—Combined open fire range and self-heating oven—Kennard and Ferguson, Glasgow.
4947—May 15—An improved apparatus for turning over or closing cartridges for breech-loading fire-arms—J. Johnson, 30, Bath-street, Birmingham.
4948—May 15—Basket or support for flower and other pots—W. J. Tait, Rugby.
4949—May 20—Scent bottle—A. Brownett, 1, Richmond-buildings, Soho, W.
4950—May 26—The paragon archery tip—Thos. Oldred, 126, Oxford-street, W.
4951—May 27—Gas oven—G. Shrewsbury, Lower Norwood, Surrey.

Journal of the Society of Arts.

FRIDAY, JUNE 12, 1868.

Announcements by the Council.

Annual Conference.

The Seventeenth Annual Conference between the Council of the Society and the Representatives of the Institutions in Union and Local Boards will be held on Friday, the 19th June, at Twelve o'clock, noon. William Hawes, Esq., F.G.S., Chairman of the Council, will preside.

The Council will lay before the Conference the Secretary's Report of the Proceedings of the Union for the past year, and the results of the Examinations; and the Programme of Examinations for 1869 will also be considered by the Conference.

The following suggestions of subjects for discussion have been received from various quarters, it being understood that in putting them forward the Council express no opinion whatever upon them :—

1. How can the Institutions best aid in the advancement of technical education?

2. Would it be desirable for the Society of Arts to promote the issue of a series of text-books in relation to technical education, especially suitable for working men?

3. How far can the Society and the Institutions cooperate with the Department of Science and Art, in carrying out the objects of Mr. Whitworth's munificent endowment?

4. What further efforts can be made by the Society of Arts to obtain the co-operation of other societies, and of the great public companies, in its educational movement?

5. How far is it possible to unite in one system, or to establish any connexion between the various systems of examination which are now available for the working-classes in different parts of the United Kingdom?

6. How can the Society aid in promoting visits of working men to various foreign centres of industry?

7. How far would it be desirable for working men to take their holidays all at once rather than piecemeal?

8. What arrangements would enable the working-classes to make more extended use of the public museums and galleries which may be available for their instruction and amusement?

9. Under what arrangements could collections of useful and interesting objects of art and nature be sent to country institutions, in circulation from the metropolitan national museums?

Secretaries of Institutions and Local Boards are requested to send, *immediately*, the names of the Representatives appointed to attend the Conference, and early notice should be given of any other subjects which Institutions or Local Boards may desire their Representatives to introduce to the notice of the Conference.

Secretaries of Institutions are requested to forward *at once* by book post, copies of the last Annual Reports of their Institutions.

Annual General Meeting.

The One Hundred and Fourteenth Annual General Meeting, for the purpose of receiving the Council's report and the Treasurers' statement of receipts, payments, and expenditure during the past year, and also for the election of officers, will be held, in accordance with the Bye-laws, on Wednesday, the 24th of June, at four o'clock p.m.

The Council hereby convene a Special General Meeting of the Members of the Society to ballot for members, such meeting to take place at the close of the Annual General Meeting.

By order,

P. Le Neve Foster, *Secretary.*

Society's House, Adelphi, June 11th, 1868.

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

FINAL EXAMINATION, 1868.

PRIZES AND CERTIFICATES AWARDED TO CANDIDATES.

PRIZES.

His Royal Highness the Prince Consort's Prize[(a)] of Twenty-Five Guineas to

1135—Robert Creaser Kingston, aged 21, of the Royal Polytechnic Institution, gardener, who, in this and the three preceding years, has obtained the following First-class Certificates:—

1865. Arithmetic—First-class Certificate.
1867. Botany—First-class Certificate, with First Prize, and the Royal Horticultural Society's Prize of £5.
,, Floriculture—First-class Certificate, with First Prize, and the Royal Horticultural Society's Prize of £5.
1868. Chemistry—First-class Certificate, with First Prize.
,, Fruit and Vegetable Culture—First-class Certificate, with First Prize, and the Royal Horticultural Society's Prize of £5, and (together with a Second-class in Mensuration) the *Gardener's Chronicle* Prize of £3.

Arithmetic	1st Prize	£5	To No. 396—George Henry Baker, 16, Devonport Mechanics' Institute, engineer student
	2nd Prize	3	,, 1452—Robert Mayston, 16, Portsea Young Men's Christian Association, engineer student
			No Prize for Females awarded‡
Book-keeping	1st Prize	5	,, 1201—Eugene Vernon Barrett, 23, Birkbeck Literary Institution, clerk
	2nd Prize	3	,, 1103—Joseph Moles, jun., 21, City of London College, clerk
			No Prize for Females awarded‡
Algebra	1st Prize	5	,, 1903—James Robinson, 22, Belfast Academy Science School, law clerk
	2nd Prize	3	,, 1448—William Green, 17, Portsea Young Men's Christian Association, engineer student
Geometry	1st Prize	5	,, 1903—James Robinson, 22, Belfast Academy Science School, law clerk
	2nd Prize	3	,, 992—William Lee, 18, Leeds Mechanics' Institute, mechanic
Mensuration	1st Prize	5	,, 394—James Allington, 16, Devonport Mechanics' Institute, shipwright apprentice
	2nd Prize	3	,, 415—Joseph T. Treleaven, 23, Devonport Mechanics' Institute, shipwright
Trigonometry	1st Prize	5	,, 1900—William Whitford, 23, Belfast Academy Science School, flax dresser
	2nd Prize	3	,, 417—Henry G. White, 26, Devonport Mechanics' Institute, shipwright
Conic Sections	1st Prize	5	,, 400—Richard Jago Butler, 19, Devonport Mechanics' Institute, engineer student
			*No Second Prize awarded**
Navigation & Nautical Astronomy	1st Prize	5	,, 403—Thomas Dawe, 17, Devonport Mechanics' Institute, clerk
			*No Second Prize awarded**
Principles of Mechanics	1st Prize	5	,, 385—Edmond F. Mondy, 22, Deptford Local Board, shipwright
	2nd Prize	3	,, 400—Richard Jago Butler, Devonport Mechanics' Institute, engineer student

(a) The following candidates have each obtained the same number of First-class Certificates in the present and three preceding years as the Prince Consort's Prizeman, but as he obtained a larger number of First-class Prizes, the award has been made in his favour:—

1104—Hugh Morgan, 21, City of London College, clerk—
1865. English History—First-class Certificate, with Second Prize.
,, Arithmetic—First-class Certificate.
1866. English Literature—First-class Certificate.
1867. Geography—First-class Certificate, with Second Prize.
1868. Political and Social Economy—First-class Certificate, with First Prize.

1641—Edward Turner Sims, jun., 21, Southampton Athenæum, clerk—
1867. English History—First-class Certificate, with First Prize.
,, Political and Social Economy—First-class Certificate, with First Prize.
,, Arithmetic—First-class Certificate.
,, Geography—First-class Certificate.
1868. Book-keeping—First-class Certificate.

417—Henry George White, 26, Devonport Mechanics' Institute, shipwright—
1865. Navigation and Nautical Astronomy—First-class Certificate, with First Prize.
1866. Domestic Economy—First-class Certificate, with First Prize.
,, Mensuration—First-class Certificate.
1867. Geography—First-class Certificate.
1868. Trigonometry—First-class Certificate, with Second Prize.

1131—William John Wilson, 25, Royal Polytechnic Classes, engineer's clerk—
1867. Animal Physiology—First-class Certificate, with 1st Prize.
,, Domestic Economy—1st-class Certificate, with 2nd Prize.
1868. Arithmetic—First class Certificate.
,, Book-keeping—First-class Certificate.
,, Geography—First-class Certificate, with First Prize, and the Royal Geographical Society's Prize of £5.

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified for receiving Prizes.
† No First-class Certificates were awarded in any of these subjects.
‡ No Female Candidate qualified to receive Prizes obtained a First-class Certificate in any of these subjects.

Practical Mechanics	1st Prize....	£5	To No. 1276—William H. Greenwood, 22, Manchester Mechanics' Institution, engineer
			*No Second Prize awarded**
Electricity & Magnetism	1st Prize....	5	„ 1148—Henry Fisher, 23, Royal Polytechnic Institution, clerk
			*No Second Prize awarded**
Light and Heat			*No Prizes awarded in this subject†*
Chemistry........	1st Prize....	5	„ 1135—Robert Creaser Kingston, 21, Royal Polytechnic Institution, gardener
	2nd Prize ..	3	„ 831—John Shaw, 35, Halifax Mechanics' Institute, paper maker
Mining and Metallurgy..........	1st Prize....	5	„ 977—Frederick H. Burton, 17, Leeds Mechanics' Institute, soap boiler
			*No Second Prize awarded**
Botany	1st Prize....	5	„ 1500—Richard L. Keenan, 25, Richmond Parochial Library, gardener
			*No Second Prize awarded**
Floriculture	1st Prize....	5	„ 1500—Richard L. Keenan, 25, Richmond Parochial Library, gardener
	2nd Prize ..	3	„ 1499—Frederick W. Burbidge, 20, Richmond Parochial Library, gardener
Fruit and Vegetable Culture	1st Prize....	5	„ 1135—Robert Creaser Kingston, 21, Royal Polytechnic Institution, gardener
	2nd Prize ..	3	„ 1494—Brian Wynne, 22, Richmond Parochial Library, gardener
Animal Physiology (in relation to health)			*No Prizes awarded in this subject†*
Domestic Economy	1st Prize....	5	„ 1101—John T. Medhurst, 21, City of London College, clerk
	2nd Prize ..	3	„ 1194—Martha Smith, 22, Birkbeck Literary Institution, of no occupation, together with the prize for female candidates of £2
	Female Prize	2	
	§ Additional Prize ..	2	„ 515—Archibald Campbell, 26, Andersonian University, Glasgow, chemist
	§ Book Prize	1	„ 229—Robert Spencer, 24, Burnley Church of England Literary Institute, gardener
	§ Book Prize	1	„ 1662—James Charlesworth, 26, Stockport Mechanics' Institute, clerk
	§ Book Prize	1	„ 1919—Mary Anne Evans, 16, Messrs. Bagnall's Girls' Evening School, Gold's-hill, dressmaker
Political and Social Economy	1st Prize....	5	„ 1104—Hugh Morgan, 21, City of London College, clerk
	2nd Prize ..	3	„ 1648—Charles Powell, 21, Southampton Athenæum, clerk
			No Female Prize awarded‡
Geography	1st Prize....	5	„ 1131—William John Wilson, 25, Royal Polytechnic Institution, engineer's clerk
	2nd Prize ..	3	„ 1567—William Pollitt, 16, Salford Working Men's College, clerk
	Female Prize	2	„ 1202—Elizabeth Backhouse, 20, Birkbeck Literary Institution (no occupation stated)
English History ..	1st Prize....	5	„ 1181—James E. Cox, 23, Birkbeck Literary Institution, accountant's clerk
	2nd Prize ..	3	„ 1202—Elizabeth Backhouse, 20, Birkbeck Literary Institution (no occupation stated), with the prize for female candidates of £2
	Female Prize	2	
English Literature	1st Prize....	5	„ 127—Edward G. Sellman, 18, Birmingham and Midland Institute, civil service (proposed)
	2nd Prize ..	3	„ 1139—Alfred E. Warner, 24, Royal Polytechnic Institution, seal engraver
			No Female Prize awarded‡
Logic and Mental Science	1st Prize....	5	„ 617—James Crichton, 27, Glasgow Athenæum, commercial traveller
	2nd Prize ..	3	„ 609—Charles S. Moir, 18, Glasgow Athenæum, salesman to calico printer
Latin and Roman History	....	..	*No Prizes awarded in this subject†*
French	1st Prize....	5	„ 1099—Henry M. McCrea, 21, City of London College, clerk
	2nd Prize ..	3	„ 1155—Edward Pickering, 17, Royal Polytechnic Institution, clerk
			No Female Prize awarded‡
German..........	1st Prize....	5	„ 1059—Thomas Abbott, 19, City of London College, clerk
	2nd Prize ..	3	„ 901—Edward B. Owen, 19, Hulme Working Men's Club, clerk
			No Female Prize awarded‡
Italian	....	..	*No Prizes awarded in this subject†*
Spanish	1st Prize....	5	„ 648—John S. Macdougall, 19, Glasgow Mechanics' Institution, clerk
			*No Second Prize awarded**
			No Female Prize awarded‡
Free-hand Drawing	1st Prize....	5	„ 1644—Frank G. Skeats, 22, Southampton Athenæum, clerk in Ordnance Survey Office
	2nd Prize ..	3	„ 661—David Murray, 19, Glasgow Mechanics' Institution, clerk
			No Female Prize awarded‡

* No other First-class Certificates were given in these subjects, or the Candidates were disqualified for receiving Prizes.
† No First-class Certificates were awarded in any of these subjects.
‡ No Female Candidate qualified to receive Prizes obtained a First-class Certificate in any of these subjects.
§ The gift of Thomas Twining, Esq.

Geometrical Drawing............	....	..	*No Prizes awarded in this subject**
Theory of Music..	1st Prize....	£5	To No. 1053—George Oakey, 26, Beauvoir College, Islington, music copyist
	2nd Prize ..	3	„ 1041—George P. Austing, 24, Beauvoir College, Islington, commercial clerk
	3rd Prize....	2	„ 467—Elizabeth Tomkinson, 23, Dudley Mechanics' Institution, occupation

The Royal Horticultural Society's Prizes are awarded as follows :—

In Botany	1st Prize....	£5	To No. 1500—Richard L. Keenan, 25, Richmond Parochial Library, gardener and assistant in herbarium
	2nd Prize ..	3	„ 1501—Richard J. Lynch, 18, Richmond Parochial Library, gardener
	3rd Prize ..	1	„ 383—Alfred Bradley, 25, Greenwich Literary Institute, gardener
In Floriculture ..	1st Prize....	5	„ 1500—Richard L. Keenan, 25, Richmond Parochial Library, gardener and assistant in herbarium
	2nd Prize ..	3	„ 1499—Frederick W. Burbidge, 20, Richmond Parochial Library, gardener
In Fruit and Vegetable Culture ..	1st Prize....	5	„ 1135—Robert Creaser Kingston, 21, Royal Polytechnic Institution, gardener
	2nd Prize ..	3	„ 1494—Brian Wynne, 22, Richmond Parochial Library, gardener

The Royal Geographical Society's Prize of £5 is awarded to—

No. 1131—William John Wilson, 25, Royal Polytechnic Institution, engineer's clerk—1st class Certificate in Geography, with the highest number of marks

The *Gardeners' Chronicle* Prize of £3 is awarded to—

No. 1135—Robert Creaser Kingston, 21, Royal Polytechnic Institution, gardener—1st class Certificate in Fruit and Vegetable Culture, together with 2nd class in Mensuration
The Prizes of £2 and £1 were not awarded, no other candidate having complied with the conditions

CERTIFICATES.

The following is an Alphabetical List of the Candidates who have obtained Certificates :—

The numbers following the names give the ages of the Candidates.

(1st) after a subject signifies a First-class Certificate.
(2d) „ „ Second-class „
(3d) „ „ Third-class „

(The occupations stated are either present or proposed.)

1059—Abbott, Thomas, 19, City of Lond. Coll., clerk—German (1st), with 1st prize of £5.
1060—Abell, Edward G., 19, City of Lond. Coll., clerk—Dom. Econ. (1st) ; Arith. (2d) ; French (3d)
1340—Abraham, John, 18, New Swindon M. I., apprentice fitter—Arith. (2d)
1789—Ackroyd, John, 16, York M. I., pupil teacher—Arith. (3d)
1005—Acomb, Leonard, 17, Leeds M. I., clerk—French (3d)
1020—Acton, Henry, 18, Lichfield W. M. I., cordwainer (occasional teacher)—Music (2d)
1410—Adam, Joseph, 20, Paisley Artis. I., warehouseman—Arith. (2d) ; French (3d)
624—Adam, Neil M., 18, Glasgow M. I., engineer—Arith. (2d)
1861—Adams, Henry, 21, City of Lond. Coll., assistant in engineer's office—Mensur. (2d) ; Chem. (3d) ; Ani. Phys. (3d) ; Geo. Dwg. (3d)
1062—Adams, William, 20, City of Lond. Coll., assistant in an engineer's office—Free-hd. Dwg. (2d) ; Mensur. (3d)
686—Adamson, David, 28, Glasgow Tonic Sol-fa Soc., iron-turner—Music (2d)
1863—Adcock, John H., 20, City of Lond. Coll., teacher—Mensur. (1st)
494—Addison, George, 29, Edinburgh Watt I., warehouseman—Arith. (3d) ; Eng. Lit. (2d)
1255—Agnew, Hugh, 18, Manchester M. I., cost clerk—Arith. (2d) ; Bkpg. (2d)
1920—Aingworth, Mary Ann, 18, Messrs. Bagnall's Girl's Even. School, home duties—Ani. Phys. (3d)
818—Akroyd, Benjamin, 25, Halifax W. M. Coll., woollen spinner—Chem. (1st)
814—Akroyd, Joseph, 20, Halifax W. M. Coll., wire drawer—Arith. (2d) ; Bkpg. (2d)
707—Alexander, James, 27, Glasgow Tonic Sol-fa Soc., boot and shoe maker—Music (3d)
506—Allan, Frantz H., 17, Andersonian Univ., Glasgow, no occupation given—Ani. Phys. (3d)
507—Allan, James, 27, Andersonian Univ., Glasgow, clerk—Botany (2d)
1646—Allcott, James H., 24, Southampton Ath., customs' officer—Alg. (2d) ; Geom. (2d)
394—Allington, James, 16, Devonport M. I., shipwright apprentice—Arith. (1st) ; Mensur. (1st), with 1st prize of £5.
621—Allison, John, 23, Glasgow I., salesman—Arith. (3d)
784—Ambler, William E., 17, Halifax M. I., book-keeper Bkpg. (3d)
1795—Amos, Henry W., 21, Bromley (Kent) L. I., clerk at gas works—Bkpg. (2d) ; Geog. (3d)
1901—Anderson, John, 37, Belfast Acad. Sci. School, teacher—Arith. (2d) ; Alg. (3d) ; Geom. (3d)
2022—Anderson, John, 20, St. Thomas' School, Woolwich, smith—Ani. Phys. (3d)
1603—Anderson, Joseph, 18, Sheerness Dockyard I., engineer student—Bkpg. (3d)
1013—Anderson, Samuel, 26, Leeds Y. M. Chr. Assoc., shopman and clerk—Bkpg. (2d)
1400—Andrew, John, 21, Paisley Artis. I., engineer apprentice—Prac. Mech. (3d)
1307—Andrew, William, 19, Mossley M. I., bookkeeper—Bkpg. (2d)
1436—Andrews, David A., 30, Pembroke Dock M.I., Millwright—Music (2d)
1040—Angel, Henry, 22, Beauvoir Coll., teacher—Music (1st)

* The only Candidate who obtained a first-class certificate in this subject having previously obtained one of the same class, his paper was cancelled.

1065—Angles, Richard T., 22, City of Lond. Coll., printer—French (3d)
90—Ann, Alfred E., 18, Birm. and Midl. Inst., clerk—Free-hand Dwg. (2d)
252—Annington, Thirkell, 16, Burnley Lit. Inst., banker's clerk—Elect. and Mag. (3d); Chem. (3d)
1854—Appleton, Charles, 19, Liverpool Inst., clerk—Bkpg. (1st)
1384—Armitage, John, 17, Oldham Lyceum, pattern-maker—Geom. Dwg. (2d)
960—Armstrong, Edward O., 21, Leeds Ch. Inst., clerk—Bkpg. (2d)
287—Armstrong, John, 18, Carlisle M.I., clerk—Eng. Hist. (1st); Mensur. (2d)
1526—Arnold, Alfred, 21, Salford W. Men's Coll., clerk—Arith. (3d)
1031—Ashworth, John, 19, Lomeshaye Evg. Sch., weaver—Light and Heat (3d)
36—Aspin, Edward, 22, S.E. Rlwy. M.I., Ashford, iron-moulder—Arith. (2d)
363—Atkinson, Roger, 16, Crewe M.I., fitter—Arith. (2d)
1041—Austing, George P., 24, Beauvoir Coll., clerk—Music (1st); with 2nd Prize of £3
1660—Axon, William, 17, Stockport M.I., painter—Free-hand Dwg. (2d)

1202—Backhouse, Elizabeth, 20, Birkbeck Lit. Inst. (no occupation stated)—Eng. Hist. (1st), with 2nd prize of £3, and the Female prize of £2—Geog. (1st); with Female prize of £2
898—Bagley, Samuel, 17, Hulme W. Men's Club, chemist and druggist apprentice—Chem. (3d)
1032—Bailey, John, 21, Lomeshaye Evg. Sch., weaver—Light and Heat (3d)
395—Bailey, George, 26, Devonport M.I., shipwright—Eng. Hist. (2d)
1528—Bailey, Samuel H., 18, Salford W.Men's Coll., mechanic—Free-hand Dwg. (2d)
214—Bailey, Thomas, 27, Bristol Y. Men's Chr. Assoc., warehouseman—Arith. (3d); Bkpg. (3d)
39—Bailey, Walter, 18, S. E. Rlwy. M.I., Ashford, railway-clerk—Bkpg. (1st)
1884—Baird, Samuel, 21, Belfast Acad. Sci. Sch., flax-dresser—Arith. (2d)
816—Bairstow, Uriah, 21, Halifax W.M. Coll., clerk—Alg. (2d)
396—Baker, George H., 16, Devonport M.I., engineer (student)—Arith. (1st), with 1st. prize of £5; Eng. Hist. (2d)
1385—Baker, John, 21, Oldham Lyceum, mechanic—Pract. Mech. (3d)
625—Ballantyne, David, 17, Glasgow M.I., warehouse-man—Eng. Lit. (2d)
587—Ballantyne, James, 20, Glasgow Ath., salesman—French (3d)
795—Bamford, Thomas, 20, Halifax W.M. Coll., packer—Bkpg. (2d)
333—Banks, William, 18, Clitheroe M.I., teacher—Arith. (1st)
1722—Bannan, John, 30, Woolwich Roy. Arsenal M.I., fitter—Elect. and Mag. (3d)
331—Bannister, John, 32, St. George's Ch. Assoc., Chorley, clerk—Music (1st)
995—Barber, Henry, 22, Leeds M.I., clerk—Arith. (2d); Bkpg (3d)
1849—Barker, James L., 17, Liverpool Inst., stationer—Bkpg. (3d)
381—Barnaby, William, 32, Deptford Loc. Bd., boot-maker—Music (1st)
2101—Barrett, Emma J., 17, Farnham Y. Men's Assoc. (no occupation stated)—Free-hd. Dwg. (2d)
1201—Barrett, Eugene V., 23, Birkbeck Lit. Inst., clerk—Bkpg. (1st), with 1st prize of £5
919—Barwell, William C., 17, Ipswich W.M. Coll., assist. time-keeper—Eng. Hist. (3d)
471—Bateman, Isaac, 16, Earlestown Mut. Imp. Soc, compositer—Free-hd. Dwg. (3d)
1022—Batkin, William, 17, Lichfield W. Men's Inst., clerk—Arith. (3d); Bkpg. (3d)
1259—Battersby, Nathaniel, 20, Manchester M.I., clerk—Bkpg. (2d)
1141—Baum, Franz, 18, Roy. Polyt. Inst., photographer—Bkpg. (2d)
1656—Baxter, James, 18, Stockport M.I., clerk—Eng. Hist. (2d)
398—Bayly, John, 31, Devonport M.I., writer—Bkpg. (2d); Mens. (2d)
1205—Beard, Fanny, 38, Birkbeck Lit. Inst., daily governess—Arith. (1st); Italian (2d)
23—Beaton, James A., 18, Aberdeen M.I., clerk—Arith. (1st)
1279—Beckett, George E., 16, Manchester M.I., clerk—Arith. (3d)
1284—Beckett, William F., 18, Manchester M.I., clerk—Arith. (2d)
1223—Bedford, William G., 19, Malvern W.M. Inst., gardener—Dom. Econ. (2d); Geog. (2d)
249—Bell, Thomas, 19, Burnley M.I., architect—Arith. (1st)
1128—Bennett, Eva E., 17, Royal Polyt. Local Board, assistant teacher—Arith. (1st); Geog. (2d); Eng. Hist. (3d)
1838—Bennett, William, 21, Liverpool Inst., assistant provision dealer—Arith. (2d)
1609—Bennington, John W., 16, Sheerness Dockyard Inst., engineer student—Geog. (3d)
1301—Bennion, John A., 18, Manchester M.I., draughts-man—Geom. Dwg. (2d); Pract. Mech. (2d)
504—Bentley, Ralph, 17, Galgate M.I., joiner—Arith. (3d); Free-hd. Dwg. (3d)
1309—Berry, Thomas, 19, Mossley M.I., cotton-piecer—Bkpg. (2d)
594—Bertram, William, 18, Glasgow Ath., stationer—French (3d)
76—Best, James, 20, Belfast Lit. Inst., clerk—Elect. and Magn (2d)
188—Best, William, 17, Bradford M.I., manufacturer—French (3d)
1518—Betts, Frank, 17, Rugby Inst., attorney's clerk—Arith. (2d)
1597—Bills, William H. T., 20, Sheerness Dockyd. Inst., engineer student—Pract. Mech. (3d)
615—Binnie, James, 23, Glasgow Ath., book-keeper—French (3d)
882—Binns, Fred, 17, Huddersfield M.I., tailor—Free-hd. Dwg. (2d)
1529—Birchby, William, 17, Salford W.M. Coll., pupil-teacher—Elect. and Mag. (3d)
1001—Blades, Phinehas, 17, Leeds M.I., no occupation stated—Arith. (2d)
1212—Blair, Archibald J., 17, Louth M.I., pupil teacher—Arith. (3d)
511—Blair, James, 20, Anderson. Univ., Glasgow, clerk—Anim. Phys. (3d)
626—Blake, Robert, 16, Glasgow M.I., clerk—Bkpg. (2d)
1153—Blake, Samuel, 19, Royal Polyt. Inst., fruiterer—French (2d)
2102—Blakemore, George, 21, Farnham Young Men's Assoc., assistant master—Arith. (2d); Free-hd. Dwg. (1st)
945—Bland, William, 28, Lancaster M.I., letter-press printer—Chem. (3d)
1590—Boelke, Henry, 24, Scarbro' M.I., joiner—Arith-metic (2d)
891—Bolton, Edward, 20, Hull Christian and Lit. Inst., clerk—Bkpg (1st)
1042—Bond, William, 32, Beauvoir Coll., schoolmaster—Music (1st)
1247—Booth, George, 16, Manchester M.I., file-cutter—Arith. (2d)
1801—Booth, Isaac, 32, Denton M.I., book-keeper—Geom. Dwg. (3d); Bkpg. (3d)

807—Booth, James E., 21, Halifax W.M. Coll., clerk—Bkpg. (3d)
616—Borthwick, James D., 23, Glasgow Ath., clerk—Eng. Lit. (1st)
198—Bottomley, Alfred W., 17, Bradford M.I., warehouseman and clerk—Arith. (2d); Eng. Hist. (2d); French (3d)
2095—Bottomley, Samuel, 17, Eccleshill M.I., clerk—Arith. (3d)
1683—Bould, Frederick, 17, Wednesbury M.I., hammerman—Free-hd. Dwg. (3d)
1043—Bourke, William, 26, Beauvoir Coll., certificated master—Music (1st)
593—Bow, James, 16, Glasgow Ath., clerk—Bookkeeping (2d)
437—Bowen, Benjamin, 17, Droylsden Educ. Inst., clerk—Free-hd. Dwg. (3d)
1305—Bowers, Wright, 28, Hollins' Mill Mut. Imp. Soc., mechanic—Music (3d)
1288—Bowker, William, 20, Manchester M.I., mechanic—Geom. Dwg. (3d)
1019—Boyd, Alfred, 17, Leeds Y.M. Chris. Asso., cloth-finisher—Arith. (3d)
1939—Boyd, Pythagoras, 25, Accrington M.I., warehouse clerk—Elect. and Mag. (3d); Chem. (3d)
1238—Boyle, John, 22, Manchester M.I., mechanic—Arith. (3d)
383—Bradley, Alfred, 25, Greenwich Inst., gardener—Floric. (2d); Fruit and Veg. Cult. (2d); Bot. (3d) with Roy. Hort. Soc. Prize of £1
234—Bradshaw, John, 22, Burnley Church Inst., mule-spinner—Anim. Phys. (3d)
1845—Brereton, Abraham, 17, Liverpool Inst., sale-room attendant—Bkpg. (3d)
1966—Brett, Alfred B., 38, Burrage-road School, Plumstead, carpenter—Geom. Dwg. (3d)
1394—Bridge, Alfred, 24, Padiham Night-school, warehouseman—Anim. Phys. (3d)
92—Bridge, Thomas W., 19, Birmingham and Midland Inst., clerk—Anim. Phys. (2d)
847—Brierley, James, 20, Haslingden M.I., weaver—Geog. (2d); Dom. Econ. (3d); Anim. Phys. (3d)
382—Bright, Henry 33, Deptford Local Board, shipwright—Arith. (2d)
113—Brittle, John R., 22, Lambeth Evg. Classes, engineer—Geom. Dwg. (2d); Prin. Mech. (3d); Pract. Mech. (3d)
512—Broadfoot, James, 26, Anderson Univ., Glasgow, clerk—Bkpg. (3d)
1927—Broadhurst, George, 21, Stockport Y.M. Imp. Soc., warehouseman—Bkpg. (3d)
1610—Bromley, William, 17, Sheerness Dockyard Inst., engineer student—Geom. (3d); French (3d)
1360—Brooks, Peter, 22, Oldham Lyceum, brickmaker—Bkpg. (1st)
312—Brooks, Sidney, 17, Chelmsford M.I., cabinet-maker—Free-hd. Dwg. (3d)
1200—Brosnahan, William, 32, Birkbeck Lit. Inst., Inland Revenue officer—Bkpg. (1st); Light and Heat (2d); Anim. Phys. (3d)
1297—Broster, George A. B., 17, Manchester M.I., clerk Bkpg. (1st)
1843—Broughton, William H., 25, Liverpool Inst., engraver—Bkpg. (3d)
1044—Brown, Alfred, 46, Beauvoir Coll., schoolmaster—Music (2d)
600—Brown, David J., 16, Glasgow Ath., clerk—French (3d)
1519—Brown, George, 16, Rugby Inst., no oocupation stated—Arith. (1st); French (3d)
1732—Brown, George, 18, Woolwich Royal Arsenal M.I., wheeler—Mensur. (3d)
1954—Brown, George, 18, Burrage-road Sch., Plumstead, wheeler—Geom. Dwg. (3d)
327—Brown, Thomas, 42, St. George's Ch. Assoc., Chorley, schoolmaster—Arith. (1st); Alg. (1st); Bkpg. (2d); Geom. (3d)
1217—Brown, Thomas 19, Macclesfield Usef. Kn. Soc., designer—Music (3d); Free-hd. Dwg. (3d)
1593—Brown, Thomas F., 19, Sheerness Dock-yd. Inst., engineer (student)—Light and Heat (2d); Mensur. (2d); Pract. Mech. (2d)
513—Brown, William, 20, Anderson Univ., Glasgow, teacher—Alg. (1st); Geog. (2d)
514—Brown, William, 24, Anderson Univ., Glasgow, warehouseman—Light and Heat (2d)
316—Brown, William E., 17, Chelmsford M.I., architect's pupil—Free-hd. Dwg. (2d)
1532—Bryning, Mary, 23, Salford W. Men's Coll., teaching (prop.)—Free-hd Dwg. (3d)
627—Buchanan, David, 20, Glasgow M.I., engineer—Pract. Mech. (3d)
1890—Buchanan, Samuel, 31, Belfast Acad. Sci. Sch., teacher—Arith. (1st); Mensur. (2d)
93—Buckley, Henry C., 25, Birmingham and Midland Inst., schoolmaster—Geog. (2d)
1415—Budds, Thomas, 17, Parsonstown Y. Men's Chr. Assoc., clerk—Arith. (2d); Bkpg. (3d)
94—Bulpitt, Emily A., 25, Birmingham and Midland Inst., certificated schoolmistress—Animal Phys. (2d); Geog. (2d)
1499—Burbidge, Frederick W., 20, Richmond Par. Library, gardener—Floric. (1st), with 2d prize of £3, and the Roy. Hort. Soc. Prize of £3; Free-hd. Dwg. (2d); Botany (3d)
477—Burchall, Charles, 20, Earlestown Mut. Imp. Soc., clerk—Geom. Dwg. (3d)
952—Burcham, William E., 38, Lancaster M.I., cert. teacher—Chem. (3d); Animal Phys. (3d)
2118—Burge, Charles H., 21, Lambeth Evg. Classes, Inland revenue officer—Chem. (2d)
1189—Burgoyne, William, 21, Birkbeck Lit. Inst., clerk—Bkpg. (1st)
1068—Burke, Charles, 18, City of Lond. Coll., clerk—Arith. (2d)
1671—Burnand, Robert J., 20, Stockton M.I., boot-maker—Arith. (3d); Eng. Hist. (3d)
813—Burnett, William H., 17, Halifax W. Men's Coll., pupil teacher—Bkpg. (3d)
704—Burney, William, 17, Glasgow Tonic Sol-fa Soc., pawnbroker's assistant—Music (3d)
86—Burns, Francis, 21, Belfast Lit. Inst., clerk—Bkpg. (2d)
1045—Burr, Augustus P., 26, Beauvoir Coll., broker's clerk—Music (2d)
977—Burton, Frederick H., 17, Leeds M.I., soap-boiler—Mining and Metall. (1st), with 1st prize of £5; Chem. (2d)
466—Burton, George, 21, Dudley M.I., clerk—Arith. (2d)
158—Bury, Oswald, 20, Bolton Ch. Inst., warehouse-man—Arith. (3d)
1913—Butler, Edwin, 17, Messrs. Bagnall's Schools, Gold's hill, wheelborer—Free-hand Dwg. (3d)
1443—Butler, George, 16, Pembroke Dock M.I., ship-wright's apprentice—Arith. (1st)
400—Butler, Richard Jago, 19, Devonport M.I., engineer (student)—Conic Sections (1st), with 1st prize of £5; Prin. Mech. (1st), with 2nd prize of £3; Pract. Mech. (2d)
984—Butterfield, John C., 18, Leeds M.I., analyt. chemist—Chem. (2d); Free-hand Dwg. (3d); Geog. (3d)
1765—Byatt, Horace, 24, Woolwich Western Mission Sci. Sch., schoolmaster—Geom. Dwg. (2d)
1533—Byrne, Thomas, 24, Salford W. Men's Coll., debt-collector—Latin and Rom. Hist. (2d)

515—Campbell, Archibald, 26, Anders. Univ. Glasgow, chemist—Light and Heat (3d); Dom. Econ. (1st), with Mr. Twining's prize of £2
1069—Campbell, Archibald, 21, City of Lond. Coll., clerk—Bkpg. (2d)
516—Campbell, Duncan, 28, Anders. Univ. Glasgow, ship-carver—Ani. Phys. (3d)

687—Campbell, John, 39, Glasgow Tonic Sol-fa Soc., calenderer—Music (2d)
1967—Candler, George, 26, Burrage-rd. Sch., Plumstead, carpenter—Geom. Dwg. (3d)
838—Card, Thomas E., 31, Handsworth W. M. Club, carpenter and joiner—Free-hd. Dwg. (2d)
948—Cardwell, Edward, 23, Lancaster M. I., chemist and druggist—Ani. Phys. (3d)
1862—Cargill, David, 26, Liverpool I. Local Board, gardener—Floric. (2d); Fruit and Veg. Cul. (1st)
1893—Carmichael, William, 26, Belfast Acad. Sci. School, book-keeper—Arith. (2d)
1240—Carter, Claude, 16, Manchester M. I., mechanical engineer—Geom. Dwg. (2d)
1751—Carter, Robert A., 22, Woolwich Royal Arsenal Sci. School, shipwright—Geom. Dwg. (2d)
1292—Carter, William, 19, Manchester M. I., engineer—French (3d)
1070—Carter, William D. C., 22, City of Lond. Coll., clerk—Bkpg. (1st)
1773—Casson, Thomas, 24, Worcester Railway I., mechanical draughtsman—Light and Heat (2d); Mensur. (2d)
95—Caswell, Charles B., 17, Birmingham and Midland I., printer—Chem. (2d); Ani. Phys. (2d)
1182—Cecil, Henry, 19, Birkbeck L. I., clerk—Geo. (2d)
474—Chadderton, Joseph, 26, Earlestown District Infants School, labourer—Geom. Dwg. (3d)
1210—Challoner, William, 20, Birkbeck L. I., warehouseman—Free-hd. Dwg. (2d)
592—Chalmers, David, 19, Glasgow Ath., draper—French (3d)
1337—Chancelor, Henry, 18, New Swindon M. I., pattern maker's apprentice—Arith. (2d)
401—Chapple, Samuel, 17, Devonport M. I., accountant Arith. (2d)
1662—Charlesworth, James, 26, Stockport M. I., clerk—Arith. (1st); Dom. Econ. (1st), with prize of books to the value of £1; Mensur. (2d)
2056—Charlesworth, Thomas, 23, St. Thomas' School, Woolwich, assistant teacher—Geom. Dwg. (3d)
1663—Charlesworth, William, 17, Stockport M.I., clerk Arith. (1st); Bkpg. (1st)
1193—Chatterley, Robert J., 21, Birkbeck L.I., clerk—Arith. (2d); Eng. Hist. (2d); Geog. (1st)
900—Cheetham, Thomas, 16, Hulme W.M. Club, book-keeper—Arith. (3d)
1733—Cheshire, Thomas W., 28, Woolwich Royal Arsenal M.I., carpenter—French (3d)
1788—Chesney, Samuel, 19, York M.I., linendraper—Eng. Hist. (3d)
1046—Chipperfield, Frederick W., 38, Beauvoir Coll., schoolmaster—Music (2d)
2003—Chittick, William H., 27, St. Thomas's School, Woolwich, clerk—Anim. Phys. (3d)
607—Christie, William E., 23, Glasgow Ath., salesman—French (3d)
1072—Chubb, Nicholls D., 17, City of Lond. Coll., clerk—Bkpg. (1st)
2104—Chuter, George, 17, Farnham Y.M. Assoc., architect's pupil—Arith. (3d); Mens. (3d)
402—Clark, Robert G., 29, Devonport M.I., shipwright—Bkpg. (1st)
1728—Clark, Thomas G., 30, Woolwich Royal Arsenal M.I., caulker—Arith. (1st); Mens. (2d)
1346—Clark, William, 16, New Swindon M.I., clerk—Bkpg. (2d)
1269—Clark, William J., 19, Manchester M.I., millwright—Bkpg. (3d)
1295—Clarke, George S., 17, Manchester M.I., shipping clerk—Arith. (2d)
1074—Clarke, Henry G., 21, City of Lond. Coll., jeweller Bkgp. (1st)
1624—Clarke, Samuel, 17, Southampton Ath., merchant's clerk—Bkpg. (2d)
1260—Clarke, William, 25, Manchester M.I., office clerk—Bkpg. (1st)
1075—Clarkson, Evans, 19, City of Lond. Coll., clerk—Arith. (1st); Bkpg. (1st)
1152—Clarkson, Frank, 23, Roy. Polyt. Inst., science student—Chem. (2d); Elect. and Mag. (3d)
1914—Clayton, Edwin, 19, Messrs. Bagnall's Schools, Gold's Hill, assistant master—Alg. (3d)
1916—Clayton, Joseph, 16, Messrs. Bagnall's Schools, Gold's Hill, clerk—Free-hd. Dwg. (3d)
987—Clayton, William W., 18, Leeds M.I., fitter—Pract. Mech. (2d)
1719—Cleall, Arthur, 17, Woolwich Roy. Arsen. M.I., iron turner—Arith. (2d); Mens. (3d)
1076—Clementson, Arthur E., 16, City of Lond. Coll., clerk—French (3d)
1344—Clere, John H. de J., 18, New Swindon M.I., apprentice engine fitter—Arith. (2d); Free-hd. Dwg. (3d)
1406—Cochran, John, jun., 29, Paisley Artiz. Inst., packer—Music (3d)
1878—Cochrane, Ernest, 17, Belfast Acad. Sci. Sch., no occupation—Arith. (3d)
1175—Cocking, Alfred E., 17, Birkbeck Lit. Inst., clerk French (3d)
815—Cockroft, Ellis, 21, Halifax W.M. Coll., wool-sorter—Arith. (2d); Bkpg. (2d)
1321—Coe, Samuel, 21, New Mills Inst., cotton spinner Arith. (3d)
1772—Cole, Thomas E., 19, Worcester Cath. Inst., glover—Light and Heat (3d); Anim. Phys. (3d); Eng. Hist. (3d)
841—Collins, Thomas, 29, Handsworth W.M. Club, artist—Free-hd. Dwg. (2d)
893—Collier, Thomas, 17, Christchurch (Hulme) Inst., warehouseman—Arith. (2d)
939—Colman, Andrew J., 18, King's Lynn Ch. of Eng. Y. M. Inst., builder's clerk—Arith. (2d)
578—Colquhoun, Andrew S. D., 25, Glasgow Ath., Merchant—French (2d)
2139—Conning, James, 26, Greenwich Lit. Inst., shipwright—Geom. Dwg. (3d)
496—Cook, Rachel S., 20, Edinburgh Local Board, no occupation given—Anim. Phys. (2d); Latin and Roman Hist. (1st)
4—Cook, William, 21, Aberdeen M.I., reporter—French (1st)
1473—Cooke, Henry, 16, Preston M.I., surveyor—Free-hd. Dwg. (3d)
31—Cooper, Harry, 17, S.E. Railway M.I., Ashford, pupil teacher—Arith. (1st); French (2d)
1294—Cornelius, Alexander, 17, Manchester M.I., book-keeper—Bkpg. (3d)
1592—Corner, John T., 18, Sheerness Dockyard Inst., engineer student—Arith. (1st); Princ. Mech. (1st); Pract. Mech. (2d); Conic Sec. (3d)
1635—Coulbert, Joseph, 21, Southampton Ath., clerk—Arith. (1st)
518—Couper, John, 29, Andersonian Univ., Glasgow, joiner—Anim. Phys. (3d)
2067—Courteen, Henry, 18, Gloucester Free Library, clerk—Alg. (3d)
1753—Courtman, Reuben S., 18, Woolwich. Roy Arsen. M.I., fitter—Geom. Dwg. (2d)
489—Cowan, George, jun., 18, Edinburgh Watt Inst., clerk—Arith. (3d)
1272—Cowley, John, 29, Manchester M.I., townsman—Free-hd. Dwg. (3d)
517—Cox, George, 22, Andersonian Univ., Glasgow, clerk—Chem. (1st)
1181—Cox, James E., 23, Birkbeck Lit. Inst., accountant's clerk—Arith. (1st); Eng. Hist. (1st), with 1st prize of £5; Eng. Lit. (2d); Geog. (2d)
1030—Crabtree, William, 23, Lomeshaye Evg. Sch., weaver—Light and Heat (3d)
618—Craig, John, 18, Glasgow Inst., clerk—Eng. Hist. (2d)
1841—Craine, Edward, jun., 16, Liverpool Inst., clerk—Arith. (2d)

1856—Craine, Thomas, 18, Liverpool Inst., clerk—Geog. (3d)
1078—Cranston, Edwin, 22, City of Lond. Coll., clerk—Arith. (2d); Eng. Hist. (2d)
603—Crawford, William, 20, Glasgow Ath., clerk—Eng. Lit. (3d)
1872—Crawshaw, Joseph, 33, Heywood M.I., joiner—Geom. Dwg. (3d)
1079—Creaton, Henry, 20, City of Lond. Coll., clerk—French (3d)
2091—Crebbin, James, C., 17, St. Michael's Sch., Bromley (Middl.), clerk—Arith. (2d)
617—Crichton, James, 27, Glasgow Ath., commercial traveller—Logic, &c., (1st), with 1st prize of £5
883—Crook, Robert, 18, Huddersfield M.I., tobacconist—Arith. (3d)
241—Crossley, Jonas, 21, Burnley M.I., weaver—Bkpg. (2d)
629—Crow, John, 18, Glasgow M.I., mech. draughtsman—Arith. (3d)
184—Crowther, George, 16, Bolton Ch. Inst., surveyor—Arith. (3d)
1004—Crowther, Herbert, 27, Leeds M.I., store clerk—Arith. (2d)
630—Crum, John, 16, Glasgow M.I., clerk—Bkpg. (2d)
867—Cryer, Thomas, 18, Holbeck M.I., mechanic—Arith. (1st); Eng. Hist. (3d)
631—Cubie, John P., 19, Glasgow M.I., clerk—French (3d)
857—Cullwick, Benjamin, 30, Hastings M.I., watchmaker—Eng. Hist. (2d); Eng. Lit. (2d)
356—Cullinane, William, 17, Cork Y. Men's Cath. Society, draper—Arith. (1st)
1150—Culverhouse, George, 22, Royal Polyt. Inst., gunmaker—Geom. (3d)
213—Cumming, Alfred, 21, Bristol Y. Men's Chr. Assoc., bootmaker—Arith. (3d)
1618—Cummings, George R. T., 17, Sheerness Dockyd. Inst., engineer student—French (3d)
632—Cunningham, Andrew, 16, Glasgow M.I., clerk—Bkpg. (1st)
519—Cunningham, John R., jun., 19, Andersonian Univ., Glasgow, commercial clerk—Anim. Phys. (3d)
633—Cunningham, John R., jun., 19, Glasgow M.I., clerk—Spanish (2d)
1408—Cunningham, Thomas A., 19, Paisley Artiz. Inst., clerk—Arith. (1st); French (3d)
273—Cussons, George, 21, Bury Ath., turner—Free-hd. Dwg. (3d)
215—Custer, John, 17, Bristol Y.M. Chris. Assoc., clerk—Arith. (3d); Bkpg. (3d)
78—Cuthbert, Robert, 21, Belfast Lit. Inst., clerk—Bkpg. (2d)

28—Dale, John, 33, Alderley Edge Educ. Inst., cabinet maker (and science teacher)—Music (2d); Geom. Dwg. (3d)
1136—Dames, Elizabeth A., 16, Royal Polyt. Local Board, (no occupation stated)—Dom. Econ. (2d)
2053—Dance, William, 22, St. Thomas' School, Woolwich, shipwright—Geom. Dwg. (2d)
1024—Davenport, William J., 23, Lichfield W.M. Inst., grocer's assistant—Bkpg. (3d)
873—Davidson, Joseph, 25, Holywell-green M.I., bookkeeper—Music (3d)
2078—Davies, Elijah K., 19, Gloucester Free Library, dentist (art. pupil)—French (3d)
1599—Davies, Louis G., 16, Sheerness Dockyard Inst., shipwright apprentice—Arith. (2d); Princ. Mechan. (2d)
1431—Davies, William, 26, Patricroft M.I., draughtsman—Geom. Dwg. (3d)
96—Davis, Elizabeth, 22, Birm. and Midl. Inst.—Geog. (1st); French (3d)
403—Dawe, Thomas, 17, Devonport M.I., clerk—Arith. (1st); Navig. and Naut. Astron. (1st), with 1st prize of £5; Mensur. (1st)
434—Dawson, George, 16, Droylsden Educ. Inst., pupil-teacher—Arith. (3d); Free-hd. Dwg. (3d)
*905—Dawson, William, 19, Christchurch (Hulme) Inst., putter-out—Arith. (3d)
879—Dearden, Frederick W., 18, Huddersfield M.I., clerk—Arith. (2d); Bkpg. (2d); French (2d); Mensur. (2d)
97—De Main, James, 17, Birm. and Midl. Inst., pupil teacher—Anim. Phys. (2d); Geog. (2d
1208—Dennes, Charles, 33, Birkbeck Lit. Inst., upholst.—Free-hd. Dwg. (2d)
212—Derisley, James G., 18, Bristol Yng. Men's Chris. Assoc., clerk—Bkpg. (3d)
1692—Derry, Alfred E., 19, St. Peter's Sch., Wolverhampton, tailor—Anim. Phys. (3d)
329—Dewhurst, John J., 18, St. George's Church Assoc. Chorley, clerk—Bkpg. (2d)
711—Dick, Robert W., 24, Glasgow Tonic Sol-Fa Soc., letter-press printer—Music (3d)
634—Dickson, William, 17, Glasgow M.I., clerk—Arith. (2d)
808—Dilworth, William P., 20, Halifax W.M. Coll., designer—Bkpg. (2d)
1319—Dobell, Douglas D., 23, Newcastle-on-Tyne Ch. Inst., assist. surv. of taxes—Pol. and Soc. Econ. (3d.)
811—Dobson, Samuel, 21, Halifax W.M. Coll. overlooker—Bkpg (3d)
284—Dobson, Thomas G., 22, Carlisle M.I., com. clerk—Bkpg. (2d)
1447—Dodd, Thomas J., 20, Portsea Yng. Men's Chris. Assoc., shipwright—Mensur. (2d); Trigon. (3d)
1857—Donnelly, Daniel, 17, Liverpool Inst., clerk—Arith. (2d); Eng. Hist. (3d)
1420—Dooley, Henry, 17, Parsonstown Yng. Men's Chris. Assoc., clerk—Arith. (1st); Eng. Hist. (3d)
1622—Dorrell, Arthur J., 18, Slough M.I., carpenter—Geom. Dwg. (3d)
2051—Dorrell, Charles F., 23, St. Thomas', Woolwich, Loc. Bd., clerk—Geom. Dwg. (2d)
1536—Douglas, Anne P., 31, Salford W.M. Coll., schoolmistress—French (2d); German (3d)
98—Dowling, John N., 19, Birm. and Midl. Inst., insurance clerk—French (2d)
1711—Downar, William A., 33, Woolwich R.A. Eveng. Classes, draughtsman—Chem. (3d)
1809—Downs, John, 21, Hope Chapel Y.M. Soc., Denton, hatter—Geog. (3d)
1839—Dowson, John, 21, Liverpool Inst., letter carrier—Bkpg. (3d); Alg. (3d)
22—Drummond, Robert, 20, Aberdeen M.I., clerk—French (3d)
368—Drummond, Robert, 29, Crewe M.I., engine fitter—Arith. (3d)
140—Duckworth, Walter, 21, Bolton M.I., clerk—Arith. (1st)
635—Dudgeon, George B., 18, Glasgow M.I., mech. draughtsman—Arith. (3d)
1039—Duerden, Charles, 21, Lomeshaye Evg. Sch., joiner—Arith. (3d)
1865—Duerr, George, 21, Heywood M.I., leather dresser—Chem. (3d)
485—Duff, William, 31, Edinburgh Watt. Inst., clerk—Arith. (1st)
1145—Duffy, F. P., 28, Roy. Polyt. Inst., city missionary Arith. (3d); Anim. Phys. (3d); Geom. (3d)
99—Dugard, William H., 21, Birmingham and Midland Inst., metal roller—Pract. Mech. (2d)
18—Dunbar, William B., 18, Aberdeen M.I., clerk—Arith. (3d)
457—Dunkerley, Eliza, 18, Droylsden Educ. Inst., weaver—Dom. Econ. (3d)
877—Dyson, William H., 26, Huddersfield M.I., waste dealer—French (2d)

1611—Edgar, John, 19, Sheerness Dockyard Inst., engineer student—Arith. (1st); Prac. Mech. (3d)

100—Edmonds, Sarah, 21, Birmingham and Midland Inst., teacher—French (3d)
2008—Edwards, Edgar, 27, St. Thomas's Sch., Woolwich, millwright—Geom. Dwg. (3d)
1348—Edwards, Joseph J., 19, New Swindon M.I., clerk —Bkpg. (2d)
636—Elder, Charles, 16, Glasgow M.I., apprentice measurer—Bkpg. (1st)
637—Elder, John L., 18, Glasgow M.I., clerk—Bkpg. (2d)
1081—Elgar, William, 25, City of London Coll., clerk —Arith. (3d)
2064—Ellercamp, Henry G., 27, St. Thomas's School, Woolwich, carpenter—Geom. Dwg. (3d)
1038—Elliott, Hartley, 16, Lomeshaye Evg. Sch., weaver, Arith. (2d)
2044—Ellis, Alfred, 22, St. Thomas's Sch. Woolwich, book-keeper—Geom. Dwg. (2d)
2130—Ellis, George, 20, Greenwich Lit. Inst., engine fitter—Geom. Dwg. (3d)
404—Ellis, Richard J., 23, Devonport M.I., shipwright —Bkpg. (1st); Mensur. (1st); Trigon. (3d)
1899—Ellison, James J., 25, Belfast Acad. Sci. Sch., master of school buildings, Union Workhouse —Arith. (2d); Eng. Hist. (3d); Pol. and Soc. Econ. (3d); Geog. (3d)
1937—Eltoft, Thomas, 22, Accrington M.I., shop-assistant—Chem. (2d); Elect. and Magn. (3d); Anim. Phys. (3d)
993—Embleton, Charles, 22, Leeds M.I., mechanic—Alg. (3d); Geom. (3d)
1312—Emmerson, William, 20, Middlesbro M.I., pattern-maker—Elect. and Mag. (3d)
2145—Endersby, William, 17, Lambeth Evg. Classes, clerk—Arith. (2d)
282—Entwistle, Benjamin E., 24, Bury Ath., architect's clerk—Free-hd. Dwg. (1st)
1830—Evans, John, 19, Liverpool Inst., joiner—Arith. (3d)
1919—Evans, Mary Ann, 16, Messrs. Bagnalls' Girl's Evg. School, Gold's Hill, dressmaker—Dom. Ecom. (1st), with prize of books to the value of £1
1539—Evans, Thomas, 20, Salford W. Men's Coll., chemist and druggist—Latin and Rom. Hist. (3d)
314—Eve, George P., 17, Chelmsford M.I., (no occupation stated)—Free-hd. Dwg. (3d)

1338—Falconer, William, 20, New Swindon M.I., engine-fitter—Arith. (2d); Bkpg. (3d)
47—Fallows, Thomas, 17, Ashton and Dukinfield M.I., piecer—Eng. Hist. (2d)
1082—Fantham, Thomas, 27, City of London Coll., clerk—Bkpg. (2d)
1972—Farlie, John L., 23, Burrage-road Schools, Plumstead, painter, &c.—Geom. Dwg. (3d)
712—Faulds, Alexander, 19, Glasgow Tonic Sol-fa Soc., draper—Music (3d)
2152—Fearon, William, 21, Gilford Mut. Imp. Soc., clerk—Arith. (2d)
1686—Fellows, Noah, 17, Wednesbury M.I., millman—Arith. (3d)
1672—Fenton, John, 17, Tottington Mut. Imp. Soc., book-keeper—Arith. (2d); Bkpg. (3d)
84—Ferguson, Hugh, 23, Belfast Lit. Inst., clerk—Bkpg. (1st)
1897—Ferguson, John, 19, Belfast Acad. Sci. Sch., teacher—Eng. Hist. (2d)
1540—Ferneley, Thomas M., 16, Salford W. Men's Coll., pupil teacher—Geog. (2d)
1917—Fidler, Hannah, 16, Messrs. Bagnall's Girls' Evg. Schools, Gold's Hill, tailoress—Dom. Econ. (2d)
602—Finlayson, John McL., 18, Glasgow Ath., clerk—German (3d)
205—Firth, George, 19, Bradford M.I., warehouseman —Arith. (2d)
1148—Fisher, Henry, 23, Roy. Polyt. Inst., clerk—Elect. and Mag. (1st), with 1st prize of £5; Chem. (1st); Anim. Phys. (2d)
878—Fitton, Tom, 18, Huddersfield M.I., fulling-miller Arith. (2d)
1438—Fitze, Mrs. Elizabeth J., 24, Pembroke Dock M.I. (no occupation stated)—Arith. (2d)
1047—Fitzsimmons, William J., 22, Beauvoir Coll., compositor—Music (2d)
1190—Flegg, Robert, 17, Birkbeck Lit. Inst., clerk—Eng. Hist. (2d); Geog. (2d); Free-hd. Dwg. (2d); Arith. (3d)
1165—Fletcher, Thos., 19, Roy. Polyt. Inst., draughtsman—Chem. (2d)
935—Floyd, William, 17, King's Lynn Ath., solicitor's clerk—Lat. and Rom. Hist. (3d)
357—Flynn, James C., 16, Cork Y. M. Cath. Society, draper and clerk—Arith. (2d); Eng. Hist. (2d)
2055—Ford, Charles C., 17, St. Thomas's School, Woolwich, architect's pupil—Geom. Dwg. (3d)
405—Ford, Francis, 20, Devonport M.I., engineer student—Princ. Mech. (1st)
1780—Foster, Lancelot, 23, York Inst., grocer—Music (3d)
1483—Foster, Richard, jun., 18, Preston M.I., clerk—Arith. (2d)
1634—Fothergill, Emma, 19, Southampton Ath.—Free-hd. Dwg. (2d)
262—Fox, John, 19, Bury Ath., fitter—Geom. Dwg. (3d)
1345—Fox, William, 18, New Swindon M.I., pupil teacher —Arith. (3d)
521—Fraser, John, 20, Anderson. Univ., Glasgow, clerk Anim. Phys. (3d)
1515—Freeman, Arthur, 17, Rugby Inst., clerk—Arith. (2d)
72—French, Alfd., 28, Banbury M.I., baker—Botany (2d)
2119—Fryer, Charles, 27, Lambeth Evg. Classes, florist —Floric. (2d)
2141—Furniss, Thos. S., 18, Greenwich Lit. Inst., engineer apprentice—Geom. Dwg. (3d)
2144—Fyson, George A., 17, Lambeth Evg. Classes, eng. apprentice—Arith. (2d)

972—Galleway, Joseph L., 22, Leeds M.I., painter and varnish maker—Chem. (3d)
33—Garaway, Thomas C., 22, S.E. Rlway. M.I., Ashford, railway clerk—Arith. (1st); Bkpg. (3d)
1606—Gardener, John, 18, Sheerness Dockyd. Inst., eng. student—Arith. (1st); Geom. (3d)
1469—Gardner, William, 18, Preston M.I., architect and surv.—Free-hd. Dwg. (3d); Geom. Dwg. (3d)
1863—Gardner, Thomas, 33, Liverpool Inst. Loc. Bd., national-school master—Music (1st)
523—Garroway, John, 18, Anderson. Univ. Glasgow, student—Chem. (3d)
1262—Garside, Alfred B., 21, Manchester M.I., clerk—Bkpg. (2d)
1918—George, Susannah, 16, Messrs. Bagnall's Girls' Ev. Sch., Gold's Hill, domestic—Dom. Econ. (2d)
639—Gibb, William, 22, Glasgow M.I., mechanical draughtsman—Geom. (3d)
361—Gibbons, John F., 17, Cork Cath. Y.M.S., clerk—Eng. Hist. (3d)
1629—Gilbert, Emma, 25, Southampton Ath., daily gov. —Arith. (2d); Eng. Hist. (2d); French (2d)
35—Giles, Richard R., 19, S.E. Railway M.I., Ashford, railway clerk, Bkpg. (1st)
1084—Gill, Walter, 19, City of Lond. Coll., clerk—Bkpg. (2d)
1640—Gilloley, Thomas, 16, Southampton Ath., colourist —Free-hd. Dwg. (3d)
1864—Given, William, 25, Liverpool Inst., teacher—Bkpg. (2d)
1025—Gladman, John T. H. G., 19, Lichfield W.M. Inst., staff-serjeant—Music (1st)
1718—Glass, Henry, 18, Woolwich, R.A.M.I., book-keeper—Arith. (2d)
1221—Godfrey, William G., 22, Malvern W.M. Inst., ironmonger's assistant—Arith. (2d)
1702—Golby, Thomas, 20, Wolverhampton Ath., clerk—Chem. (3d)

1699—Goodman, Thomas, 19, St. Peter's Evng. Sch., Wolverhampton, carpenter—Arith. (3d); Anim. Phys. (3d)

1697—Goodman, Walter, 20, St. Peter's Eveng. Sch., Wolverhampton, clerk—Arith. (3d); Animal Phys. (3d)

167—Goodwin, Richard, 21, Bolton Ch. Inst., book-keeping—Geom. Dwg. (3d)

1680—Goold, William A., 20, Walsall Ch. Inst., saddler —Music (2d)

13—Gordon, Andrew, 20, Aberdeen M.I., bank clerk —French (3d)

1926—Gosling, Joseph W., 23, Stockport Y.M. Imp. Soc., warehouseman—Bkpg. (3d)

2017—Gough, William G., 23, St. Thomas's Sch., Woolwich, shipwright—Geom. Dwg. (2d)

151—Goulding, Ebenezer, 18, Bolton M.I., clerk—Geom. Dwg. (3d)

699—Govan, Colin, 31, Glasgow Tonic Sol Fa Soc., book-keeper—Music (3d)

1935—Graham, Joseph F., 17, St. Stephen's School, Westminster, clerk—Geog. (2d); Eng. Hist. (3d)

640—Graham, Robert, 21, Glasgow, M.I., wholesale newsagent—Spanish (3d)

1836—Graham, William J., 16, Liverpool Inst., office lad—Bkpg. (3d)

235—Grant, John H., 16, Burnley Ch. of Eng. Lit. Inst., school assistant—Arith. (1st); Alg. (3d); Chem. (3d)

1425—Gratrix, Timothy, 16, Patricroft M.I., clerk—Arith. (3d)

1085—Gravenor, James, 16, City of Lond. Coll., clerk—Arith. (1st); Mensur. (2d)

484—Gray, Andrew, 20, Edinburgh Watt. Inst., mason, —Arith. (1st)

688—Gray, David, 24, Glasgow Tonic Sol-fa Soc., pattern-maker—Music (2d)

1774—Gray, Robert, 16, Worcester Rlwy. Inst., clerk—Arith. (1st); Eng. Hist. (2d)

1009—Greaves, William, 19, Leeds Y. Men's Chr. Assoc., machine printer—Arith. (3d)

1048—Green, Charles E., 24, Beauvoir Coll., cabinet-maker—Music (2d)

1086—Green, Henry G., 28, City of Lond. Coll., draper —Arith. (1st); Alg. (3d)

845—Green, John R., 20, Haslingden M.I., pattern maker—Music (3d)

1448—Green, William, 17, Portsea Y. Men's Chr. Assoc., engineer (student)—Arith. (1st); Alg. (1st), with 1st prize of £5; Mensur. (1st)

1185—Greenfield, William, 21, Birkbeck Lit. Inst., shorthand clerk—Bkpg. (2d)

828—Greenhalgh, John, 17, Halifax W. Men's Coll., teacher—Arith. (2d)

248—Greenway, Charles M., 20, Burnley M.I., chemist and dentist—Anim. Phys. (3d)

781—Greenwood, Charles, 21, Halifax M.I., printer—Bkpg. (3d)

1945—Greenwood, Holmes, 20, Accrington M.I., warehouseman—Arith. (1st)

60—Greenwood, James, 17, Bacup M.I., weaver—Arith. (2d)

237—Greenwood, William, 18, Burnley M.I., Warehouseman—Arith. (3d)

1276—Greenwood, William H., 22, Manchester M.I., engineer—Pract. Mech. (1st), with 1st prize of £5; Geom. (2d); Conic Sect. (3d)

700—Greer, William, 29, Glasgow Tonic Sol-Fa Soc., cooper—Music (3d)

1541—Gretton, John J., 20, Salford W.M. Coll., clerk—Arith. (1st); Bkpg. (2d); Geog. (2d)

1614—Grieve, William H., 18, Sheerness, &c., M.I., naval engineer student—Alg. (2d); Geom. (3d)

1440—Griffiths, Henry, 26, Pembroke Dock M.I., shipwright—Mensur. (2d)

1049—Griffiths, John A., 20, Beauvoir Coll., student—Music (1st)

918—Grimswade, John R., 19, Ipswich W.M. Coll., tailor—Eng. Hist. (3d)

1026—Guttridge, Thomas, jun., 27, Lichfield W.M. Inst., grocer's assistant—Bkpg. (2d)

1684—Hackwood, William F., 16, Wednesbury M.I., pupil teacher—Arith. (2d); Eng. Hist. (3d); Geog. (3d)

1825—Hadfield, John H., 21, Stockport M.I., no occupation given—Princ. Mech. (3d)

1203—Haggitt, Catherine S., 42, Birkbeck Lit. Inst., teacher—German (2d)

1461—Hague, Jonathan, 20, Preston M.I., apprentice—Anim. Phys. (3d)

461—Hale, Agnes, 20, Dudley M.I., teacher (proposed), French (3d)

1258—Haliday, Samuel, 20, Manchester M.I., clerk—Bkpg. (3d)

641—Hall, David, jun., 16, Glasgow M.I., warehouseman—Arith. (2d)

1493—Hall, Edward, 21, Redditch Lit. and Scien. Inst., assistant master—Arith. (1st); Anim. Phys. (3d)

852—Hall, George H., 23, Hastings M.I., bootmaker—Bkpg. (3d)

161—Hall, Henry, 21, Bolton Ch. Inst., book-keeper—Arith. (3d)

1342—Hall, Thomas, 20, New Swindon M.I., engine-fitter—Arith. (3d)

1361—Halliwell, Benjamin, 19, Oldham Lyceum, warehouseman—Arith. (2d); Bkpg. (3d)

1037—Halstead, Joseph, 18, Lomeshaye Evg. Sch., weaver—Arith. (2d)

246—Halstead, Samuel, 21, Burnley M.I., weaver—Anim. Phys. (3d)

1632—Hamilton, James T., 19, Southampton Ath., assurance clerk—Eng. Hist. (2d)

1628—Hamilton, William F., 19, Southampton Ath., architect's clerk—Eng. Hist. (1st); Alg. (3d)

1174—Hamley, Francis J., 18, Birkbeck Lit. Inst., clerk —French (3d)

1416—Hampton, Edward, 17, Parsonstown Y. Men's Ch. Assoc., soldier—Arith. (2d); Eng. Hist. (2d)

1739—Hanlon, John W., 20, Woolwich Roy. Arsen. M.I., mechanic—Geom. Dwg. (3d)

1855—Hannah, Francis C., 19, Liverpool Inst., clerk—Alg. (3d); Geog. (3d)

797—Hanson, John H., 17, Halifax W. Men's Coll., overlooker—Bkpg. (3d)

1782—Hardcastle, Henry, 18, York M.I., clerk in gas-works—Mensur. (3d)

1421—Harding, Richard, 36, Parsonstown Y. Men's Chr. Assoc., clerk—Bkpg. (2d); Eng. Lit. (3d)

1542—Hardman, James, 23, Salford W. Men's Coll., book-keeper—Bkpg. (1st); Geog. (2d); Arith. (3d)

1545—Hare, Henry, 17, Salford W. Men's Coll., salesman—Arith. (2d)

2093—Harper, Frederick, 17, Eccleshill M.I., wool-sorter —Arith. (1st)

869—Harper, John, 27, Holywell Green M.I., wool-stapler—Music (1st)

979—Harries, Richard E., 30, Leeds M.I., no occupation stated—Chem. (2nd)

1224—Harris, Ernest, 17, Malvern W. Men's Inst., iron-monger's apprentice—Arith. (2d)

1544—Harrison, Anne, 26, Salford W. Men's Coll., schoolmistress—French (2d)

1366—Harrison, Joseph E., 20, Oldham Lyceum, draughtsman—Chem. (2d)

1929—Hart, Sydney J., 20, Blandford Lit. Inst., grocer—Arith. (2d)

585—Harvie, Duncan, 17, Glasgow Ath., clerk—French (3d)

102—Haseler, Rowland, 17, Birm. and Midl. Inst., watchmaker—Prac. Mech. (2d)

1196—Haskins, George P., 21, Birkbeck Lit. Inst., solicitor's clerk—Arith. (1st); Bkpg. (1st)
175—Haslam, Edward, 34, Bolton Ch. Inst., clerk—Anim. Phys. (3d)
1396—Hattrick, Alexander, 24, Paisley Artiz. Inst., smith—Music (3d)
250—Haworth, Frank, 18, Burnley M.I., book-keeper—Bkpg. (3d)
1601—Hay, David, 16, Sheerness Dockyd. Inst., shipwright appr.—Arith. (2d)
1050—Haynes, Isaac, 25, Beauvoir Coll., carpenter and blindmaker—Music (2d)
868—Healey, George, 35, Holywell Green M.I., schoolmaster—Italian (3d)
1706—Heastie, John A., 18, St. Peter's Evg. Sch., Wolverhampton, railway clerk—Arith. (3d); Anim. Phys. (3d)
103—Heath, Alfred, 21, Birm. and Midl. Inst., jewel-case maker—Arith. (3d)
1546—Heaton, Ellen, 21, Salford W.M. Coll., private governess—French (3d)
863—Hebden, George W., 17, Holbeck M.I., clerk—Arith. (3d); Geog. (3d); Eng. Hist. (2d)
1349—Hefford, Joseph G., 22, New Swindon M.I., cert. teacher—Latin and Rom. Hist. (1st)
821—Hellwell, William H., 20, Halifax W.M. Coll., dyer—Chem. (3d)
951—Hemingway, Joseph, 16, Lancaster M.I., druggist (apprentice)—Chem. (3d)
524—Henderson, James, 19, Anderson. Univ., Glasgow, normal student—Anim. Phys. (3d)
604—Henderson, Robert S., 19, Glasgow Ath., warehouseman—Bkpg. (2d)
1142—Hendricks, Herman, 17, Roy. Polyt. Inst., clerk—Arith. (2d); Bkpg. (3d)
27—Henshaw, David, 21, Alderley Edge Ed. Inst., wheelwright—Dom. Econ. (3d); Geom. Dwg. (3d); Free-hand Dwg. (3d)
1087—Hensler, William A., 23, City of Lond. Coll., chemist's assistant—Arith. (1st)
794—Hepworth, Jonathan, 23, Halifax W.M. Coll., sanitary tube maker—Arith. (2d)
1675—Herbert, George, 26, Wakefield M.I., glass engraver—Free-hand Dwg. (2d)
525—Herbert, Robert P., 16, Anderson. Univ., Glasgow, clerk—Arith. (3d); Bkpg. (3d).
1206—Heritage, George, jun., 23, Birkbeck Lit. Inst., builder—Free-hand Dwg. (2d)
2120—Hewish, John, 19, Lambeth Evg. Classes, clerk—Arith. (1st); Eng. Hist. (1st); Geog. (1st); French (3d)
104—Hewitt, James E., 22, Birm. and Midl. Inst., jeweller—French (2d)
1330—Hewitt, Samuel, 21, New Mills Inst., self-actor minder—Arith. (3d)
864—Hewitt, William, 16, Holbeck M.I., pupil teacher—Arith. (1st); Eng. Hist. (2d); Geog. (2d)
773—Heyhurst, Phineas, 18, Halifax M.I., cabinet maker—Arith. (3d); Mensur. (3d)
1281—Heywood, Frederick, 18, Manchester M.I., clerk French (3d)
171—Heywood, James, 23, Bolton Ch. Inst., clerk—Light and Heat (3d)
1482—Heywood, John J., 17, Preston M.I., warehouseman—Arith. (1st)
326—Hibbert, Henry F., 17, St. George's Ch. Assoc., Chorley, book-keeper—Arith. (2d)
388—Hibbert, John, 23, Burton Lit. Soc., clerk—Eng. Hist. (3d); Geog. (2d)
1490—Hiccox, William, 20, Redditch L. and S.I., clerk Bkpg. (3d)
1156—Hicks, Amelia, 25, Roy. Polyt. Inst., daily governess—French (2d)
1847—Higgin, Richard B., 16, Liverpool Inst., office apprentice—Bkpg. (3d)
1639—Higgs, John C., 27, Southampton Ath., gardener—Floric. (2d)
2105—Hill, Frederick, 18, Farnham Y. Men's Assoc., teacher—Arith. (1st); Bkpg. (2d); Mensur. (2d)
1088—Hill, George, 25, City of Lond. Coll., clerk—Arith. (3d); Bkgp. (2d); Geog. (1st)
1787—Hill, John H., 17, York M.I., clerk—Mens. (3d)
577—Hill, William, 25, Glasgow Ath., traveller—German (3d)
1089—Hill, William H., 17, City of Lond. Coll., clerk—Bkpg. (1st)
860—Hills, Henry G., 25, Hertford Lit. and Sci. Inst., printer—Mens. (2d)
43—Hilton, John E., 20, Ashton-under-Lyne M.I., spindle maker—Geom. Dwg. (3d)
881—Hinchcliffe, Tom, 18, Huddersfield M.I., whitesmith—Free-hd. Dwg. (2d)
37—Hinds, Charles W., 19, S.E. Railway M.I., Ashford, engine fitter—Pract. Mech. (3d)
1784—Hirstwood, William, 36, York M.I., china packer—Geog. (3d)
495—Hodge, David, 29, Edinburgh Local Board, tutor—Arith. (1st); Eng. Lit. (3d)
936—Hodgkinson, Frederick J., 21, Stanley Library, King's Lynn, druggist's clerk—Arith. (1st); Geog. (1st); Eng. Hist. (2d)
890—Hodgson, Robert, 28, Hull Chr. and Lit. Inst., engineer's clerk—Bkpg. (1st)
1375—Hodgson, William, 25, Oldham Lyc. Local Board, planer—Arith. (3d)
359—Hogan, Dennis J., 18, Cork Y. Men's Cath. Soc., clerk—Eng. Hist. (3d)
1336—Hogarth, Thomas O., 17, New Swindon M.I., apprentice—Arith. (3d)
1892—Holden, Charles, 18, Belfast Acad. Sci. School, mechanic—Arith. (3d)
236—Holden, Luke, 33, Burnley M.I., saddler—Anim. Phys. (3d)
798—Holdsworth, Geo., 22, Halifax W.M. Coll., book-keeper—Arith. (3d); Bkpg. (2d)
1002—Holdsworth, John L., 28, Leeds M.I., clerk—Arith. (3d)
967—Holdsworth, John L., 28, Leeds Ch. Inst., clerk—Bkpg. (1st)
239—Holgate, James, 22, Burnley M.I., stonemason—Arith. (2d)
1204—Holland, Hubert C., 22, Birkbeck Lit Inst., clerk (foreign corresponding)—French (2d)
141—Holland, William, 21, Bolton M.I., spindle turner—Arith. (1st)
*959—Holliday, William, 33, Lancaster M.I., teacher—Anim. Phys. (3d)
2094—Holmes, Samuel, 18, Eccleshill M.I., wool-sorter—Arith. (3d)
1547—Homer, Lilly, 18, Salford W. Men's Coll., pupil-teacher—Free-hand Dwg. (3d)
1278—Hompes, Leo, 18, Manch. M.I., clerk—Arith. (3d)
1186—Hood, Thomas W., 19, Birkbeck Lit. Inst., clerk—Bkpg. (1st)
2133—Hooper, James, 24, Greenwich Lit. Inst., fitter and turner—Geom. Dwg., (3d)
1974—Hooton, John, 36, Burrage-road Sch., Plumstead, mechanic—Geom. Dwg. (3d)
106—Hope, Samuel, 20, Birm. and Midl. Inst., jeweller's clerk—Chem. (1st)
105—Hope, Francis, 24, Birm. and Midl. Inst., jeweller's engraver—Chem. (2d)
1017—Horne, William, 19, Leeds Y. Men's Chr. Assoc., clerk—Arith. (1st); Bkpg. (2d)
1548—Horrox, Peter, 30, Salford W. Men's Coll., scripture reader—Arith. (2d)
1922—Horton, William, 18, Messrs. Bagnall's Schools, Gold's-hill—pupil teacher—Arith. (3d); Eng. Hist. (3d); Free-hand Dwg. (2d)
527—Hossack, John, jun., 21, Anders. Uni. Glasgow, dentist—Anim. Phys. (3d)
1091—Hough, John, 22, City of Lond. Coll., editor's assistant—French (3d)

44—Howard, James, 18, Ashton and Dukinfield M.I., clerk—Arith. (3d); Eng. Hist. (3d)

932—Howard, John, 20, Kidderminster Ch. of Eng. Mut. Imp. Soc., cabinet-maker—Free-hd. Dwg. (2d)

1271—Howard, Joseph B., 21, Manch. M.I., mechanic—Arith. (3d); Pract. Mech. (3d)

328—Howarth, John, 23, St. George's Ch. Assoc., Chorley, weaver—Arith. (3d)

1938—Hoyle, William H., 22, Accrington M.I., assistant teacher—Elect. and Mag. (2d); Chem. (2d); Anim. Phys. (3d)

832—Hughes, William J., 22, Halifax W. Men's Coll., book-keeper—Bkpg. (2d)

1598—Hugo, John, 17, Sheerness Dckyd. Inst., dock-yard apprentice—Arith. (2d); Geom. (2d)

1143—Hulland, Rebecca A., 31, Royal Polyt. Local Board, governess—Dom. Econ. (3d)

998—Hunt, Richard, 18, Leeds M.I., teacher—Arith. (3d); Eng. Hist. (3d)

258—Hurst, Samuel, 17, Bury Ath., architect (apprentice)—Free-hd. Dwg. (2d)

1833—Huther, Alfred, 17, Liverpool I., clerk—Arith. (1st)

792—Illingworth, Thomas, 18, Halifax M.I., mechanic—Arith. (3d)

209—Illingworth, Wheater, 18, Bradford M.I., joiner and builder—Arith. (3d)

827—Ingham, James, 25, Halifax W.M. Coll., carpet weaver—Eng. Lit. (3d)

1380—Ingham, William, 18, Oldham Sci. Sch., engineer—Geom. Dwg. (3d); Pract. Mech. (3d)

1498—Inglis, Robert, 23, Richmond Parochial Library, gardener—Floric. (2d); Fruit and Veg. Cult. (2d)

1093—Ingram, John H., 25, City Lond. Coll., clerk—Eng. Lit. (2d); German (3d)

529—Innes, Richard, 27, Andersonian Univ., Glasgow, locomotive fitter—Pract. Mech. (3d)

1944—Isherwood, Thomas, 25, Accrington M.I., teacher—Anim. Phys. (2d)

642—Jack, Henry, 33, Glasgow M.I., engineer—Pract. Mech. (2d)

703—Jack, Jane, 23, Glasgow Tonic Sol Fa Soc., winder—Music (3d)

1676—Jackson, James, 22, Wakefield M.I., mat maker—Arith. (3d)

197—Jackson, John A., 19, Bradford M.I., warehouse-man—Geog. (3d)

985—Jackson, John P., 19, Leeds M.I., chemist and druggist—Chem. (2d)

643—Jackson, Matthew, 17, Glasgow M.I., clerk—Arith. (2d)

765—Jackson, Thomas, 16, Halifax M.I., clerk—Bkpg. (3d)

20—Jamieson, Thomas, 20, Aberdeen M.I., clerk—Anim. Phys. (2d)

1094—Jauralde, Alexander, 19, City Lond. Coll., clerk—Spanish (2d)

598—Jefferson, Jeremiah, 20, Glasgow Ath., warehouse-man—Arith. (3d)

989—Jefferson, John C., 17, Leeds M.I., engineer (apprentice)—Arith. (2d); Eng. Hist. (2d); Alg. (3d); Geom. (3d)

406—Jeffery, Samuel R., 18, Devonport M.I., clerk—Arith. (1st)

108—Jennings, Elizabeth, 35, Birm. and Midl. Inst., teacher—Latin and Roman Hist. (3d)

110—Jennings, John M., 18, Birm. and Midl. Inst., clerk—Geog. (3d)

109—Jennings, Julia, 31, Birm. and Midl. Inst., teacher—Latin and Roman Hist. (3d)

1859—Jobling, William, 16, Liverpool Inst., clerk—Chem. (2d)

2122—Johnson, Henry, 29, Lambeth Evg. Classes, fore-man carpenter—Geom. Dwg. (3d)

34—Johnson, James W., 16, S.E. Railway M.I., Ashford, railway clerk—Arith. (1st)

1429—Johnson, John A., 19, Patricroft M.I., draughts-man—Geom. Dwg. (3d)

1242—Johnson, John W., 22, Manch. M.I., clerk—Bkpg. (1st); Geog. (2d); French (3d)

1827—Johnson, Joshua, 20, Liverpool Inst., mechanical engineer—Arith. (1st); Prac. Mech. (2d)

608—Johnston, James, 22, Glasgow Ath., clerk—French (3d)

1449—Jolliffe, Henry, 19, Portsea Y.M. Chris. Assoc., engineer student—Arith. (1st); Conic Sec. (2d); Algebra (2d)

332—Jolly, Alban, 16, St. George's Church Assoc., Chorley, grocer—Arith. (2d)

325—Jolly, Daniel, 19, St. George's Ch. Assoc., Chorley, millwright and engineer—Mens. (3d); Geom. Dwg. (3d)

1219—Jones, Charles, 22, Malvern W.M. Inst., assistant reporter—Music (1st)

393—Jones, George S., 18, St. Peter's Evg. Schools, Derby, clerk—Arith. (1st)

111—Jones, Henry R., 38, Birm. and Midl. Inst., clerk—Latin and Roman Hist. (2d)

1353—Jones, William, 23, Messrs. Chance's Schools, Oldbury, labourer—Chem. (2d)

1497—Jones, William, 20, Richmond Par. Lib., gardener—Floric. (2d); Fruit and Veget. Cult. (2d)

1250—Jordan, William R., 17, Manch. M.I., clerk—Arith. (1st)

1522—Jukes, William, 23, St. Thomas' Ch. Inst., St. Helen's, labourer—Music (3d)

1509—Junghaus, Sophie, 22, Rugby Loc. Bd., governess—Latin and Rom. Hist. (2d)

1555—Kay, Andrew, 18, Salford W.M. Coll., clerk—Bkpg. (1st); Geog. (2d)

1554—Kay, David, 20, Salford W.M. Coll., salesman—Arith. (2d); Geog. (2d)

1553—Kay, Reuben, 22, Salford W.M. Coll., clerk—Geog. (2d); French (2d)

450—Kay, William, 18, Droylsden Educ. Inst., ware-houseman—Arith. (2d); Chem. (2d)

1314—Kay, William T., 18, Middlesbro' M.I., surgeon—Chem. (2d)

822—Kaye, Joe, 24, Halifax W.M. Coll., woollen spinner—Chem. (3d)

210—Kaye, Uriah, 21, Bradford M.I., cashier—Bkpg. (2d); Mensur. (2d)

1500—Keenan, Richard L., 25, Richmond Par. Lib., gardener and assist. in herbarium—Floric. (1st) with 1st prize of £5, and the Roy. Horticultural Soc. prize of £5; Fruit and Vegt. Cult. (1st); Botany (1st) with 1st prize of £5, and the Roy. Horticultural Soc. prize of £5

1607—Keir, James J., 17, Sheerness Dockyard Inst., engineer student—Geog. (2d); French (3d)

530—Kelley, James M., 28, Anders. Univ., Glasgow, cutler, &c.—Anim. Phys. (3d)

384—Kelly-Kelly, Alfred J. H., 25, St. John's School, Deptford, corrector of the press—Arith. (2d)

874—Kendall, Thomas, 18, Huddersfield M.I., engraver—Free-hand Dwg. (2d)

1895—Kennedy, William, 21, Belfast Acad. Sci. Sch., teacher—Arith. (1st); Mensur. (2d)

531—Kent, James S., 41, Anderson. Univ., Glasgow, warper—Anim. Phys. (3d)

1393—Kenyon, William, 24, Padiham Night School, warehouseman—Anim. Phys. (3d)

586—Ker, Henry A., 19, Glasgow Ath., clerk—Logic, &c. (2d)

583—Ker, Robert H., 18, Glasgow Ath., chemist's assistant—Logic and Ment. Sci. (3d)

644—Kerr, Peter, 25, Glasgow M.I., compositor—Eng. Lit. (3d)

735—Kershaw, James D., 20, Glodwick Inst., mechanic—Arith. (3d)

218—Kerslake, James, 28, St. Mark's Sci. Sch., New Brompton, boiler maker—Geom. Dwg. (3d)

2088—Kidd, George W., 17, St. Michael's Sch., Bromley, Middlesex—engineer—Arith. (2d)
997—Kidney, John, 18, Leeds M.I., clerk—Arith. (1st); Eng. Hist. (1st); Geog. (2d)
1556—King, Charles, 20, Salford W.M. Coll., putter-out Arith. (2d)
1135—Kingston, Robert C., 21, Roy. Polyt. Inst., gardener—Elect. and Mag. (3d); Chem. (1st) with 1st prize of £5; Fruit and Vegt. Cult. (1st) with 1st prize of £5, and the Roy. Hort. Soc. prize of £5, and, together with Mensur. (2d), the *Gardeners' Chronicle* prize of £3; AND THE PRINCE CONSORT'S PRIZE OF 25 GUINEAS.
579—Kinloch, Robert C., 18, Glasgow Ath., clerk—Bkpg. (3d)
645—Kirkwood, James, 19, Glasgow M.I., engineer—Arith. (2d)
777—Kitchen, Thomas, 18, Halifax M.I., woolsorter—Bkpg. (3d)
764—Knowles, John W., 20, Halifax M.I., pianoforte maker—Bkpg. (3d)
1263—Knowles, Stuart, 20, Manchester M.I., bookbinder and stationer—Bkpg. (2d)

1517—Lackington, James, 16, Rugby Inst., pupil-teacher, Arith. (1st)
1708—Laing, John, 18, Woolwich R.A. Evening School, writer—Chem. (3d)
1793—Lambeth, Allan, 17, York M.I., carpenter—Free-hd. Dwg. (2d)
113—Lancaster, Cornelius J., 16, Birm. and Midl. Inst., laboratory assistant—Chem. (1st); Elect. and Mag. (3d); Anim. Phys. (3d)
112—Lancaster, William J., 21, Birm. and Midl. Inst., optician—Elect. and Mag. (3d); Chem. (3d); Anim. Phys. (3d)
16—Lane, Andrew, 17, Aberdeen M.I., clerk—Arith. (2d); Bkpg. (2d)
2000—Lane, Charles, 16, St. Thomas' School, Woolwich, engineer student—Anim. Phys. (3d)
8—Lane, William, 18, Aberdeen M.I., pupil-teacher—Arith. (2d); Bkpg. (1st)
1908—Larmor, Matthew H. 19, Belfast Acad. Sci. Sch., book-keeper—Arith. (2d); Bkpg. (3d); Mensur. (3d)
1140—Laurie, James L., 18, Royal Polyt. Inst., clerk—German (3d)
1883—Laverty, Robert, 19, Belfast Acad. Sci. Sch., teacher—Arith. (2d); Alg. (3d); Mensur. (3d)
1220—Lawford, Edward, 20, Malvern W.M. Inst., builder's clerk—Free-hd. Dwg. (3d)
996—Lawrence, John E., 17, Leeds M.I., clerk—Arith. (2d)
887—Lawton, Charles, 24, Hull Chris. and Lit. Inst., gardener—Flori. (2d); Fruit and Veg. Cul. (2d)
1695—Lead, Henry P., 17, St. Peter's Evg. Sch., Wolverhampton, clerk—Arith. (3d)
1694—Lead, John E., 19, St. Peter's Evg. Sch., Wolverhampton, clerk—Arith. (2d)
26—Leadbeater, George, 20, Alderley Edge Educ. Inst., no occupation given—Free-hd. Dwg. (3d)
1779—Leaf, Matthew, 27, York Inst., book-keeper—Music (3d)
346—Lee, Abel, 24, Compstall M.I., weaver—Arith. (2d)
1409—Lee, Charles H., 16, Paisley Artiz. Inst., clerk—Music (3d)
1397—Lee, James, 23, Paisley Artiz. Inst., joiner—Music (2d)
992—Lee, William, 18, Leeds M.I., mechanic—Geom. (1st) with 2d prize of £3; Arith. (2d); Alg. (2d)
731—Lees, Joshua, 23, Glodwick Inst., self-actor minder Arith. (3d)
444—Lees, Robert W., 19, Droylsden Educ. Inst., pupil teacher—Arith. (1st); Bkpg. (3d)
1511—Leeson, Mary, 19, Rugby Evg. Classes, milliner's assistant—Arith. (2d); Eng. Hist. (3d)
1681—Leighton, Edwin, 20, Walsall Ch. Inst., saddler's ironmonger—French (3d)
1557—Lenthall, George, 19, Salford W.M. Coll., warehouseman—Geog. (1st)
1619—Lewis, Owen W., 18, Slough M.I., architect's clerk—Geom. Dwg. (3d)
3—Leys, Frank S., 19, Aberdeen M.I., clerk—French (2d)
1513—Linnell, William H., 17, Rugby Inst., solicitor's clerk—Arith. (2d); Free-hd. Dwg. (2d)
2062—Lintell, Benjamin, 29, St. Thomas's School, Woolwich, fitter—Geom. Dwg. (3d)
1095—Lintott, Edward, 20, City of Lond. Coll., clerk—Bkpg. (2d)
683—Litster, William, 20, Glasgow Tonic Sol-fa Soc., warehouseman—Music (1st)
1051—Livermore, Charles, 30, Beauvoir Coll., clerk—Music (2d)
1441—Llewhellen, Arthur J., 17, Pembroke Dock M.I., clerk—Arith. (1st); Geog. (2d); Bkpg. (3d)
1411—Lockie, Joseph, 24, Paisley Artiz. Inst., weaver—Music (2d)
876—Lodge, Alfred, 16, Huddersfield M.I., lithographer—Free-hd. Dwg. (2d)
438—Lord, John, 16, Droylsden Educ. Inst., pupil teacher—Free-hd. Dwg. (3d)
1673—Lord, Joseph, 17, Tottington Mut. Imp. Soc., warehouseman—Arith. (1st)
2080—Loveridge, William H., 20, Gloucester W.M. Inst., shopman—French (3d)
1251—Lowe, Thos., 16, Manchester M.I., clerk—Arith. (2d)
1940—Lucas, John, 34, Accrington M.I., teacher—Anim. Phys. (3d)
1704—Ludlam, Isaac S., 20, St. Peter's Evg. Sch. Classes, Wolverhampton, railway clerk—Anim. Phys. (3d)
1501—Lynch, Richard J., 18, Richmond Par. Library, gardener—Botany (2d), with the R. Hort. Soc. prize of £3.

206—Macaulay, Peter T., jun., 17, Bradford M.I., book-keeper—Arith. (1st); Bkpg. (1st)
187—Macaulay, Peter T., 38, Bradford M.I., overlooker—Bkpg. (2d)
648—Macdougall, John S., 19, Glasgow M.I., clerk—Spanish (1st), with 1st Prize of £5
1144—Macey, Charles G., 20, Roy. Polyt. Inst., warehouseman—Arith. (1st)
614—Macfadyen, Daniel R., 19, Glasgow Ath., warehouseman—French (2d)
1965—Machen, William J., 28, Burrage-road School, Plumstead, carpenter & joiner—Geom. Dwg. (3d)
1133—Mackintosh, James A., 19, Royal Polyt. Local Board, usher—Eng. Hist. (3d); Mensur. (3d)
1098—Mackintosh, William, 21, City of London Coll., clerk—Arith. (2d); Bkpg. (1st)
539—MacLeod, William, 24, Andersonian Univ., Glasgow, clerk—Anim. Phys. (3d)
1642—Macpherson, John, 22, Southampton Ath., gardener—Floric. (2d); Mensur. (3d)
116—Madeley, George F., 17, Birm. and Midl. Inst., barrister's clerk—Latin and Rom. Hist. (3d)
68—Maden, Isabella, 20, Bacup M.I., weaver—Dom. Econ. (3d)
75—Maitland, Alexander S., 22, Belfast Lit. Inst., clerk—Bkpg. (1st)
82—Maitland, William H., 16, Belfast Lit. Inst. clerk—Bkpg. (2d)
2150—Makin, James, 16, Freetown (Glossop) W.M. Inst., clerk—Arith. (1st)
199—Mallinson, Dan, 22, Bradford M.I., grocer's assistant—Arith. (2d); Mensur. (3d)
1166—Marchant, Henry W., 20, Roy. Polyt. Inst., chemist's assistant—Chem. (1st)
1450—Mares, William H., 19, Portsea Y.M. Chr. Associ., engineer student—Alg. (2d); Prin. Mech. (2d)
1308—Marland, James W., 21, Mossley M.I., weaver—Bkpg. (2d)

1731—Marlow, William, 20, Woolwich Royal Arsen. M.I., wheelwright—Arith. (2d)
389—Marples, Sarah A., 24, Derby Loc. Board, teacher (proposed)—French (3d); Geog. (3d)
1559—Marriott, Tom, 17, Salford W.M. Coll., clerk—Arith. (2d)
*1384—Marsden, Thomas, 21, Oldham Lyceum, millwright—Pract. Mech. (3d)
1594—Marsh, Edward W., 19, Sheerness Dockyard Inst., engineer student—Geom. (3d)
895—Marsh, James, 27, Christchurch (Hulme) Inst., clerk—Arith. (3d)
1664—Marsland, Thomas, 19, Stockport M.I., shoemaker—Arith. (3d)
1171—Marston, Emma L., 31, Birkbeck Lit. Inst., teacher—French (1st)
1451—Martin, Frederick, 22, Portsea Y.M. Chris. Assoc., shipwright—Geom. (3d)
542—Martin, John, 34, Anders. Univ. Glasgow, fruit salesman—Anim. Phys. (2d)
543—Martin, John, jun., 18, Anders. Univ. Glasgow, clerk—Light and Heat (2d)
386—Martin, Robert, 17, Deptford Loc. Bd., shipwright appr.—Arith. (3d)
1921—Massey, James, 16, Messrs. Bagnall's School, Gold's Hill, pupil-teacher—Arith. (2d); Free-hd. Dwg. (2d)
1643—Massy, Charles, 20, Southampton Ath., clerk, engineer, &c.—German (3d)
1645—Massy, William L., 21, Southampton Ath., clerk H.M. Customs—Geom. (1st); Trigon. (3d)
1794—Matson, James, 17, York M.I., lithographic printer—Free-hd. Dwg. (2d)
1306—Maude, Dan, jun., 18, Mossley M.I., warehouseman—Bkpg. (2d)
2092—May, Andrew T., 18, St. Michael's Sch., Bromley (Middlesex), shipwright—Arith. (2d)
1999—May, William, 29, St. Thomas' Sch., Woolwich, fitter—Chem. (3d); Anim. Phys. (3d)
1452—Mayston, Robert, 16, Portsea Y.M. Chris. Assoc., engineer student—Arith. (1st) with 2d prize of £3; Alg. (1st)
646—McAlister, Robert, 19, Glasgow M.I., mechanical engineer—Pract. Mech. (3d)
697—McAlister, Robert, 20, Glasgow Tonic Sol-Fa Soc., baker—Music (3d)
1495—McArdle, John, 21, Richmond Par. Lib., gardener—Floric. (2d); Fruit and Veget. Cult. (2d)
599—McCarthy, Dennis, 16, Glasgow Ath., clerk—Arith. (2d); Geom. (2d)
1099—McCrea, Henry M., 21, City London Coll., clerk—French (1st) with 1st prize of £5
85—McCulloch, James, 17, Belfast Lit. Inst., clerk—Bkpg. (1st)
1600—McDonald, John N., 16, Sheerness Dockyd. Inst., shipwright appr.—Arith. (2d)
649—McEwen, Charles, 19, Glasgow M.I., warehouseman—Eng. Lit. (2d)
650—McEwen, James, 18, Glasgow M.I., clerk—French (3d)
651—McGhie, Daniel, 25, Glasgow M.I., weighing clerk—Music (2d)
713—McGregor, Donald, 17, Glasgow Tonic Sol-Fa Soc., clerk—Music (2d)
533—McHardie, James, 22, Anders. Univ., Glasgow, warehouseman—Music (3d)
1906—McIlveen, Samuel, 17, Belfast Acad. Sci. Sch., in the linen trade—Arith. (1st)
652—McInnes, William, 17, Glasgow M.I., warehouseman—Eng. Lit. (3d)
1840—McIntyre, John, 18, Liverpool Inst., clerk—Bkpg. (1st); Alg. (3d); Geog. (3d)
534—McKay, Richard, 28, Anders. Univ., Glasgow, compositor—Botany (3d)
83—McKee, William S., 31, Belfast Lit. Inst., pattern designer—Bkpg. (1st)
1891—McKie, Daniel, 17, Belfast Acad. Sci. Sch., civil engineer—Alg. (3d); Mensur. (2d)
536—McKillop, Patrick, 27, Anders. Univ., Glasgow, time-keeper—Chem. (3d)
1877—McKnight, William J. 25, Belfast Acad. Sci. Sch., teacher—Arith. (1st); Mensur. (2d)
537—McLachlan, Samuel, 25, Anders. Univ., Glasgow, clerk—Anim. Phys. (3d)
538—McLean, John, 19, Anders. Univ., Glasgow, clerk Bkpg. (3d)
1407—McLennan, William B., 23, Paisley Artiz. Inst., warehouseman—French (1st)
1419—McManus, William, 23, Parsonstown Y.M. Chris. Assoc., teacher—Arith. (1st)
596—McMillan, Duncan, 20, Glasgow Ath., clerk—Arith. (2d)
622—McMillan, Matthew, 17, Glasgow Inst., clerk—Arith. (1st)
1052—McNaught, William G., 18, Beauvoir Coll., mer. clerk—Music (1st)
653—McNeil, Charles, jun., 20, Glasgow M.I., blacksmith appr.—Arith. (2d); Bkpg. (2d)
1904—McNeill, Henry, 18, Belfast Acad. Sci. Sch., teacher—Mensur. (2d); Trigon. (3d)
541—McTaggart, John, 22, Anders. Univ., Glasgow, warehouseman—Anim. Phys. (3d)
1596—Meaden, Nicholas, 20, Sheerness Dock-yard Inst., engineer (student)—Light and Heat (2d); Mensur. (2d); Pract. Mech. (3d)
1100—Meadows, Henry, 16, City of London Coll., clerk—Arith. (1st)
117—Measures, Simon, 26, Birmingham and Midland Inst., clerk—German (3d)
1101—Medhurst, John T., 21, City of London Coll., clerk—Dom. Econ. (1st.), with 1st prize of £5; Anim. Phys. (3d); Geog. (3d)
1873—Mellalieu, Robert, 22, Heywood M.I., no occupation stated—Chem. (3d)
1218—Melvin, Arthur D., 20, Malvern W. Men's Inst., land agent's clerk—Arith. (1st); Bkpg. (3d)
1243—Metcalf, Edward, 22, Manchester M.I., grey-looker—Arith. (2d)
763—Metcalf, John A., 23, Guisboro' M.I., clerk—Bkpg. (3d)
1496—Middleton, Michael, 21, Richmond Par. Library, gardener—Floric. (2d); Fruit and Veg. Cult. (2d)
885—Middleton, Thomas E., 17, Huddersfield M.I., warehouse boy—Free-hd. Dwg. (3d)
657—Millar, William J., 28, Glasgow M.I., collector—Free-hd. Dwg. (1st)
2132—Millard, Joseph, 27, Greenwich Lit. Inst., shipwright—Geom. Dwg. (2d)
1102—Miller, Charles, 23, City of London Coll., bookseller's assistant—Bkpg. (2d)
544—Miller, James, 36, Andersonian Univ., Glasgow, cloth-lapper—Music (3d)
656—Miller, John, 19, Glasgow M.I., clerk—Free-hd. Dwg. (2d)
2100—Millichap, William, 18, Farnham W.M. Assoc., clerk—Arith. (3d)
1560—Mills, George, 22, Salford W.M. Coll., warehouseman—Free-hd. Dwg. (3d)
2081—Mills, John E., 19, Gloucester Free Lib., banker's clerk—French (3d)
1184—Mills, Samuel H., 25, Birkbeck Lit. Inst., clerk—Bkpg. (3d)
955—Milne, Edward P., 16, Lancaster M.I., upholsterer—Free-hd. Dwg. (3d)
1453—Milton, James T., 17, Portsea Y.M. Chris. Assoc., engineer student—Arith. (1st); Geom. (2d)
1826—Misell, Alfred, 16, Liverpool Inst., clerk—Arith. (3d)
658—Mitchell, Alexander C., 16, Glasgow M.I., land-surveyor—Arith. (3d)
1984—Mitchell, George, 16, Burrage-road Sch., Plumstead, cabinet maker—Geom. Dwg. (2d)

5—Mitchell, James, 16, Aberdeen M.I., compositor—Eng. Lit. (2d)
1630—Mitchell, James F., 17, Southampton Ath., on ordnance survey—Geog. (1st); Bkpg. (3d)
609—Moir, Charles S., 18, Glasgow Ath., salesman to calico printer—Logic, &c. (1st), with 2nd prize of £3
1103—Moles, Joseph, jun., 21, City of Lond. Coll., clerk—Bkpg. (1st), with 2nd prize of £3
385—Mondy, Edmond F., 22, Deptford Loc. Bd., shipwright—Princ. Mech. (1st), with 1st prize of £5; Prac. Mech. (2d); Trigon. (2d); Bkpg. (3d)
1274—Monks, Peter, jun., 26, Manch. M.I., draughtsman—Prac. Mech. (3d)
55—Moore, Emanuel, 17, Bacup M.I., pupil teacher—Arith. (1st); Geog. (3d)
74—Moore, Thomas, 23, Belfast Lit. Inst., clerk—Bkpg. (1st)
1104—Morgan, Hugh, 21, City of Lond. Coll., clerk—Pol. and Soc. Econ. (1st), with 1st prize of £5
211—Morgan, Thomas, 17, Bristol Y. Men's Chr. Assoc., land surveyor—Arith. (2d); Bkpg. (3d)
620—Morrice, David, 29, Glasgow Inst., shoemaker—Arith. (2d)
920—Morris, Frederick A., 22, Ipswich W.M. Coll., grocer's assistant—Arith. (1st); Bkpg. (3d)
902—Morris, Thomas, 24, Christ Church (Hulme) Inst., clerk—Arith. (3d)
547—Morrison, George, 29, Anders. Uni., Glasgow, wood engraver—Music (3d)
292—Morrison, John H., 22, Chatham M.I., shipwright—Alg. (1st); Eng. Hist. (2d).
1781—Morritt, William, 33, York Inst., tailor—Music (3d)
1282—Moss, Walter, 20, Manchester M.I., bricklayer—Geom. Dwg. (3d)
1249—Mounsey, David, 20, Manchester M.I., mechanical draughtsman—Free-hd. Dwg. (3d)
659—Muir, Matthew, 18, Glasgow M.I., manufacturer—Arith. (3d); Bkpg. (2d)
1183—Muirson, Jane, 21, Birkbeck Lit. Inst., infant-school teacher—Arith. (3d)
2153—Mulligan, William M., 18, Gilford Mut. Imp. Soc., apprentice (flax trade)—Arith. (1st)
1283—Munn, William W., 20, Manchester M.I., clerk—Arith. (1st); Bkpg. (1st); Geog. (1st); French (2d)
660—Murdoch, James, 18, Glasgow M.I., engineer—Arith. (3d)
360—Murphy, Thomas, 23, Cork Y.M. Cath. Soc., accountant—Arith. (1st)
661—Murray, David, 19, Glasgow M.I., clerk—Free-hd. Dwg. (1st), with 2nd prize of £3
605—Murray, James, 19, Glasgow Ath., clerk—Eng. Lit. (2d)
1414—Murray, Richard L., 30, Parsonstown Y.M. Chr. Assoc., solicitor's clerk—Bkpg. (2d); Eng Lit. (3d)
1426—Musgrave, John T., 17, Patricroft M.I., draughtsman—Geom. Dwg. (2d)
1589—Myers, Thomas, 19, Scarborough M.I., joiner—Arith. (2d)

909—Naden, Edwin, 24, Hyde M.I., in a printworks—Light and Heat (3d)
1724—Napier, John, 18, Woolwich Royal Arsenal M.I., fitter—Arith. (2d); Mensur. (3d)
1000—Nedwill, David B. L., 16, Leeds M.I., no occupation stated—Arith. (3d); Eng. Hist. (3d); Geog. (3d)
734—Needham, Robert, 17, Glodwick Inst., piecer—Arith. (3d)
1886—Neill, James, 16, Belfast Acad. Sci. Sch., in the linen trade—Arith. (3d)
982—Newill, Frank, 22, Leeds M.I., book-keeper—Chem. (3d)
2050—Newman, George, 19, St. Thomas's, Woolwich, Local Board, clerk—Geom. Dwg. (3d)
1775—Newman, George C., 16, Worcester Railway Lit. Inst., law clerk—Arith. (2d); Bkpg. (3d); Geog. (3d)
321—Niblet, Charles J., 17, Cheltenham W.M. Club, pupil teacher—Arith. (3d); Eng. Hist. (3d); Geog. (3d)
1879—Nicholl, James, 16, Belfast Acad. Sci. Sch., no occupation stated—Arith. (3d)
465—Nicholls, Jane, 23, Dudley M.I., no occupation stated—French (3d)
1561—Nichols, William, 16, Salford W.M. Coll., clerk—Geog. (3d)
771—Nicholson, Richard E., 17, Halifax M.I., printer Bkpg. (3d); Free-hd. Dwg. (3d)
662—Nimmo, Robert, 22, Glasgow M.I., clerk—Arith. (3d)
1395—Niven, David C., 26, Paisley Artisan Inst., gas-rates collector—Bkpg. (2d)
323—Nixon, Thomas, 22, St. George's Ch. Assoc., Chorley, pattern maker—Mensur. (2d); Geom. Dwg. (3d)
1105—Noakes, Francis M., 20, City of London Coll., pocket-book maker—Eng. Hist. (2d)
1562—Noar, Herbert, 16, Salford W.M. Coll., warehouseman—Bkpg. (2d)
664—Noble, Kenneth D., 24, Glasgow M.I., mech. or marine engineer—Pract. Mech. (3d)
2029—Norman, Henry C., 28, St. Thomas's, Woolwich, Loc. Board, pattern maker—Geom. Dwg. (3d)
830—Norminton, John W., 21, Halifax W.M. Coll., draper's assistant—Eng. Lit. (3d)
1178—Norris, William R., 19, Birkbeck Lit. Inst., clerk—Bkpg. (1st)
576—Norval, George O., 18, Glasgow Ath., warehouseman—French (3d)
2090—Notman, James, 16, St. Michael's Sch. Bromley (Middlesex), engineer—Arith. (2d)
2147—Nutter, William J., 30, Littlemoor and Howardtown (Glossop) M.I., clerk—Bkpg. (1st)
1154—Nye, Henry S., 17, Royal Polyt. Inst., clerk—French (3d)

1053—Oakey, George, 26, Beauvoir Coll., music-copyist—Music (1st), with 1st prize of £5
362—O'Connor, Jeremiah J., 25, Cork Cath. Y.M. Soc., deputy rate collector—Arith. (1st); Bkpg. (2d)
2027—O'Donoghue, Daniel, 24, St. Thomas' Sch. Woolwich, shipwright—Geom. Dwg. (3d)
1203—O'Flaherty, Mary Anne Lissy, 18, Rugby Loc. Bd., of no occupation—Arith. (2d); Music (3d); Free-hd. Dwg. (3d); Latin and Roman Hist. (3d)
1106—Ogle, William S., 23, City of London Coll., no occupation stated—Bkpg. (2d)
367—O'Grady, John, 42, Crewe M.I., assistant clerk—Princ. Mech. (3d)
1563—Oldfield, Alfred, 22, Salford W.M. Coll., manager of machine works—German (3d)
865—Oldfield, George, 18, Holbeck M.I., mechanic—Arith. (3d)
1179—O'Malley, Thomas, 20, Birkbeck Lit. Inst., clerk—Geog. (1st); Eng. Hist. (2d); Arith. (3d)
1516—Orchard, John, 16, Rugby Inst., railway clerk—Arith. (2d)
459—Ordish, James, 31, Dudley M.I., serj. of police—Bkpg. (3d)
915—Orriss, James S., 18, Ipswich W.M. Coll., clerk—Arith. (1st)
1508—Osborn, Lucy K., 16, Rugby Evg. Classes, pupil-teacher—Arith. (2d)
1320—Oswald, Joseph, 17, Newcastle-on-Tyne Ch. Inst., architect's pupil—Mensur. (2d); Geom. Dwg. (3d)
1520—Over, Henry W., 17, Rugby Inst., solicitor's clerk—Arith. (2d); Free-hd. Dwg. (2d)

901—Owen, Edward B., 19, Hulme W.M. Club, clerk—German (1st), with 2d prize

1931—Pannett, Charles Y., 19, St. Stephen's School, Westminster, salesman—Arith. (2d)
929—Pardoe, William A., 21, Kidderminster Ch. of Eng. Soc., designer—French (3d)
48—Parker, John, 16, Bacup M.I., weaver—Arith. (3d); Geog. (3d)
942—Parker, William, 17, Lancaster M.I., chemist and druggist (appr.)—Anim. Phys. (3d)
245—Parkinson, Joseph E., 20, Burnley M.I., poor-rates collector—Anim. Phys. (3d)
1287—Parnell, George, 24, Manchester M.I., book-keeper—Light and Heat (2d); Chem. (2d); Alg. (3d)
1492—Parr, John, 20, Redditch Lit. and Sci. Inst., clerk—Bkpg. (3d)
1956—Parry, Parton T. W., 28, Burrage-rd. Sch., Plumstead, saddler—Geom. Dwg. (3d)
480—Parsons, Alfred, 24, Edinburgh Loc. Bd., gardener Floric. (3d); Fruit and Veg. Cult. (2d)
2005—Parsons, George, 17, St. Thomas' Sch., Woolwich, engineer student—Anim. Phys. (2d)
2002—Parsons, Richard, 16, St. Thomas' School, Woolwich, clerk—Anim. Phys. (3d)
1180—Pashler, Thomas, 18, Birkbeck Lit. Inst., clerk—Arith. (2d)
589—Paterson, Alexander, 16, Glasgow Ath., clerk—French (3d)
483—Paterson, Donald, 24, Edinburgh Watt Inst., clerk—Arith. (1st)
551—Paton, James, 28, Anders. Univ. Glasgow, clerk—Bkpg. (3d); Anim. Phys. (3d)
380—Payne, Jabez, 23, Deptford Loc. Bd., shipwright Arith. (2d)
925—Pearce, Joseph, jun., 29, Ipswich W.M. Coll., clerk—French (1st)
1858—Pearce, Joseph H., 30, Liverpool I., schoolmaster—Arith. (2d)
552—Pearson, David, 30, Andersonian Univ., Glasgow, clerk—Ani. Phys. (3d)
553—Peat, David, 34, Andersonian Univ., Glasgow, engineer—Ani. Phys. (3d)
554—Peebles, Robert, 26, Andersonian Univ., Glasgow, railway clerk—Arith. (2d); Spanish (2d); Ani. Phys. (3d)
978—Pegler, Oliver, 20, Leeds M.I., photographic chemist—Chem. (1st); Free-hd. Dwg. (2d); Elect. and Mag. (3d)
390—Peick, Amelia, 30, Derby Local Board, governess Arith. (1st); Geog. (1st); Eng. Hist. (3d)
118—Pelford, Charles E., 18, Birmingham and Midland I., draughtsman and designer—Free-hd. Dwg. (1st); Geog. (2d)
999—Peniston, John R., 19, Leeds M.I., mechanical draughtsman—Arith. (2d)
315—Pennack, Thomas, 17, Chelmsford M.I., carpenter—Free-hd. Dwg. (3d)
1979—Pennal, John, 26, Burrage-road School, Plumstead, turner—Geom. Dwg. (3d)
928—Penney, George R., 16, Kidderminster Mut. Imp. Soc., engine fitter—Arith. (1st)
373—Penney, Joseph, 21, Crewe M.I., engine fitter—Arith. (3d)
1605—Penney, William H., 17, Sheerness Dockyard I., shipwright's apprentice—Arith. (3d)
157—Pennington, Robert T., 23, Bolton Ch. Inst., warehouseman—Ani. Phys. (3d)
1565—Percival, Thomas, 18, Salford W.M. Coll., packing clerk—Bkpg. (2d)
407—Perkins, Charles E., 20, Devonport M.I., solicitor's clerk—Bkpg. (3d)
663—Perks, George G., 18, Glasgow M.I., clerk—Eng. Lit. (3d)
79—Perry, John, 18, Belfast Lit. Inst., draughtsman Geom. (1st); Eng. Hist. (2d); Eng. Lit. (2d); Geom. Dwg. (2d)
372—Peters, Sam, 20, Crewe M.I., fitter—Pract. Mech. (2d)
119—Petit, Alfred, 18, Birmingham and Midland I., cabinet case maker—Arith. (3d)
556—Philip, Robert, 22, Andersonian Univ., Glasgow, teacher—Arith. (1st); Geog. (2d)
1507—Phillips, Martha, 16, Rugby Loc. Bd., of no occupation—Arith. (3d); Music (3d); Latin and Rom. Hist. (3d); Free-hand Dwg. (2d)
1439—Phillips, Thomas, 20, Pembroke Dock M.I., shipwright apprentice—Mensur. (1st); Trigon. (2d)
1109—Phillips, William R., 19, City of Lond. Coll., clerk—Bkpg. (1st)
776—Pickard, Sam, 21, Halifax M.I., book-keeper—Bkpg. (2d); Arith. (3d)
1155—Pickering, Edward, 17, Roy. Polyt. Inst., clerk—French (1st), with 2nd prize; Italian (3d)
195—Pickering, Richard C., 23, Bradford M.I., clerk—French (3d)
163—Pickering, William F., 18, Bolton Ch. Inst., pawnbroker—Free-hand Dwg. (2d)
230—Pickles, Jonathan, 22, Burnley Lit. Inst., weaver—Anim. Phys. (3d)
870—Pickles, Joseph, 24, Holywell Green M.I., mechanic—Arith. (3d)
50—Pickup, Richard, 19, Bacup M.I., weaver—Anim. Phys. (3d); Geog. (3d)
1191—Pile, James A., 16, Birkbeck Lit. Inst., clerk—Arith. (2d)
61—Pilling, James, 18, Bacup M.I., weaver—Arith. (3d)
49—Pilling, John, 19, Bacup M.I., book-keeper—Arith. (3d)
66—Pilling, John R., 19, Bacup M.I., book-keeper—Arith. (2d); Bkpg. (3d)
65—Pilling, William, 17, Bacup M.I., weaver—Arith. (3d)
121—Pilter, William T., 16, Birm. and Midl. Inst., paper salesman—Anim. Phys. (3d)
1405—Pinkerton, William, 23, Paisley Artiz. Inst., clerk—Bkpg. (2d)
1568—Plant, Clement W. F., 19, Salford W. Men's Coll., warehouseman—Arith. (1st); Free-hd. Dwg. (2d)
729—Platt, Samuel, 26, Glodwick Inst., tin-plate worker—Geom. Dwg. (3d)
1796—Pocock, James R., 32, Bromley Lit. Inst., gardener—Flor. (3d); Fruit and Vegt. Cult. (3d)
1110—Pollard, Henry T., 20, City of Lond. Coll., clerk—Dom. Econ. (1st)
1567—Pollitt, William, 16, Salford W. Men's Coll., clerk—Arith. (1st); French (1st); Geog. (1st); with 2nd prize of £3
1569—Poole, James H., 19, Salford W. Men's Coll., clerk—Geog. (2d)
378—Poole, John G., 16, Deptford Loc. Bd., bricklayer—Arith. (1st)
853—Poole, Thomas, 23, Hastings M.I., joiner—Bkpg. (2d)
1016—Popplewell, Joseph, 16, Leeds Y. Men's Christ. Assoc., warehouse lad—Arith. (3d)
1998—Potter, Edwin, 17, St. Thomas' School, Woolwich, cook's-assist.—Anim. Phys. (3d)
317—Potter, Henry, 18, Chelmsford M.I., coach painter—Free-hd. Dwg. (2d)
1648—Powell, Charles, 21, Southampton Ath., clerk—Music (1st); Pol. and Soc. Econ. (1st), with 2nd prize of £3
1777—Powell, Edmund, 18, Worcester Mut. Imp. Assoc., clerk—Bkpg. (1st)
1236—Powell, Edwin, 19, Manchester M.I., clerk—Eng. Hist. (2d); Alg. (2d); Mensur. (2d)
1111—Powell, Henry, 20, City of London Coll., corresp. clerk—Bkpg. (3d)
1239—Powell, William E., 21, Manchester M.I., clerk—Bkpg. (1st); Alg. (3d); Geom. (3d)
1027—Power, John, 23, Lichfield W. Men's Assoc., grocer's-assistant—Bkpg. (2d)

1195—Pownall, Robert E., 19, Birkbeck Lit. Inst., surveyor's clerk—Bkpg. (1st)
1942—Preston, James, 19, Accrington M.I., book-keeper Arith. (2d); Chem. (3d)
243—Preston, John, 24, Burnley M.I., cotton weaver—Arith. (2d)
1943—Preston, Richard, 18, Accrington M.I., dyer—Arith. (3d); Chem. (2d)
1112—Price, Edward E., 17, City of London Coll., clerk—Alg. (3d)
1776—Price, Thomas, 19, Worcester Mut. Imp. Assoc., clerk—Bkpg. (1st); French (3d)
216—Pritchard, William, 23, Bristol Y. Men's Chr. Assoc., clerk—Arith. (1st); Bkpg. (2d)
1576—Probert, Frederick, 19, Salford W. Men's Coll., clerk—Arith. (2d)
2111—Prophet, William W., 19, Greenwich Lit. Inst., engineer—Pract. Mech. (3d)
826—Proven, John, 20, Halifax W. Men's Coll., mechanic—Arith. (2d)
1003—Prust, Thomas W., 18, Leeds M.I., chemist and druggist—Chem. (3d)

1743—Quick, James, 20, Woolwich Roy. Arsenal M.I., shipwright apprentice—Chem. (2d); Animal Phys. (3d)

957—Ralph, William J., 19, Lancaster M.I., clerk—Free-hd. Dwg. (2d)
709—Rankin, William, 26, Glasgow Tonic Sol Fa Soc., mason—Music (3d)
1661—Rathbone, Thomas H., 28, Stockport M.I., book-keeper—Elect. and Mag. (3d)
313—Raven, Arthur J., 17, Chelmsford M.I., house painter—Free-hd. Dwg. (3d)
18—Rea, Samuel, 23, Belfast Literary Inst., clerk—Bkpg. (2d)
1740—Redling. Richard J., 27, Woolwich Roy. Arsen. M.I., brass turner—Geom. Dwg. (3d)
1035—Reed, John, 18, Lomeshaye Evg. Sch., weaver—Light and Heat (3d)
1033—Reed, William, 20, Lomeshaye Evg. Sch. weaver—Light and Heat (3d)
1933—Rees, Turner J., 19, St. Stephen's School, Westminster, assist. master—Arith. (2d)
613—Reid, David, 16, Glasgow Ath., clerk—English Lit. (2d)
1460—Rendell, James R., 17, Preston M.I., no occupation stated—Alg. (3d); Chem. (3d)
557—Rhind, James, 21, Andersonian Univ., Glasgow, engineer—Pract. Mech. (3d)
365—Richards, Jeremiah, 25, Crewe M.I., engine fitter—Arith. (3d)
1613—Richards, John, 19, Sheerness Dockyard Inst., engineer student—Pract. Mech. (2d)
1437—Richards, Joseph, 17, Pembroke Dockyard M.I., pupil teacher—Arith. (1st); Geog. (3d)
1484—Richardson, Benjamin, 16, Preston M.I., pupil teacher—Arith. (3d); Geog. (3d)
1572—Rider, Ruth, 21, Salford W.M. Coll., teacher—Free-hd. Dwg. (3d)
1700—Ridgway, George, 18, St. Peter's Ev. Sch. Classes, Wolverhampton, teacher—Anim. Phys. (3d)
1113—Rigg, Thomas, 22, City of Lond. Coll., clerk—Bkpg. (1st); French (3d)
436—Riley, John, 19, Droylsden Educ. Inst., warehouseman—Chem. (2d)
1146—Rimer, James C., 20, Roy. Polyt. Inst., engineer—Elect. and Mag. (3d)
1167—Riorden, George J., 17 Royal Polyt. Inst., engraver—French (2d)
1802—Roberts, Alfred, 33, Hope Chapel Y.M. Soc., Denton—Pol. and Soc. Econ. (3d); Geog. (3d)
961—Roberts, Charles, 20, Leeds Ch. Inst., clerk—Arith. (1st); Bkpg. (1st)
1573—Roberts, John, 17, Salford W.M. Coll., pupil-teacher—Arith. (3d)
1571—Roberts, Richard, 40, Salford W.M. Coll., collector—Arith. (2d)
123—Roberts, Thomas, 24, Birm. and Midl. Inst., chemist—Chem. (1st)
1254—Roberts, Thomas, 16, Manchester M.I., tailor and draper—Arith. (2d); Eng. Hist. (3d)
667—Roberton, Stephen, 22, Glasgow M.I., clerk—Arith. (1st); Bkpg. (1st); Eng. Lit. (3d)
558—Robertson, John, 18, Anders. Univ., Glasgow, clerk—Chem. (3d)
669—Robertson, Robert M. M., 17, Glasgow M.I., clerk—French (2d)
408—Robins, Samuel J., 16, Devonport M.I., engineer student—Arith. (2d)
824—Robinson, Charles T., 16, Halifax W.M. Coll., pattern dyer—Chem. (2d)
1903—Robinson, James, 22, Belfast Acad. Sci. Sch., law clerk—Alg. (1st), with 1st prize of £5; Geom. (1st), with 1st prize of £5; Eng. Hist. (2d); Trigon. (3d)
1310—Robinson, John, 18, Mossley M.I., minder—Bkpg. (2d)
1995—Robinson, Joseph, 17, Stourbridge Ch. Inst., teacher—Arith. (2d)
1574—Robinson, Robert H., 23, Salford W.M. Coll., book-keeper—Arith. (2d); French (3d)
803—Robinson, William, 17, Halifax W.M. Coll., wool-stapler (apprentice)—Bkpg. (3d)
124—Rock, Rose S., 20, Birm. and Midl. Inst., no occupation stated—Latin and Rom. Hist. (2d)
685—Roddie, William, 22, Glasgow Tonic Sol-Fa Soc., engraver—Music (2d)
1147—Rodmell, George, 17, Royal Polyt. Inst., clerk—Elect. and Mag. (3d); Anim. Phys. (3d)
17—Rose, John, jun., 22, Aberdeen M.I., assist. teacher—Geom. (3d)
341—Rose, Robert, 17, Compstall M.I., piecer—Arith. (1st); Anim. Phys. (3d)
347—Rose, Samuel, 20, Compstall M.I., spinner—Arith. (3d); Anim. Phys. (3d)
482—Ross, David, 23, Edinburgh Sch. of Arts, gardener—Arith. (1st)
559—Ross, George, 33, Anders. Univ., Glasgow, tailor—Botany (3d)
670—Ross, James, 17, Glasgow M.I., clerk—Bkpg. (2d)
560—Ross, John, 21, Anderson. Univ., Glasgow, teacher—Geog. (2d); Arith. (3d)
850—Rostron, Edward C., 20, Haslingden M.I., warehouseman—Geog. (2d)
597—Roxburgh, Alfred F., 16, Glasgow Ath., clerk—Eng. Lit. (3d)
1304—Rowland, Samuel, 20, Manch. M.I., book-keeper—Chem. (2d); Anim. Phys. (3d)
1261—Rowson, Walter G., 16, Manch. M.I., clerk—Bkpg. (1st)
1602—Rule, Thomas, 16, Sheerness Dockyard Inst., engineer-student—Geom. (3d)
1197—Rushton, Samuel, 34, Birkbeck Lit. Inst., commercial traveller—Music (1st)
561—Russell, John, 25, Anderson. Univ., Glasgow, clerk—Bkpg. (2d)
125—Russell, Samuel, 16, Birm. and Midl. Inst., weighing-machine filer—Arith. (3d)
938—Rye, Richard, 23, King's Lynn Loc. Bd., organist and choirmaster—Music (1st)

2114—Sadler, Alfred, 28, Lambeth Evening Classes, engineer—Geom. Dwg. (2d)
595—Sandeman, Richard, 23, Glasgow Ath., merchant—Logic, &c. (3d)
727—Sands, Joshua, 23, Glodwick Inst., pattern-maker—Geom. Dwg. (3d)
1114—Sarll, Andrew, 29, City Lond. Coll., school assistant—Eng. Lit. (2d)
1958—Saunders, John, 21, Burrage-road School, Plumstead, lithographer—Geom. Dwg. (2d)

2082—Savory, Edwin, 22, Gloucester Free Library, railway clerk—French (3d)
2151—Schofield, Alfred E., 17, Freetown (Glossop) W. Men's Inst., printer—Arith. (3d)
1290—Scholes, Thomas, 24, Manch. M.I., book-keeper—Bkpg. (1st); Geom. Dwg. (3d)
693—Scobbie, Andrew, 19, Glasgow Tonic-Sol-Fa Soc., blacksmith—Music (3d)
894—Scotson, Joseph, 25, Christchurch (Hulme) Inst., coal dealer—Arith. (3d)
671—Scott, John, 19, Glasgow M.I., clerk—Bkpg. (3d)
162—Scott, Jonathan, 35, Bolton Ch. Inst., iron turner—Anim. Phys. (3d)
1455—Scotten, William, 18, Portsea Y.M. Chris. Assoc., engineer student—Arith. (1st); Chem. (2d); Pract. Mech. (2d); Geom. (2d)
562—Scoular, John, 22, Anderson. Univ., Glasgow, clerk—Music (2d)
14—Selbie, William, 17, Aberdeen M.I., clerk—Arith. (2d)
1790—Seller, John C., 18, York M.I., railway clerk—Eng. Hist. (3d)
126—Sellers, John, 24, Birm. and Midl. Inst., clerk—Latin and Roman Hist. (2d)
127—Sellman, Edward G., 18, Birm. and Midl. Inst., civil service (proposed)—Eng. Lit. (1st), with 1st prize of £5
1578—Shafto, William J., 28, Salford W.M. Coll., confectioner—Bkpg. (3d)
590—Shand, James, 18, Glasgow Ath., draper—Logic, &c. (3d)
672—Shand, Thos., 16, Glasgow M.I., clerk—Bkpg. (2d)
831—Shaw, John, 35, Halifax W.M. Coll., paper maker—Chem. (1st), with 2nd prize of £3
872—Shaw, Reuben C., 18, Holywell-green M.I., overlooker—Arith. (3d)
1705—Shekelton, John H., 21, St. Peter's Evg. Sch. Classes, Wolverhampton, clerk—Anim. Phys. (2d)
1631—Shelton, John, 19, Southampton Ath., engineer apprentice—Arith. (3d)
486—Shepherd, David L., 21, Edinburgh Watt Inst., telegraph clerk—Arith. (1st)
800—Shepherd, Sam, 19, Halifax W.M. Coll., overlooker—Bkpg. (3d)
89—Shepherd, Walter, 16, Bewdley W.M. Inst., baker—Arith. (3d)
922—Sheppard, Alfred, 18, Ipswich W.M. College, clerk—Arith. (1st); Bkpg. (2d)
1637—Shields, Isaac M., 16, Southampton Ath., clerk—Arith. (2d); Eng. Hist. (3d); Geog. (3d)
1491—Shore, Thomas H., 22, Redditch Lit. and Sci. Inst., warehouseman—Bkpg. (3d)
1579—Shorrocks, James H., 20, Salford W.M. Coll., clerk—French (1st)
2134—Shott, George, 17, Lambeth Evg. Classes, turner and fitter—Geom. Dwg. (2d)
2146—Sidebottom, Joshua, 24, Freetown (Glossop) W.M. Inst., clerk—Bkpg. (3d)
196—Silverwood, Leonard, 19, Bradford M.I., clerk—Arith. (1st); Geog. (3d)
1577—Simister, Anne B., 31, Salford W.M. Coll., schoolmistress—Free-hd. Dwg. (3d)
842—Simkin, Henry, 18, Handsworth W.M. Club, silversmith—Free-hd. Dwg. (2d)
1173—Simmonds, Benjamin, 30, Birkbeck Lit. Inst., no occupation stated—French (3d)
1115—Simmons, John D., 33, City of Lond. Coll., oilman—Eng. Hist. (3d)
129—Simpkin, Samuel J., 18, Birm. and Midl. Inst., pupil teacher—Chem. (3d); Anim. Phys. (3d)
921—Simpson, James B., 19, Ipswich W.M. Coll., plumber's apprentice—Bkpg. (3d)
152—Simpson, Jonathan, 17, Bolton Ch. Inst., surveyor—Arith. (3d); Free-hd. Dwg. (3d)
1641—Sims, Edward T., jun., 21, Southampton Ath., clerk—Bkpg. (1st); Alg. (2d); Latin and Rom. Hist. (2d)
2077—Siveter, William A., 21, Gloucester Free Library, solicitor's clerk—French (3d)
1644—Skeats, Frank G., 22, Southampton Ath., clerk in Ordnance Survey Office—Free-hd. Dwg. (1st), with 1st prize of £5; Arith. (2d)
804—Skelton, William H., 18, Halifax W.M. Coll., dyer Bkpg. (2d)
673—Smeaton, James, 22, Glasgow M.I., engineer—Pract. Mech. (2d)
310—Smee, Alfred, 25, Chelmsford Lit. and Mech. Inst., clerk in Provident office—Bkpg. (2d)
886—Smith, Benjamin, 21, Huddersfield M.I., waste dealer—Free-hd. Dwg. (2d)
392—Smith, Charles H., 20, Derby M.I., ironmaster's clerk—Mens. (2d)
805—Smith, David, 19, Halifax W.M. Coll., wool sorter—Bkpg. (3d)
1709—Smith, George, 16, Woolwich R.A. Evg. School, labourer—Chem. (3d)
924—Smith, Harry, 17, Ipswich W.M. Coll., brewer's clerk—Arith. (2d); Bkpg. (2d)
836—Smith, Henry J., 18, Handsworth W.M. Club, die sinker—Free-hd. Dwg. (3d)
1729 and 1763 — Smith, Henry H., 21, Woolwich R.A. Mech. Inst., and West. Mission Sci. Sch., turner—Mens. (3d); Geom. Dwg. (3d)
182—Smith, John, 35, Bolton Ch. Inst., colliery clerk—Anim. Phys. (3d)
837—Smith, John, 19, Handsworth W.M. Club, jeweller—Free-hd. Dwg. (3d)
376—Smith, John, 17, Dean Mills Inst., pupil teacher—Arith. (3d); Eng. Hist. (3d)
801—Smith, Joseph, 16, Halifax W.M. Coll., warehouseman—Bkpg. (3d)
254—Smith, Margaret P., 17, Bury Ath., pupil teacher Free-hd. Dwg. (3d)
1194—Smith, Martha, 22, Birkbeck Lit. Inst., no occupation stated—Arith. (2d); Dom. Econ. (1st), with second prize of £3; and Female Prize of £2
888—Smith, Thomas, 17, Hull Chr. and Lit. Inst., gardener—Arith. (1st)
1116—Smith, Thomas J., 29, City of Lond. Coll., clerk—Bkpg. (1st)
1783—Smith, Wm. H., 24, York M.I., draper—Music (3d)
130—Smith, William T., 24, Birmingham and Midland Inst., manufactory manager—French (2d)
923—Smyth, Edward B., 26, Ipswich W.M. Coll., clerk—Bkpg. (1st)
1902—Smyth, William, 23, Belfast Acad. Sci. School, teacher—Arith. (2d)
409—Snell, William W., 17, Devonport M.I., pupil teacher—Free-hd. Dwg. (3d)
564—Somerville, George, 17, Andersonian Univ., Glasgow, power-loom tenter—Ani. Phys. (2d)
377—Spacey, Alfred, 27, Deptford Local Board, master of ragged school—Mensur. (3d)
1898—Speer, William, 19, Belfast Acad. Sci. School, teacher—Arith. (2d); Mensur. (3d)
1481—Spencer, Richard, 16, Preston M.I., pupil teacher Free-hd. Dwg. (3d)
229—Spencer, Robert, 24, Burnley Ch. of Eng. Lit. Inst., gardener—Dom. Econ. (1st), with prize of books value £1; Ani. Phys. (2d)
2121—Spencer, Robert, 20, Lambeth Evg. Classes, tailor—Arith. (3d)
785—Spencer, Squire, 18, Halifax M.I., joiner—Bkpg. (3d)
*334—Spencer, William, 22, Clitheroe M.I., weaver—Arith. (3d)
1132—Spriggs, Henry, 18, Royal Polyt. Inst., no occupation stated—Arith. (3d)
410—Stanbury, William, 20, Devonport M.I., clerk—German (2d)
131—Stanley, Samuel S., 20, Birmingham and Midland Inst., printer's reader—French (3d)
51—Stansfield, George S., 18, Bacup M.I., chemist—Arith. (1st); Chem. (3d); Anim. Phys. (3d)

812—Stansfield, William, 17, Halifax W. Men's Coll., wool trade apprentice—Bkpg. (3d)
959—Stanton, John S., 16, Lancaster M.I., draughtsman—Free-hand Dwg. (3d)
889—Starr, Edward, jun., 18, Hull Chr. and Lit. Inst., architect's pupil—Free-hand Dwg. (2d)
962—Stead, John, 21, Leeds Ch. Inst., in the linen manufacture—French (3d)
675—Steel, James B., 37, Glasgow M.I., commercial traveller—Bkpg. (2d)
1459—Stephens, Edward B., 17, Preston M.I., no occupation stated—Latin and Rom. Hist. (2d)
411—Stephens, Thomas M., 16, Devonport M.I., caulker apprentice—Arith. (3d)
189—Stephenson, Albert, 18, Bradford M.I., clerk—Arith. (2d)
1456—Stevens, James, 19, Portsea Y. Men's Chr. Assoc., engineer (student) — Arith. (1st); Algebra (3d)
584—Stewart, James, 16, Glasgow Ath., clerk—Arith. (3d); French (3d)
610—Stewart, John, 20, Glasgow Ath., engineer apprentice—Prac. Mech. (3d)
1192—Stewart, William, 24, Birkbeck Lit. Inst., barrister's clerk—Bkpg. (2d)
705—Stirling, James, 41, Glasgow Tonic Sol-fa Soc., hatter—music (1st)
581—Stirling, James, 27, Glasgow Ath., warehouseman—Logic and Mental Sci. (2d)
259—Stockdale, William, 17, Bury Ath., book-keeper—Geom. Dwg. (3d)
2083*—Stockwell, Thomas H., 17, Gloucester Free Lib., attorney's clerk—Free-hand Dwg. (3d)
1670—Stokeld, Joseph T., 17, Stockton M.I., printer—Eng. Hist. (3d)
2025—Stone, John W., 16, St. Thomas's Sch., Woolwich, writer—Geom. Dwg. (3d)
1911—Stone, Robert J., 17, Christchurch W. Men's Inst., attorney's clerk—Bkpg. (3d)
1343—Stone, Walter, 17, New Swindon M.I., engine-fitter (appr.)—Arith. (3d)
1997—Stone, Walter H., 24, St. Thomas, Woolwich, Loc. Bd., teacher—French (1st)
565—Storrie, John, 24, Anders. Univ. Glasgow, stereotyper—Botany (2d)
1300—Stott, Henry, senr., 28, Manchester M.I., weaver—Geom. Dwg. (2d)
1302—Stott, Henry, 21, Manchester M.I., weaver—Geom. Dwg. (3d)
1896—Stronge, John, 26, Belfast Acad. Sci. Sch., teacher—Arith. (3d)
941—Suggett, Dix, 24, King's Lynn Ch. of Eng. Y. Men's Soc., merchant's clerk—Bkpg. (1st)
1213—Sumner, Jane, 23, Macclesfield Usef., Kn. Soc., weaver—Dom. Econ. (2d)
1011—Sumner, Pearson, 30, Leeds Y. Men's Chr. Assoc., coal agent—Arith. (3d)
1241—Suringar, William F. G. L., 22, Manchester M.I., draughtsman—Bkpg. (2d)
1941—Sutcliffe, George, 33, Accrington M.I., national-school-master—Elect. and Magn. (3d); Chem. (3d); Anim. Phys. (3d)
53—Sutcliffe, George W., 19, Bacup M.I., warehouseman—Anim. Phys. (2d); Geog. (2d); Geom. Dwg. (3d)
802—Sutcliffe, Joseph A., 18, Halifax W.M. Coll., maker-up—Bkpg. (3d)
2086—Swain, Thomas, 16, St. Michael's School, Bromley (Midd.), engineer (appr.)—Arith. (2d)
1750—Swanson, William, 19, Woolwich Roy. Arsenal M.I., mechanic—Geom. Dwg. (3d)
1177—Sweeting, Robert D., 24, Birkbeck Lit. Inst., school teacher—Arith. (3d)
820—Sykes, Edmund, 24, Halifax W.M. Coll., factory-operative—Elect. & Magn. (3d); Chem. (1st)
1119—Symonds, Charles D., 20, City of London Coll., clerk—German (3d)
291—Taffs, William W., 17, Chatham M.I., pupil-teacher—Arith. (3d)
1720—Tailby, William, 19, Woolwich Roy. Arsenal M.I., carpenter—Arith. (3d)
1934—Tapp, George W., 19, St. Stephens' Even. Sch., Westminster, clerk—Bkpg. (2d)
1703—Tart, John B., 28, Bilston Inst., grocer's-assistant—Arith. (2d); Bkpg. (2d)
1199—Tassell, Henry, 24, Birkbeck Lit. Inst., national-school-teacher—French (3d)
132—Tayler, Jane, 21, Birmingham and Midland Inst., assistant-mistress—Anim. Phys. (3d); Geog. (3d)
133—Taylor, Daniel, 22, Birmingham and Midland Inst., clerk—Arith. (1st)
862—Taylor, Ernest A., 17, Hertford Lit. and Sci. Inst., ironmonger's assistant—Arith. (2d)
1055—Taylor, Henry, 32, Beauvoir Coll., schoolmaster—Music (1st)
1388—Taylor, James, 19, Oldham Lyceum, mechanic—Arith. (1st); Princ. Mech. (2d); Pract. Mech. (2d); Bkpg. (3d)
737—Taylor, James, 18, Glodwick Inst., mechanic—Arith. (3d); Mensur. (3d)
1256—Taylor, John, 20, Manch. M.I., warehouseman—Bkpg. (2d)
1834—Taylor, Joseph B., 19, Liverpool Inst., clerk—Bkpg. (3d)
1658—Taylor, Samuel, 17, Stockport M.I., book-keeper—Arith. (3d); Anim. Phys. (3d)
908—Taylor, Thomas, 18, Hyde M.I., joiner—Light and Heat (3d); Anim. Phys. (3d)
1331—Taylor, William, 18, New Mill's Inst., labourer—Arith. (3d); English Hist. (3d); Geog. (3d)
1264—Teggin, Edward, 17, Manchester M.I., mechanic—Bkpg. (2d)
861—Tekell, John S., 16, Hertford Lit. and Sci. Inst., clerk—Arith. (3d)
1317—Telford, Robert, 19, Middlesbro' M.I., clerk in iron-works—Bkpg. (2d)
1120—Temple, Albert, 17, City of Lond. Coll., no occupation stated—Arith. (1st); Bkpg. (2d)
676—Thom, Andrew H., 18, Glasgow M.I., pupil teacher (formerly)—Geom. (3d)
1445—Thomas, Frederick, 16, Pembroke Dock M.I., shipwright apprentice—Arith. (1st)
414—Thomas, James, 17, Devonport M.I., butcher—Arith. (1st)
1442—Thomas, Wm. C., 21, Pembroke Dock M.I., shipwright—Arith. (1st)
283—Thomlinson, John H., 17, Carlisle M.I., no occupation—Geog. (2d)
983—Thompson, Alfred, 16, Leeds M.I., cloth manufacturer—Arith. (3d)
379—Thompson, George C., 17, Deptford Local Board, shipwright apprentice—Mensur. (3d)
806—Thompson, Henry, 16, Halifax W.M. Coll., clerk—Bkpg. (3d)
1580—Thompson, John, 21, Salford W.M. Coll., clerk—Arith. (1st)
2024—Thompson, Robert, 28, St. Thomas's Woolwich, Loc. Bd., brass finisher—Geom. Dwg. (3d)
799—Thompson, Walter, 16, Halifax W.M. Coll., warehouseman—Bkpg. (3d)
1842—Thomson, Frederick C. A., 23, Liverpool Inst., gardener—Floric. (3d); Fruit and Veg. Cult. (2d)
*575—Thomson, Robert, 27, Anders. Univ. Glasgow, pianoforte and music seller—Music (3d)
684—Thorn, Andrew H., 18, Glasgow Tonic Sol-Fa Soc., formerly pupil teacher—Music (2d)
1121—Thorne, Samuel, 20, City of Lond. Coll., railway clerk—Bkpg. (2d)
146—Thornley, James B., 17, Bolton M.I., turner—Geom. Dwg. (3d)
1329—Thornley, Richard, 18, New Mills Inst., book-keeper—Arith. (2d)

2087—Thornton, Robert, 16, St. Michael's Sch., Bromley (Middlesex), engineer—Arith. (3d)
255—Thornton, Thomas, 22, Bury Ath., joiner—Geom. Dwg. (3d); Free-hd. Dwg. (3d)
289—Thorpe, Alfred, 17, Carlisle M.I., mech. engineer (apprentice)—Arith. (3d)
1006—Tiffany, John B., 24, Leeds Y.M. Chr. Assoc., tobacco manuf.—Mens. (1st); Eng. Hist. (2d); Trig. (2d)
1786—Tissiman, Charles, 19, York M.I. Loc. Board, teacher—Arith. (2d)
566—Todd, Robert, 21, Andersonian Univ., Glasgow, law clerk—Anim. Phys. (3d)
2084—Tomes, William J., 23, Gloucester Free Library, draper's assistant—French (3d)
467—Tomkinson, Elizabeth, 23, Dudley M.I., no occupation stated—Music (1st), with prize of £2
2106—Tomlinson, George, 18, Aldershot and Farnham Loc. Board, clerk—Arith. (1st)
1122—Tomlinson, Harry, 21, City of Lond. Coll., clerk (H.M. Customs)—French (3d)
371—Tomlinson, John J., 23, Crewe M.I., engine fitter—Arith. (2d); Prac. Mech. (2d)
370—Tomlinson, Thomas D., 21, Crewe M.I., engine fitter—Prac. Mech. (3d)
2103—Topping, Alexander T., 16, Farnham Y.M. Assoc., no occupation stated—Arith. (3d); Bkpg. (3d)
1209—Tracy, Mary, 30, Birkbeck Lit. Inst., book-keeper—Bkpg. (3d)
1417—Treacy, Thomas, 22, Parsonstown Y.M. Chr. Assoc., grocer's assist.—Bkpg. (3d)
415—Treleaven, Joseph T., 23, Devonport M.I., shipwright—Mens. (1st), with 2nd prize of £3
1056—Treverton, George F., 29, Beauvoir Coll., fancy-box maker—Music (1st)
1604—Trezise, Theodore T., 18, Sheerness Dockyard Inst., engineer student—Mensur. (2d)
502—Tritton, John D., 19, Faversham Inst., mast and block maker—Arith. (1st); Geog. (1st.)
1168—Truelove, Maurice H., 18, Birkbeck Lit. Inst., clerk—Eng. Hist. (2d)
40—Tunks, Joseph, 16, S.E. Railway M.I., Ashford, railway clerk—Arith. (1st)
1350—Turnbull, George, 18, New Swindon M.I., apprentice engineer—Arith. (3d)
567—Turnbull, James, 18, Anderson. Univ., Glasgow, clerk—Anim. Phys. (3d)
677—Turnbull, John, jun., 26, Glasgow M.I., engineer —Prac. Mech. (2d)
2116—Turner, Albert, 27, Lambeth Evg. Classes, clerk —Arith. (1st); Eng. Hist. (3d); Geog. (3d)
1932—Turner, George, 26, St. Stephen's, School, Westminster, clerk—Arith. (3d); Mensur. (3d)
1486—Turner, Sarah J., 19, Preston M.I., weaver—Dom. Econ. (3d)
1726—Tyers, Arthur S., 20, Woolwich Royal Arsenal M.I., iron turner—Arith. (2d)

1444—Vaughan, James R., 16, Pembroke Dock M.I., shipwright apprentice—Arith. (1st)
1581—Vaughan, Thomas, 18, Salford W.M. Coll., clerk —Bkpg. (2d)
503—Veitch, John, 18, Faversham Inst., teacher—Arith. (1st)
1832—Vicars, John, 21, Liverpool Inst., mech. engineer —Arith. (2d); Pract. Mech. (2d)
153—Vose, William, 18, Bolton Ch. Inst., warehouseman—Arith. (3d)

568—Waddell, Matthew, 21, Anderson. Univ., Glasgow clerk—Anim. Phys. (3d)
1471—Wade, George A., 20, Preston M.I., art teacher—Geom. Dwg. (3d)
1476—Wade, John W., 16, Preston M.I., architect's pupil—Free-hd. Dwg. (1st)
1723—Wagg, Frederick, 20, Woolwich Royal Arsenal M.I., wheeler—Arith. (3d)
1691—Wager, Jasper, 18, Wednesbury M.I., clerk—Arith. (2d); Free-hd. Dwg. (2d); Eng. Hist. (3d); Geog. (3d)
817—Wainhouse, Walter, 16, Halifax W.M. Coll., pattern cutter—Free-hd. Dwg. (3d)
1359—Wainwright, John, 19, Oldham Lyc., warehouseman—Bkpg. (3d)
1583—Walkden, Joseph, 19, Salford W.M. Coll., clerk—Arith. (3d)
416—Walke, Andrew J., 16, Devonport M.I., engineer student—Arith. (1st); Alg. (2d); Geog. (2d)
11—Walker, David, 19, Aberdeen M.I., umbrella-maker—Eng. Lit. (3d)
569—Walker, David K., jun., 19, Anders. Univ. Glasgow, clerk—Chem. (2d)
1523—Walker, John, 19, St. Helen's M.I., book-keeper Arith. (3d)
1347—Wall, George H., 28, New Swindon M.I., brass-finisher—Bkpg. (2d)
571—Wallace, George, 22, Anders. Univ., Glasgow, teacher—Anim. Phys. (3d)
678—Wallace, John, 22, Glasgow M.I., engine-fitter—Pract. Mech. (2d)
286—Wallace, John, 17, Carlisle M.I., clerk—Arith. (2d)
1582—Walters, Thomas, 18, Salford W.M. Coll., warehouseman—Arith. (2d)
1712—Walton, William, 19, Woolwich R.A. Evg. Sch., engineer student—Chem. (3d)
1257—Warburton, Alfred, 18, Manchester M.I., clerk—Bkpg. (2d)
1910—Ward, Charles W., 21, Christchurch W.M. Inst., no occupation stated—Bkpg. (3d)
916—Ward, Francis C., 18, Ipswich W.M. Coll., clerk —Eng. Hist. (2d); Geog. (3d)
1299—Ward, George M., 18, Manchester M.I., engineer apprentice—Geom. (3d); Geom. Dwg. (3d)
994—Wardle, James W., 18, Leeds M.I., civil engineer —Arith. (3d)
1293—Wardle, John, 16, Manchester M.I., clerk—French (3d)
572—Ware, Charles, 18, Anders. Univ., Glasgow, fire insurance surveyor—Arith. (3d)
1764—Ware, James, 17, Woolwich Western Mission Sci. Sch., turner—Geom. Dwg. (3d)
38—Warman, John R., 20, S.E. Railway M.I., Ashford, engine fitter—Pract. Mech. (2d)
1139—Warner, Alfred E., 24, Roy. Polyt. Inst., seal engraver—Eng. Lit. (1st), with 2d prize; Eng. Hist. (2d); Latin and Rom. Hist. (2d); Geom. Dwg. (3d)
134—Warner, Francis H., 22, Birmingham and Midland Inst., clerk—Arith. (1st); Bkpg. (1st)
1412—Waterston, John, 19, Paisley Artis. Inst., clerk—Arith. (1st); Bkpg. (1st); French (2d)
1401—Waterston, Marion, 17, Paisley Artis. Inst., mill-worker—Music (3d)
1057—Wates, Joseph, jun., 17, Beauvoir Coll., clerk—Music (2d)
679—Watson, Peter, 18, Glasgow M.I., clerk—Arith. (1st); Bkpg. (3d)
194—Watson, Thomas B., 21, Bradford M.I., accountant Light and Heat (3d); Chem. (3d); Ani. Phys. (3d)
1457—Watts, Luther, 19, Portsea Y.M. Chr. Assoc., engineer student—Alg. (2d); Princ. Mech. (2d)
1698—Weaver, Samuel, 16, St. Peter's Evg. School, Wolverhampton, pupil teacher—Arith. (2d)
1915—Webb, George, 20, Messrs. Bagnall's Schools, Gold's-hill, labourer—Arith. (3d)
854—Weeks, Nelson D., 16, Hastings M.I., tailor—Bkpg. (3d)
680—Weir, Joseph, 18, Glasgow M.I., clerk—Bkpg. (2d)
32—Welsh, Charles, 17, S.E. Rail. M.I., Ashford, railway clerk—French (1st)
1882—Welwood, Daniel, 18, Belfast Acad. Sci. Sch., clerk—Arith. (1st); Mens. (2d)

1762—Wentzell, Henry T., 33, Woolwich Roy. Arsen. Gen. Sch., book-keeper—Chem. (3d)
1123—West, John B., 19, City of London Coll., clerk—French (3d)
2083—West, William R., 18, Gloucester Free Library, merchant's clerk—Arith. (3d); French (3d); Geog. (3d)
1124—Westerton, Walter C., 20, City of London Coll., clerk—Arith. (1st)
1357—Weston, William, 19, Oldbury Local Board, boiler maker—Anim. Phys. (3d)
716—Whatmough, William, 16, Glodwick Inst., grocer's assistant—Arith. (3d)
58—Whitaker, John, 16, Bacup M.I., book-keeper—Arith. (1st)
227—Whitaker, John, 24, Burnley Ch. of Eng. Lit. Inst., warehouseman—Anim. Phys. (3d)
1502—White, Florence, 19, Rugby Local Board, of no occupation—Latin and Rom. Hist. (3d)
1696—White, Harry E., 16, St. Peter's Evg. Sch., Wolverhampton, clerk—Arith. (2d); Anim. Phys. (3d)
417—White, Henry G., 26, Devonport M.I., shipwright—Trig. (1st), with 2nd prize of £3; Con. Sec. (2d); Anim. Phys. (2d); Prin. Mech. (2d)
1860—White, Henry T., 26, Liverpool Inst. Loc. Bd., gas-meter inspector—Music (3d)
285—Whitehead, Thomas, 19, Carlisle M.I., mech. engineer (apprentice)—Prac. Mech. (2d)
1905—Whitford, Thomas, 19, Belfast Acad. Sci. Sch., flax-dresser—Arith. (3d); Alg. (3d); Mensur. (3d)
1900—Whitford, William, 23, Belfast Acad. Sci. Sch., flax-dresser—Trigon. (1st), with 1st prize of £5; Mensur. (2d); Eng. Hist. (2d); Eng. Lit. (2d)
2069—Whitmarsh, Robert T., 18, Gloucester Free Lib., cheese-factor—Arith. (2d)
42—Whittaker, William, 20, Ashton and Dunkinfield M.I., timekeeper—Alg. (3d); Mensur. (3d); Geom. Dwg. (3d)
57—Whittles, Henry, 18, Bacup M.I., pupil teacher—Arith. (2d)
884—Wigglesworth, Thomas, 22, Huddersfield M.I., litho. printer—Free-hand Dwg. (2d)
819—Wilby, Richard, 23, Halifax W.M. Col., cotton-spinner—Chem. (1st)
866—Wildman, William P., 19, Holbeck M.I., mechanic—Eng. Hist. (3d); Pract. Mech. (3d)
1151—Wilkins, Robert W., 23, Roy. Polyt. Inst., clerk Elect. and Mag. (2d); Anim. Phys. (3d)
964—Wilkinson, John H., 16, Leeds Ch. Inst., share-broker's clerk—Arith. (3d); Geog. (3d)
135—Wilkinson, Nathan, 29, Birm. and Midl. Inst., stationer—Latin and Rom. Hist. (2d)
1423—Williams, Herbert, 16, Patricroft M.I., planer—Arith. (2d)
1948—Williams, Robert, 29, Burrage-road Sch. Plumstead, carpenter—Geom. Dwg. (3d)
1623—Williams, William H., 24, Southampton Ath., carpenter—Music (2d)
1362—Williamson, Jeremiah, 23, Oldham Lyc., letter-press printer—Bkpg. (3d)
1831—Williamson, Jonathan, 22, Liverpool Inst. Local Board, engineer—Pract. Mech. (2d)
1792—Williamson, William, 16, York M.I., pupil-teacher Free-hd. Dwg. (3d); Geog. (3d)
1211—Willman, Joshua, 16, Louth M.I., pupil teacher—Arith. (2d)
809—Wilson, Benjamin C., 25, Halifax W.M. Coll., warehouseman—Bkpg. (2d)
1586—Wilson, Edwin, 29, Scarborough M.I., hosier—Bkpg. (3d)
573—Wilson, John, 29, Andersonian Univ., Glasgow, teacher—Ani. Phys. (3d)
582—Wilson, Malcolm, 16, Glasgow Ath., ironmonger—Arith. (3d)
580—Wilson, Robt., 19, Glasgow Ath., clerk—Bkpg. (1st)
574—Wilson, Robert A., 21, Andersonian Univ., Glasgow, clerk—Ani. Phys. (3d)
973—Wilson, Thomas, 29, Leeds M.I., chemist and druggist—Chem. (3d)
1131—Wilson, William J., 25, Royal Polyt. Inst., engineer's clerk—Arith. (1st); Bkpg. (1st); Geog. (1st), with 1st prize of £5; and the Royal Geographical Society's prize of £5
1277—Winfield, Richard, 20, Manchester M.I., book-keeper—Arith. (2d)
1715—Wingfield, Henry E., 18, Woolwich Royal Arsenal Evg. School, engineer student - Elect. and Mag. (2d); Geom. (2d); Chem. (3d); Alg. (3d)
1134—Winterbottom, Charles, 18, Roy. Polyt. Inst., dental mechanic—Arith. (2d); Geog. (3d)
320—Winters, Edwin S., 38, Cheltenham W.M. Club, teacher of drawing—Free H. Dwg. (2d)
575—Wiseman, William, 25, Anderson. Univ., Glasgow, clerk—Bkpg (1st)
*622—Wishart, Andrew M., 22, Glasgow Inst., book-keeper - Bkpg. (3d)
*2080—Witchell, Edward J., 20, Gloucester Free Lib., engineer and manufacturer—Pract. Mech. (3d)
207—Wolstencroft, William, 20, Bradford M.I., clerk—Arith. (1st); Bkpg. (3d)
1584—Wolstenholme, John B., 18, Salford W.M. Coll., —porter Arith. (3d)
851—Womersley, Frederick W., 28, Hastings M.I., upholsterer—Bkpg. (1st); Alg. (2d)
491—Wood, Alexander, 19, Edinburgh Watt Inst., clerk—Bkpg. (2d); French (3d)
1198—Wood, James H., 18, Birkbeck Lit. Inst., butcher—Geog. (3d)
823—Wood, William H., 19, Halifax W.M. Coll., accountant's clerk—Elect. and Mag. (2d)
137—Wood, William H., jun., 19, Brm. and Midland Inst., lamp manufacturer—Chem. (2d)
1058—Woodard, James, 29, Beauvoir Coll., schoolmaster—Music (2d)
2004—Woodley, Decimus, 18, St. Thomas's Sch., Woolwich, clerk—Anim. Phys. (3d)
1506—Woods, Ellen M., 26, Rugby Loc. Board, of no occupation—Arith. (1st); Eng. Lit. (2d)
1505—Woods, Mary A., 27, Rugby Loc. Board, governess—Arith. (1st); Latin and Roman Hist. (2d)
1458—Woodthorpe, William H., 17, Portsea Y.M. Chr. Association, engineer student—Arith. (1st); Mensur. (2d)
1524—Woolfall, George, 17, St. Thomas's Ch. Inst., St. Helen's, pupil teacher -Arith. (3d)
1126—Woolfe, Henry, 17, City of Lond. Coll., clerk—Eng. Hist. (3d); Geog. (3d)
1014—Worfolk, George W., 18, Leeds Y. Men's Chr. Assoc., druggist (apprentice)—Arith. (3d)
2054—Worrall, William, 26, St. Thomas's School, Woolwich, writer—Geom. Dwg. (3d)
954—Worsdell, Edward, 16, Lancaster M.I., assistant master—Chem. (2d)
387—Wright, Francis S., 20, Nottingham M.I., lace warehouseman—French (3d)
2052—Wright, Henry E., 23, St. Thomas's School, Woolwich, teacher—Geom. Dwg. (3d)
138—Wright, Herbert, 28, Birm. and Midl. Inst., iron-monger's clerk—Spanish (2d)
1244—Wright, Samuel, 17, Manchester M.I., cabinet maker—Free-hd. Dwg. (3d)
1813—Wright, Thomas E., 16, Southport Church Inst., photographer—Free-hd. Dwg. (2d)
472—Wrigley, Robert, 17, Earlstown Mut. Imp. Soc., mechanic—Free-hd. Dwg. (3d)
2109—Wrigley, William, 22, Werneth M.I., warehouseman—Geom. Dwg. (3d)
1494—Wynne, Bryan, 22, Richmond Paroch. Library, gardener—Floric. (1st); Fruit and Veg. Cult. (1st), with 2d prize of £3, and the Roy. Hortic. Soc. prize of £3

324—Yates, Henry, 20, St. George's Ch. Assoc., Chorley, currier—Arith. (3d)
2048—Yearsley, Ormond B., 18, St. Thomas' Woolwich Loc. Bd., pattern-maker—Geom. Dwg. (3d)
555—Young, James, 19, Anderson. Univ., Glasgow, clerk—Music (2d)
1633—Young, Lillie, 21, Southampton Ath., teacher of the pianoforte—Music (2d)
682—Young, Peter, 17, Glasgow M.I., clerk—Bkpg. (1st)
611—Young, Sydney W., 22, Glasgow Ath., clerk—Bkpg. (2d); Logic, &c. (2d)

Fine Arts.

Exhibition of Fine Arts at Bordeaux.—The provincial exhibitions become more important every day. That of Bordeaux has long held a prominent place amongst its rivals, and the present, its seventeenth exhibition, is superior to any that have preceded it. The number of works exhibited is 635, and they include specimens of some of the best living French painters, and of some lately deceased artists; amongst the latter is the "Source," by Ingres, the property of the Countess Duchâtel. The purchases amount to £3,200, besides two works bought for the museum of Bordeaux, of which the price is not given. The works which have found purchasers are of all classes—paintings by Duverger, Landelle, Ribot, Antigna, Bonheur, Bourgeois, Chaplin, Paul Flandrin, Phileppoteaux, and-many other well-known artists, and sculpture and bronzes by such artists as Carpeaux, Carrier, Belleuse, and Paul Dubois. With such provincial markets as this and others open to the artists of France, it is no wonder that the annual exhibition in Paris becomes more crowded every year, for the admission to the latter is alone a passport to the exhibitions of the provinces.

Ghent Triennial Exhibition of Fine Arts.—This important exhibition is announced to take place in September, in the new hall of the Casino, recently erected specially for exhibitions. All kinds of works of art are admissible, provided they are the productions of living artists; but, from the title "National Exhibition," it would appear to be confined exclusively to Belgian exhibitors. The exhibition is to open on the 13th of September and close on the 2nd of November.

Manufactures.

The Cotton Manufacture in Switzerland.—One of the most important industries in Switzerland is the spinning and weaving of cotton. Spinning is chiefly carried on in the eastern part of Switzerland. The total number of spindles in all the establishments amounts to 1,600,000, of which 607,082 spindles are in 78 establishments in the canton of Zurich; 266,805 in 22 establishments in the canton of Argovie; 200,000 in 12 establishments in the canton of Glaris; 172,136 in 20 establishments in the canton of S. Gallo; 109,800 in 4 establishments in the canton of Zug; 50,400 in Svitto; 42,800 in Turgovie; 31,600 in the Grisons; 30,000 in Bern; 22,768 in Soletta; 10,000 in the canton of Bâle; 16,120 in Scaffhausen; and 6,016 in the canton of Lucern. The total number of workpeople employed in this manufacture is about 15,400, and adding the number of managers, the clerks, and other employés, and the families of the workpeople, about 30,000 persons may be said to depend on this industry for their livelihood. The annual production of the spinning-mills in Switzerland is estimated at 338,630 quintals. In 1857, the exports of cotton-yarn was 18,504 quintals against 4,818 imports; in 1863, 53,836 quintals exports against 47,475 quintals imports; and in 1866, 35,738 quintals exports against 16,686 imports. This decrease must not be attributed to a smaller production, for during the years 1864, 1865, and 1866, the imports of raw cotton and the exports of cotton goods had largely increased; it should rather be attributed to the greater development of the cotton weaving during the last few years in Switzerland, which has tended to augment the consumption of cotton-yarn, and for this reason a greater quantity has been imported.

Commerce.

The Coral Fishery on the Italian coasts is giving satisfactory results, and this industry annually acquires greater importance. The greater part of the boats employed in this fishery are Italian, and they take to Genoa, Leghorn, and Naples, their produce, which forms one of the principal branches of the trade of the peninsula. These boats are of two distinct kinds:—One kind, by far the most numerous, is composed of vessels of from 11 to 16 tons burden, with crews of 12 or 14 men each. They are all fitted out at Torre del Greco, under the Italian flag, and fish during the months of February and March. The second kind includes crafts from three to six tons burden, under the French flag, although they are almost entirely manned by Italian seamen. Their crews consist of five or six men, and they remain at sea all the year. The boats fish on the coast of Africa and Sardinia, at a distance of fifteen, twenty, or even thirty miles from shore, only returning to port in case of absolute necessity. They work day and night without intermission; half of the crew relieve the other half every six hours. They remain at sea in this way for several months, and their fare during that time consists of biscuits and macaroni. The number of the smaller kind of craft appear to have diminished during the last few years. Last year there were only twenty-seven; but, to make up for this, the number of the larger kind of vessels increases daily; they may be estimated on the average at 100, their crews amounting in all to about 1,200 men. In 1866 there were 120, and, though there was a diminution last year, it is calculated that in 1868 there will not be less than 200. The value of coral constantly varies; the lowest price is 75 francs the kilogramme. In 1867 it was only 60 francs; sometimes it is worth 100 francs. The differences of price is due in a degree to the different qualities of the coral; they arise also most frequently from special circumstances, which the markets of distant countries cause, the sale of coral being much smaller in Europe than elsewhere.

Colonies.

Victorian Railways.—The revenue of the government line of railways in Victoria continues steadily to increase. The total receipts up to the 19th March were £124,810 17s., against £119,870 15s. 6d. for the corresponding period of last year, making an increase of £4,940 1s. 6d. The following is a list of the revenue of the Victorian railways during February:—

	Passengers.	Goods.	Total.
	£	£	£
Murray River Line ..	8,710	15,751	24,462
Williamstown Line ..	1,086	1,140	2,227
Ballarat Line........	9,069	10,008	19,077
	£18,865	£26,899	£45,766

Revenue of New South Wales.—When responsible government commenced in this colony there was a deficit of £150,000. Seven years thereafter it had grown to £400,000. In the eighth year it had increased to

£800,000. New taxes were then imposed to the amount of £300,000 per annum, for the purpose of providing for the deficiency of £800,000, which it was thought might be met in three years. During the first two years, however, £450,000 of the new taxes were expended for various purposes other than that of meeting the deficiency, leaving in the treasury only £150,000 of the new taxes. The treasurer holds that, with this sum of £150,000, his ways and means will be sufficient without additional taxation.

Notes.

The Suez Canal.—In a recent number of the *Revue Contemporaine* will be found an article, by M. Amedée Marhean, in which he examines the advantages and drawbacks the passage of the Suez Canal may offer. If distance only were taken into account there could be no question about it; but, unfortunately, there are meteorological considerations, which render the new route difficult for sailing vessels. The winds of the Mediterranean and Red Sea, though favourable from March to October, will be the contrary during the winter season, for the out passage to India. The opposite will be the case for home-bound vessels. It has been calculated that at present the average time required for the Cape of Good Hope, starting for Cape Lizard, is in the summer 106 days for Ceylon; 107 days for Singapore; and 102 for the Straits of Sunda. By the Suez Canal, these figures will be respectively 55, 77, and 70. But by doubling the Cape the vessel saves 10 frs. per ton it would have had to pay in going by the canal, which, for a ship of 650 tons, makes a saving of 6,500 frs. Now the daily expenses of a sailing-vessel of that burden being 340 frs., the above sum would represent 19 days navigation, a difference to be taken into account in calculating the relative advantages of the two routes. It will be found, that during the winter season, the advantages offered by the out passage are, owing to the monsoon, much smaller than in the summer. For Java no time will be gained either way, and for Ceylon there will be an actual loss of 11 days by Suez. Nevertheless, deducting from the above 19 days, the vessels going by the shorter route will still have arrived a week sooner than those which have doubled the Cape, and will be able to forestall the competitors in the market, if, as is usually the case, that be an object. But if, instead of a sailing-vessel, the craft be a mixed one, say of 1,600 tons, matters will assume a different aspect. The voyage by the Cape will be 77, 75, and 71 days respectively. By the Canal, 43, 54, and 53; the 16,000 frs. for the tonnage dues will only represent 16 days' navigation, at the rate of 1,000 francs per day, so that whether in winter or summer such a ship will always be a gainer by taking the Suez route.

Date Pudding.—The *Produce Markets Review* says:—"Many grocers find a difficulty in disposing of any except the finest qualities of dates, but we are told on good authority, that even the lowest kinds may be made very palatable by converting them into what is called the Palmyra or date pudding, for which the following is the receipt:—1 lb. of dates, chopped fine; 1 lb. of flour; ½ lb. of suet; ¼ lb. of moist sugar. Mix all well together, and moisten with a little milk, boil in a basin or cloth for three hours, or bake slowly for two hours. These quantities make a large pudding."

The Electric Telegraph.—M. Neumann, in the Austrian report of the Paris Universal Exhibition in 1867, states that the telegraphic lines in the whole world are 49,255 geographical miles long; there are in Europe 8,000 offices, and 4,000 in the other continents. It has been necessary to employ for the conducting wires 1,300,000 cwt. of iron; the expense of establishing all the lines is estimated at 416,000,000 francs.

Correspondence.

Artificial Incubation.—Sir,—My attention having been called to the evidence of Mr. George Brooke, relative to the subject of hatching poultry by steam, as given before the Food Committee on the 13th of May last, and published in your issue of the 5th of June, I would very respectfully beg the favour of making a few remarks in reply. Mr. Broooke has evidently been misinformed on the subject, or has not given the personal attention to the matter which it deserves. Mr. Brooke is entirely in error. In the first place, I have birds alive which have been hatched and reared without hens, and they are strong, healthy, and fat. By artificial incubation birds may be hatched out to the extent of from 50 even up to 100 per cent. The birds so hatched are reared without hens, and the larger per centage, with care and attention, live to become full-grown fowls. The generality of birds so hatched and reared are perfect in form, and not the subjects of malformations and defects. The eggs from birds hatched and reared by steam are fertile, the same as if hatched and reared by hens. I have birds now alive the eggs from which they were hatched being laid by birds I had previously hatched and reared by steam. That a great deal of prejudice and opposition will have to be overcome before artificial incubation will be even tolerated in England, I feel very likely to be the case; but if gentlemen of standing and influence will only give a thought and some little attention to the subject, my conviction is that, eventually, it will hold its own against all opponents. We may not contravene nature, but we may imitate her; and if the science of artificial incubation is all problematical and a myth, how can we reconcile the fact that the art has been carried out in Egypt for the last 4,000 years up to the present time, and in China for very many years. I write these few lines in the interest of the many, although I may, from personal motives (being a manufacturer of hatching machines) be supposed to be actuated by mercenary motives only; but I shall be happy to afford to you, or any gentleman who may feel an interest in the subject, practical evidence that what I have stated is fact, from letters I have received and from the actual exhibition of birds which are now living.—I am, &c.,—William H. Thick.

188, Weedington-road, Kentish-town, N.W., June 9th, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon......Asiatic, 3.
Victoria Inst., 8.
R. United Service Inst., 8½. Major Palliser, "The Construction of Heavy Rifled Ordnance."
Social Science Assoc., 8. Meeting of Health Department. Mr. W. E. Bonnerjee, "On the Establishment of a Sanitary Department connected with the Government of India."

Tues ...Statistical, 8. Mr. I. H. Elliott, "On the Increase of Material Prosperity and of Moral Agencies, compared with the state of Crime and Pauperism."
Anthropological, 8.

Wed ...Meteorological, 7. Annual Meeting.
Geological, 8.

Thur ...Royal Inst., 3. Sir John Lubbock, "On Savages."
Royal, 8½.
Antiquaries, 8½.
Linnæan, 8. 1. Dr. Kirk, "On Zanzibar Copal." 2. Mr. Carruthers, "On British Fossil, *Cycadeæ*." 3. M. Bureau, "On Brazilian *Bignoniaceæ*." And other botanical papers.
Zoological, 4.
Numismatic, 7.
Chemical, 8. 1. Prof. Wanklyn, "On the Establishment of high Chemical Formulæ." 2. Prof. Church, "On some Cornish Minerals."
Philosophical Club, 6.
Society of Fine Arts, 8. Fourth Conversazione.

Fri.......Society of Arts. Conference, at noon.
Philological, 8.
R. United Service Inst., 3. Col. W. F. D. Jervois, "Coast Defences, and the Application of Iron to Fortification."

Sat ......Royal Inst., 3. Sir John Lubbock, "On Savages."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 22nd May, 1868.*

128. Bill—Voters in Disfranchised Boroughs.
198. Loan Societies—Abstract of Accounts.
278. Statutes at Large—Letter.

Delivered on 26th May, 1868.

126. Bill—Fairs.
131. „ Water Supply.
135. „ Public Schools (amended in Committee, and by the Select Committee.)
191. (I.) Coronation, &c., Oaths—Further Return.

Delivered on 27th May, 1868.

274. Ecclesiastical Commission (Ireland)—Return.
275. Tulla Union—Correspondence.
276. Record of Title, &c. (Ireland)—Returns.
294. Education (Scotland)—Minute.
297. Poor Law (Saint Pancras)—Report.

Public Petitions—Twenty-third Report.

Delivered on 28th May, 1868.

135. Bill—Public Schools (as amended by the Select Committee) (corrected copy)
138. „ Sale of Liquors on Sunday (Ireland) (as amended by the Select Committee).
194. (I.) Whitworth Scholarships—Minutes.
261. Metropolitan Foreign Cattle Market Bill—Second Report.
298. Military Reserve Funds—Report.
302. Civil Services—Estimate "on account."

Delivered on 29th May, 1868.

133. Bill—Thames Embankment & Metropolis Improvement (Loans) Act Amendment.
231. Local Taxation and Expenditure—Return.

Session 1867.

431. (A XI.) Poor Rates and Pauperism—Return (A) (March 1867 and 1868).

Delivered on 30th May, 1868.

119. (III.) Trade and Navigation Accounts (30th April).
292. Public Schools Bill—Report from the Select Committee.
293. Park Lane Improvement Bill—Special Report.

Statistical Abstract for the United Kingdom (1853 to 1867)—Fifteenth Number.

Abyssinian Expedition—Further Papers.

Public Petitions—Twenty-fourth Report.

Patents.

From Commissioners of Patents' Journal, June 5.

Grants of Provisional Protection.

Advertising in railway tunnels and cuttings—1641—H. H. Johnson.
Bags of paper, &c., fastenings for—1671—J. Booth.
Baths, &c., heating water for—1656—C. R. Havell.
Boilers—1703—F. Wirth.
Book-binding—1604—J. G. Tongue.
Boots—1658—C. Mole.
Bottles, &c., stoppers for—1652—Z. Poirier.
Carding engines—1683—J. W. Whittaker.
Carding engines—1711—S. A. Smith.
Carriage springs—1628—J. Mitchell.
Cartridges—1636—C. Fusnot.
Cask-washing apparatus—1635—J. Steel.
Chairs, &c.—1662—C. Barnard.
Chlorides, anhydrous, preparing—1630—E. P. H. Vaughan
Combs used in carding engines, &c.—431—W. Richardson.
Compasses—1709—P. Cameron.
Conservatories, &c., heating—6'6—R. Kerr.
Corks, apparatus for drawing—1638—J. Pollock.
Cotton, removing from cotton pods—1298—S. Dreyfous.
Cotton, &c., spinning and doubling—1697—J. Higgins.
Cranes, &c.—921—C. J. Appleby and I. Riley.
Cranks, &c.—1663—J. Convers.
Engines—1691—A. M. Clark.
Engines—1699—E. W. de Rusett.
Engines and boilers—1659—W. Inglis.
Fabrics, bleaching and cleansing—1639—T. Griffon.
Fabrics, fluting, &c.—1715—W. H. Kent.
Fabrics, woven, stretching—1610—W. Jones and J. Hetherington.
Fabrics, woven, stretching, &c.—1648—J. B. Whiteley.
Feet, &c., warming whilst travelling—1654—D. Jones & J. Jackson.
Filtering surfaces—1624—W. Needham and J. Kite.
Fire-arms, breech-loading—1524—A. M. Clark.
Fire engines—1675—T. G. Messenger.
Floral devices—1694—R. K. Bowley.
Flour—1705—T. J. Baker.
Fuel, artificial—1651—H. D. Hoskold, J. Davis, and G. P. Wheeler.
Furnaces—1647—F. D. Nuttall.
Gas, transforming hydrocarbon oils into—1430—P. Marlin & A. Tack.
Gas-tube hooks or fastenings—1700—T. Ashford.
Gearing, frictional—1684—R. Rayner.
Grain, hulling and winnowing—1515—W. Seck.
Grate bars—1689—W. E. Newton.
India-rubber, vulcanised, treating—1522—S. Moulton.
Iron and steel—1618—W. R. Lake.
Kilns for drying grain—1701—W. Seck.
Lamps—1610—A. M. Clark.
Land, tilling—1677—R. and J. Fryer.
Liquids, measuring—1657—W. England.
Looms—1636—J. Elce.
Looms—1661—G. T. Bousfield.
Looms—1669—W. Hadfield.
Looms—1719—H. L. A. Lippens.
Machinery, tools, &c., for cutting stone, &c.—1426—A. Munro.
Materials wound upon spools, making up—1673—E. E. Allen.
Metals, &c., shaping—1650—W. F. Batho.
Meters, liquid or gas—1668—E. A. Chameroy.
Motive-power apparatus—1707—E. Hunt.
Mowing machines—1622—W. Manwaring.
Oil for lubricating machinery—1579—J. E. Piper.
Oils, expressing from seeds, &c.—1497—B. Pickering.
Ordnance, &c.—1667—W. Palliser and F. J. Bolton.
Ores, metallic, dressing—1605—W. Rule, jun.
Ovens for manufacturing coke, &c.—1481—J. Young.
Paint, manufacture of—1470—D. R. Macgregor and P. Taysen.
Paper, &c., treating—1717—J. Scoffern.
Perambulators—1643—J. Fry.
Pipes for smoking—1631—E. P. H. Vaughan.
Pipes, &c., used in smoking, cases for—1633—J. Flachfeld.
Postage stamps, &c.—356—J. Jameson.
Pumps—1645—C. L. Taverdon and J. Moret.
Pumps, steam—1655—W. Tijou.
Retorts—1698—J. Fletcher.
Roads, macadamized, breaking up—1551—J. Slater.
Roads, watering, &c.—1660—W. Sim.
Saddles for frames used in spinning flax, &c.—1679—J. R. Batty.
Sardine cases, &c., opening—1644—R. Froehlich.
Sewers, ventilating—1642—J. Kennett.
Sewing machines—1658—A. V. Newton.
Sewing machines—1664—W. R. Lake.
Sewing machines—1678—J. Starley.
Ships, propelling—1681—H. Hall and J. A. Mason.
Ships, &c., iron and steel—1629—J. Grantham.
Shuttle holes and eyes, drawing threads through—1687—C. D. Abel.
Silver, separating copper, &c., from—1632—R. Pearce.
Soap—1670—J. E. Poynter.
Solitaires, &c.—1637—D. A. Cooper.
Steam cultivation, apparatus for—1653—A. Leslie.
Stone, &c., drilling—1682—F. E. B. Beaumont and C. J. Appleby.
Threads, warp, apparatus for selecting, &c.—1529—J. H. W. Biggs.
Umbrella and parasol cloths—1625—L. Goldstein.
Valves—1626—J. F. Spencer.
Valves—1649—A. Bell.
Wool, &c., combing—1672—J. Crofts, R. Dawson, and J. King.
Zirconia, preparing—1513—C. E. Brooman.

Inventions with Complete Specifications Filed.

Lead pipe, &c.—1767—H. Haines.
Paper satining machines—1803—T. Christy.
Spoons, plating—1777—G. T. Bousfield.

Patents Sealed.

3472. J. W. Kenyon and R. A. Armitstead.	3506. W. H. Barlow.
3477. F. Roper.	3519. J. M. Napier.
3483. R. B. Jones and W. Powell.	3535. E. R. Sintzenich.
3484. J. B. Morrison.	3540. J. Robinson.
3485. O. Barrett and H. Leggott.	3550. J. G. Settle.
3486. J. Blakey and H. B. Fox.	3571. J., J., and J. Booth.
3492. R. Warry.	3640. J. Rowe.
3497. W. Clapperton.	8. H. Milward.
3499. L. Rose.	158. R. Heathfield.
	886. H. A. Bonneville.

From Commissioners of Patents' Journal, June 9.

Patents Sealed.

3508. W. B. Leachman.	3577. W. H. Kerr.
3510. J. W. Burton.	3581. W. Huskisson, jun.
3516. A. M. Clark.	3583. T. V. Mackintosh.
3522. T. A. Weston.	3584. A. Shrimpton.
3527. J. Ward.	3600. J. Cockshoot, jun.
3528. R. Roberts and P. Williams.	3609. L. M. Becker.
3532. W. G. Hanning, G. B. Knott, & L. C. F. Clerc.	3714. H. Bessemer.
3533. J. Collingham and T. E. Smith.	2. W. R. Lake.
3534. P. Bawden.	44. F. Chamberlain.
3547. W. McIlwraith & J. Bonner.	79. W. E. Newton.
3549. A. Bullough.	684. T. Trotman.
3551. T. Pebardy.	731. T. Johnson.
3560. R. Tinkler.	755. F. T. Baker.
	841. P. Lennox.

Patents on which the Stamp Duty of £50 has been Paid.

1535. P. Coombes.	1530. W. Townend.
1541. W. E. Newton.	1547. D. Barker.
1552. G. Haseltine.	1778. G. Low.
1557. W. Tongue.	1626. H. A. Bonneville.
1574. J. de Hemptinne.	1646. G. Smith, jun.

Patents on which the Stamp Duty of £100 has been Paid.

1325. E. Green and J. Cadbury.	1400. W. R. Floyd.
1518. J. Knowles.	

Journal of the Society of Arts.

FRIDAY, JUNE 19, 1868.

Announcements by the Council.

ANNUAL GENERAL MEETING.

The One Hundred and Fourteenth Annual General Meeting, for the purpose of receiving the Council's report and the Treasurers' statement of receipts, payments, and expenditure during the past year, and also for the election of officers, will be held, in accordance with the Bye-laws, on Wednesday next, the 24th of June, at four o'clock p.m.

The Council hereby convene a Special General Meeting of the Members of the Society to ballot for members, such meeting to take place at the close of the Annual General Meeting.

By order,

P. LE NEVE FOSTER, *Secretary.*

Society's House, Adelphi, June 11th, 1868.

FINANCIAL STATEMENT.

The following statement is published in this week's *Journal*, in accordance with Sec. 42 of the Society's Bye-laws, which provides that, at the Annual General Meeting, the Council shall render to the Society a full account of their proceedings, and of the receipts, payments, and expenditure during the past year; and a copy of such statement shall be published in the *Journal* of the Society on the Friday before such general meeting.

TREASURERS' STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE, FOR THE YEAR ENDING 30TH MAY, 1868.

Dr.

		£ s. d.	£ s. d.
To Cash in hands of Coutts and Co., 30th May, 1867		826 3 10	
Do. do. the Secretary		16 6 2	
			842 10 0
To Subscriptions received during the year, from Members and Institutions in Union		5,326 10 6	
Life Contributions		252 1 0	
Donation by A. Davis, Esq. (3rd)		21 0 0	
			5,599 11 6
To Dividends on Stock:—			
Consols, £4,746 19s. 5d.	139 8 11		
Do. North London Exhibition Trust, £167 7s. 3d.	4 18 3		
Reduced 3 per Cents. £434 8s. 6d.	9 10 3		
		153 17 5	
To New 3 per Cents.:—			
Dr. Fothergill's Trust, £388 1s. 4d.	11 8 1		
India 5 per Cent. Notes, 52,000 Rupees	248 17 9		
		260 5 10	
			414 3 3
To Examinations:—			
The Worshipful Company of Coachmakers		3 0 0	
The Royal Geographical Society		5 0 0	
The Royal Horticultural Society		24 0 0	
The Rev. Dr. Temple		5 5 0	
Charles Brooke, Esq., F.R.S.		2 2 0	
Fees from Local Board Candidates, &c.		7 2 6	
			46 9 6
To Art Workmanship:—			
The Worshipful Company of Salters		21 0 0	
Sale of Examples		9 15 [illegible]	
			30 15 6
To Sale of Books:—			
Jury Reports		2 2 0	
Artizans' Reports		22 8 2	
Journals, &c.		29 8 11	
			53 19 1
To The Prince Consort's Prize		26 5 0	
The Artizans' Paris Visit Fund		857 2 6	
The South Australian Institute		450 0 0	
			1,333 7 6
			£8,320 16 4

Cr.

	£ s. d.	£ s. d.
By House and Premises:—		
Rent, Rates, and Taxes	264 13 6	
Insurance, Gas, Coals, and House Charges	158 13 5	
Repairs and Alterations	158 9 11	
		581 16 10
By Office:—		
Salaries, Wages, and Commissions	1,691 16 7	
Stationery and Printing	194 11 0	
Advertising	38 9 8	
Postage Stamps and Parcels	122 10 6	
		2,047 7 9
By *Journal*, including Stamps and Distribution to Members	1,542 2 4	
Library, Bookbinding, &c.	94 17 3	
Conversazione	175 11 11	
		1,812 11 6
By Union of Institutions, including Examination Prizes, Postage, Stationery, Printing, &c.	751 19 6	
Art Workmanship Prizes	239 14 5	
Society's Albert Memorial Medal	47 6 9	
Harvesting Prize	15 3 0	
Paris Exhibition	106 12 8	
		1,160 16 4
By Committees:—		
Food	66 18 7	
Musical	16 1 6	
Artistic Copyright	33 5 11	
Memorial Tablets	4 15 6	
Technical Education	57 1 11	
		178 3 5
By South Australian Institute	525 13 8	
Prince Consort's Prize	26 5 0	
North London Exhibition Prize	4 18 8	
Artizans' Paris Visit	942 17 2	
Artizans' Reports	29 18 4	
Donation to the Jerusalem Exploration Fund	10 10 0	
Repayment of Money received in excess	1 0 0	
		1,541 2 10
By Cantor Lectures		155 5 2
By Invested in purchase of £220 4s. 8d. Reduced 3 per Cent. Stock	203 3 3	
Power of Attorney to Messrs. Coutts and Co.	0 6 6	
		203 9 9
		7,680 13 7
By Balance of Cash in hands of Messrs. Coutts and Co., 30th May, 1868	617 3 9	
Ditto in hands of Secretary, Petty Cash	22 19 0	
		640 2 9
		£8,320 16 4

Liabilities and Assets.

Dr.

	£	s.	d.	£	s.	d.
To Sundry Creditors:—						
Sir W. C Trevelyan	70	0	0			
The Prince Consort's Prize	26	5	0			
North London Exhibition Trust	2	8	11			
Examination Prizes (Society's)	203	0	0			
Do. Royal Horticultural Society's Prizes	25	0	0			
Do. *Gardeners' Chronicle* Prize	3	0	0			
Do T. Twining, Esq., Prize	5	0	0			
Examiners' Fees	268	16	0			
Artizans' Reports	320	16	5			
Tradesmen's Accounts	612	19	1			
Harvesting Prize	52	10	0			
East London Museum Donation	105	0	0			
				1,694	15	5
* Excess of assets over liabilities				3,729	2	6
				£5,423	17	11

Cr.

	£	s.	d.	£	s.	d.
By Reduced 3 per Cent. Stock, £220 4s. 8d., at 92¼	202	17	9			
Consols, £146 19s 5d., at 95¾	141	4	0			
Invested in India 5 per Cent. Rupee Notes	353	11	6			
Subscriptions due and in course of collection, £2,195 11s. valued at	1,756	9	0			
Barry's Pictures and other Property, do.	2,000	0	0			
Prince Consort's Prize	26	5	0			
Royal Horticultural Society	25	0	0			
Gardeners' Chronicle	3	0	0			
Thomas Twining, Esq.	5	0	0			
South Australian Institute	11	15	5			
Sale of Artizans' Reports	188	12	6			
				4,713	15	2
Cash in hands of Messrs. Coutts and Co.	617	3	9			
Do. London and Westminster Bank	70	0	0			
Do. Secretary, Petty Cash	22	19	0			
				710	2	9
				£5,423	17	11

* The above is exclusive of the value of the Society's lease of premises.

Stock standing in the name of the Society at the Bank of England.

Consols	£4,914 6 8
New 3 per Cents.	388 1 4
Reduced 3 per Cents.	434 8 6
India 5 per Cent. Rupee Notes	Rs. 52,000

Trust Funds included in the above.

	£	s.	d.	
Swiney Bequest	£4,500	0	0	Consols, chargeable with a sum of £200 once in five years.
John Stock's Trust	100	0	0	„ chargeable with the Award of a Medal.
North London Exhibition Trust	167	7	3	„ chargeable with the Award of the Interest as a Money Prize.
Fothergill's Trust	388	1	4	New 3 per Cents., chargeable with the Award of a Medal.
Cantor Bequest	5,049	9	7	Invested in India 5 per Cent. Rupee Notes, 52,000 rupees.

JOHN MURRAY, SAMUEL ANDREWS, } *Auditors.*
P. LE NEVE FOSTER, *Secretary.*

Society's House, Adelphi, 15th June, 1868.

The Whitworth Scholarships.

The following letter has been received:—

"Science and Art Department, South Kensington.

"Sir,—Referring to the document, Form No. 293, on the subject of Mr. Whitworth's Scholarships and Exhibitions, and the restrictions therein imposed, by which the limit in the age of the holder of the Exhibition of £25 was fixed at 22 years, I am directed to inform you that Mr. Whitworth has, at the request of several applicants, decided that the limit shall be extended so as to include all candidates who had not completed their 25th year on 1st May, 1868.

"I am, sir, your obedient servant,

"Henry Cole, *Secretary.*

"The Secretary of the Society of Arts."

Subscriptions.

The Lady-day subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Memorial Tablets of Great Men and Events.

In order to show how rich the metropolis is in the memory of important personages and events, which it would be desirable to mark by means of tablets on houses, the Council have caused an alphabetical list to be prepared, the sixth part of which is now inserted. The Council request the assistance of members of the Society in completing and correcting this list, especially with reference to dates and the insertion of other names.

Whilst the Council intend proceeding with this work, they desire also to see it carried on by others—either by corporate bodies or individuals—and the Council will be happy to be instrumental in procuring suitable tablets from the manufacturers.

Quin, James (b. 1693—d. 1766), comedian and oratorical tutor to George III. Was born at (No. —?), King-street, Covent-garden, and baptized at the adjoining church. He acted at Lincoln's-inn-fields Theatre. He frequented the Bedford Coffee-house, in the Piazza, Covent-garden. He lived from 1749-52 at (No. —?), Bedford-street, Strand. A portrait of him hangs at the Garrick Club.

Radcliffe, Anne (b. 1764—d. 1823), novelist. Lived and died at Stafford-row, Pimlico, and lies buried at the burial-ground in the Bayswater-road.

Radcliffe, Dr. John (b. 1650—d. 1714), an eminent physician. Largely endowed St. Bartholomew's Hospital. Also bequeathed library and infirmary to the University of Oxford. Lived in Bow-street, Covent-garden. Often frequented the "Bull's Head," Clare-market. Portraits of him hang at St. Bartholomew's Hospital and at the College of Physicians.

Raimbach, Abraham (b. 1776—d. 1843), the engraver. Born and lived in Cecil-court, St. Martin's-lane.

Raleigh, Carew (d. 1666-7), son of Sir Walter. Born in the Tower of London. Lived from 1636-38, and in 1664, on the west side of St. Martin's-lane. He lies buried in St. Margaret's, Westminster.

Raleigh, Sir Walter (b. 1552—d. 1618), navigator and historian. Defeated the Spanish Armada. He was a Templar, and lived at Islington; also at the Bishop of Durham's Inn, on the site of Durham-street, Strand. He was imprisoned in the Tower, and beheaded in Old Palace-yard.

Raleigh, Lady, widow of Sir Walter Raleigh. Lived from 1623-25 at Boswell-court, Fleet-street; also on Tower-hill.

Ramsay, Allan (b. 1709—d. 1784), the painter. Lived at (No. —?), Harley-street, Cavendish-square. He lies buried in the cemetery of St. Marylebone.

Rastell, John (d. 1536), the printer, brother-in-law to Sir Thomas More. Lived at the sign of the "Star," Fleet-street, and at the "Mermaid," in Cheapside.

Ravenet, S. F. (d. 1764), the engraver. Lies buried in St. Pancras-in-the-Fields.

Raymond, Robert (b. 1670—d. 1733), Lord Chief Justice. Lived and died at (No. —?), Red Lion-square.

Reed, Isaac (b. 1742—d. 1807), author. Had chambers at No. 11, Staple-inn, Holborn.

Rees, Abraham (b. 1743—d. 1825), editor of an encyclopædia. Lived at (No. —?), east corner of Hunter-street, Brunswick-square.

Reeve, John (b. 1799—d. 1838), the comic actor. Played at the Adelphi Theatre. Lived and died at 46, Brompton-row. He lies buried in Brompton churchyard.

Rennie, John (b. 1761—d. 1821), engineer. Designed new London-bridge, Southwark-bridge, and Waterloo-bridge. He is buried in St. Paul's Cathedral.

Reynolds, Sir Joshua (b. 1723—d. 1792), President of the Royal Academy. Lived in St. Martin's-lane, nearly opposite the May's-buildings; afterwards at No. 5, (north side) Newport-street, Long-acre; and from 1761 till his death at No. 47, on the west side of Leicester-square. He lies buried, and a monument is erected to his memory, in St. Paul's Cathedral. Portraits of him hang at the Dilettanti Society and at the Royal Academy. He founded the Literary Club in 1764 at the "Turk's Head," Gerrard-street.

Richardson, Jonathan (b. 1665—d. 1745), artist, and author of works on painting. Lived and died at (No. —?), Queen-square, Bloomsbury.

Richardson, Jonathan, jun. (b. 1694—d. 1771), artist. Lived at (No. —?), Queen-square, Bloomsbury. He lies buried at St. George-the-Martyr, Bloomsbury.

Richardson, Samuel (b. 1689—d. 1761), printer and novelist. He is styled by Johnson, "an author from whom the age has received great favours." Educated at Christ's-hospital; lived, and had his place of business, at Salisbury-court, Fleet-street, where he wrote his "Pamela." He lies buried at St. Bride's, Fleet-street. A portrait of him hangs at Stationers'-hall.

Richardson, Sir Thomas (temp. Charles I.), chief justice; lived at No. 15, Bedford-street, Strand. A bust is erected to his memory in Westminster Abbey.

Riley, John (b. 1646—d. 1691), portrait painter, and afterwards State painter. Buried in St. Botolph Without, Bishopsgate.

Ripperda, John William, Baron of (b. 1680—d. 1730), the Dutch adventurer, once Prime Minister of Spain; lived in great magnificence in 1726 at (No. —?), Soho-square.

Ritson, Joseph (b. 1761—d. 1803), the eminent antiquary; lived and died at No. 8, Holborn-court, Gray's-inn, against the south wall of the chapel (now pulled down); lies in Bunhill-fields burial-ground.

Roberts, John, bookseller, from whose shop, at the "Oxford Arms," in Warwick-lane, Newgate-street, issued the majority of the squibs and libels on Pope.

Rodney, George, Lord (b. 1718—d. 1792), admiral; lived and died at (No. —?) Hanover-square. A monument is erected to him in St. Paul's Cathedral.

Romilly, Sir Samuel (b. 1757—d. 1818), a very eminent lawyer; born in Frith-street, Soho; lived at No. 6, Lincoln's-inn, New-square, and afterwards at No. 21, Russell-square.

Romney, George (b. 1734—d. 1802), painter; lived at No. 32, Cavendish-square.

Roubiliac, Louis Francis (b. 1695—d. 1762), sculptor; his chief works are in Westminster Abbey; lived in St. Peter's-court, St. Martin's-lane, and afterward removed to a studio on the west side of St. Martin's-lane, where he died. He often frequented Slaughter's Coffee-house; and lies buried in St. Martin's-in-the-Fields. A portrait of him hangs at Salter's-hall, Oxford-court.

Rowe, Nicholas (b. 1673—d. 1718), dramatic poet; educated at Westminster School; lived and died at his lodgings at Mr. West's, cabinet-maker, in King-street, Covent-garden. He lies buried, and a monument is erected to his memory, in Westminster Abbey.

Roxburgh, John, Duke of (b. 1740—d. 1804), the great book collector; lived at No. 11, St. James's-square.

Rumford, Benjamin Thompson, Count (b. 1752—d. 1814), philosopher; lived at No. 17, Michael's-place, Brompton. One of the early promoters of the Royal Institution of Great Britain.

Rupert, Prince (d. 1682), lived in Drury-house, Beech-lane, Barbican, no longer standing; also in Outer Spring-garden, from 1674 to his death. He lies buried at Westminster Abbey.

Russell, Edward, Earl of Orford (b. 1651—d. 1727), the admiral who defeated the French, off Cape La Hogue; lived and died at Evans's Hotel, Covent-garden, which was built for him.

Russell, William Lord (b. 1614—d. 1683), the patriot; was condemned to death in Hick's-hall, Clerkenwell; imprisoned in the Tower of London; executed at Lincoln's-inn-fields.

Russia, Alexander, Emperor of (b. 1777—d. 1825), resided at No. 105, Piccadilly (the Old Pulteney Hotel), during the visit of the allied sovereigns in 1814.

Ryland, W. W. (b. 1732—d. 1783), the engraver; lived, in 1767, at Stafford-row, Pimlico.

Rymer, Thomas (d. 1713), antiquarian and historian; lived at (No. — ?), south side Newport-street, Long-acre; and at (No. —?), Arundel-street, Strand, where he died.

Rysbrach, John Michael (b. 1694—d. 1770), sculptor; lived and died at (No. — ?), Vere-street, Oxford-street. Buried at St. Marylebone. A portrait of him hangs in the Privy-garden collection.

Sackville, Charles, Earl of Dorset and Middlesex (b. 1637 —d. 1705-6), celebrated poet and wit; lived, in 1678, on the west side of St. James's-square; in 1681, at (No. —?), Buckingham-street, Strand; and, in 1684-5, on the west side of Bow-street, Covent-garden.

Sackville, Thomas, Lord Buckhurst, Earl of Dorset (b. 1536—d. 1608), Lord High Treasurer, poet and dramatic writer; was a member of the Inner Temple, and lived in Dorset House, Fleet-street. Lies buried in St. Bride's or St. Bridget's, Fleet-street.

Sale, George (d. 1736), celebrated English writer and Arabic scholar; lived and died at (No. —?) Surrey-street, Strand.

St. Vincent, John Jervis, Earl (b. 1734 — d. 1823), Admiral, and hero of the battle of Cape St. Vincent; lived at No. 48, Lower Grosvenor-street. A monument to him is erected in St. Paul's Cathedral, and a portrait of him hangs at Fishmongers' Hall.

Sancho, Ignatius (b. 1729—d. 1780), the extraordinary negro, originally a slave, celebrated for his literary attainments, patriotism, and power of reasoning; intimate friend of Sterne and Garrick; lived at No. 19, Charles-street, King-street, Westminster.

Sancroft, William (b. 1616—d. 1693), Archbishop of Canterbury; was at one time Vicar of Hackney; and he assisted the erection of Chelsea Hospital. Lived in Maiden-lane, Covent-garden. He retired into private life and poverty, because he would not swear allegiance to William and Mary, after he had done so to James.

Sandford, Francis (b. 1629—d. 1693), author of the "Genealogical History of England;" was Lancaster Herald. He lived at (No. — ?), Great Russell-street, Bloomsbury. He died in the Fleet Prison, and lies buried in St. Bride's, or St. Bridget's, Fleet-street.

Sandford, the actor; lived at (No.—?), Salisbury-square, Fleet-street.

Sandwich Islands, King of (d. 1824); when on a visit to this country lived at Osborne's Hotel, John-street, Adelphi.

Savage, Richard (b. 1698—d. 1743), poet; was born in Fox-court, Brook-street, and baptised at St. Andrew's, Holborn. He lived some time in the liberties of the Fleet, and was confined in the Gate-house Prison. One of his favourite haunts was the "Cross Keys Inn," St. John's-street, Clerkenwell.

Schiavonetti, Lewis (b. 1765—d. 1810), painter and engraver. He lived at No. 12, Michael's-place, Brompton, and lies buried in the churchyard of Paddington parish.

Scott, Sir Walter (b. 1771—d. 1832), poet and novelist; lived at No. 25, Pall-mall; and St. James's-hotel, St. James's-street, was his last London lodging. A bust of him is in the Privy Garden Collection.

Selden, John (b. 1584—d. 1654), antiquarian, historian, and law writer. He was a member of the Inner Temple; lived in Paper-buildings, Temple. He died in Friary-house, Whitefriars. He lies buried, and a monument is erected to him, in the Temple Church.

Selwyn, George (b. 1719—d. 1791); lived, in 1766, at (No. —?), Chesterfield-street, Mayfair, also at Cleveland-court, St. James's, where he died.

Serres, John Dominick (d. 1793), marine painter; buried in the church of St. Marylebone.

Settle, Elkanah (b. 1648—d. 1723 or 24), dramatic poet and actor; was the last City poet. He ended his career as one of the Poor Brethren of the Charter-house, where he died.

Seward, William (b. 1747—d. 1799), author of "Anecdotes of Distinguished Persons," &c.; educated at the Charter-house, and lived at No. 40, Great Portland-land-street, Oxford-street.

Seymour of Sudeley, Thomas Lord (d. 1548–9), Admiral; lived at Arundel-house, Strand, also at Chelsea after his marriage to Queen Catherine Parr. He was beheaded on Tower-hill, and lies buried in the church of St. Peter's *ad vincula.*

Shadwell, Thomas (b. 1640—d. 1692), Poet Laureate, dramatic writer, and the "Mac Fleckno" of Dryden. Was a Templar. Lived in Salisbury-court, Fleet-street, now called Salisbury-square. Buried in St. Luke's, Chelsea; and a monument to his memory stands in Westminster Abbey.

Shadwell, Sir John, son of the above, an eminent physician. Lived at (No. —?), Duke-street, Buckingham-street, Strand; also in 1729 at (No. —?), Great Windmill-street.

Shaftesbury, Anthony Ashley Cooper, Earl of (b. 1621—d. 1682-3), Lord High Chancellor. Was a student of Lincoln's-inn. Lived in Shaftesbury-house, Aldersgate-street; also at Exeter-house, Strand; also on the west side of St. Martin's-lane. A portrait of him hangs at the Charter-house.

Shaftesbury, Anthony Ashley Cooper, third Earl of (b. 1671—d. 1713), author of "The Characteristics." He was the great advocate for the Bill for allowing the aid of counsel to prisoners charged with high treason. He was born in Exeter-house, Strand; baptised at St. Clement's Danes, Strand; and lived from 1699-1710 in Little Chelsea, in a house which is now an additional workhouse to the parish of St. George's, Hanover-square.

Shakspeare, Edmund (d. 1607), the poet's youngest brother, a "player." Lies buried in the church of St. Saviour's, Southwark.

Shakspeare, William (b. 1564—d. 1616), the poet. It is probable that he lived in St. Helen's parish, Bishopsgate. He partly owned, and acted at Blackfriars Theatre in 1596, also, during the summer months, at the Globe Theatre, on the Bankside, Southwark. He frequented, and mentions in his works, the "Boar's Head Tavern," East-cheap, which was destroyed for the approaches of New London-bridge in 1831. The only letter known to have been addressed to him, and which is still preserved, was written by Richard Quyney, from Bell-yard, Great Carter-lane, Doctors'-commons. His signature to a deed of conveyance is preserved in the Guildhall. He owned a house in Blackfriars, which he bequeathed to his daughter. It is described as "abutting upon a streete leading down to Puddle Wharffe, on the east part, right against the King's Majesty's Wardrobe." His original will, of three folio sheets, each having his signature, is preserved in the Prerogative Will Office, Knightrider-street, Doctor's-commons. The monument at Stratford-upon-Avon was made by Gerald Johnson, a Hollander, living in St. Thomas-the-Apostle's-street, City. The Chandos portrait of him is in the Bridgwater collection. A bas-relief bust, between allegorical figures, has been erected on the front of the British Institution, Pall-mall. A statue is also placed to his memory in the British Museum; and a monument in Westminster Abbey. Some of the first editions of his works were published and sold at the New Exchange, Strand, and St. Paul's Churchyard.

Sharp, Granville (b. 1734—d. 1813), the great advocate for the abolition of slavery, and other patriotic and philanthropic objects. A bust of him is placed in the Guildhall.

Sharp, John (d. 1713-14), Archbishop of York, a learned theological writer. Lived in a house standing on the site of York-street, Westminster.

Shee, Sir Martin Archer (b. 1770), President of the Royal Academy. Lived at No. 32, Cavendish-square.

Sheepsbanks, John (b. 1787—d. 1863), patron of British art, and presenter of the collection bearing his name in the South Kensington Museum. Lived in the detached house on the south west side of Rutland-gate, Knightsbridge.

Sheffield, John (b. 1649—d. 1720-1), Duke of Buckingham, a celebrated general, critic, and poet; friend and patron of Dryden; lived at Arlington-street, Piccadilly; also at Buckingham-house, St. James's-park, pulled down to erect Buckingham-palace, in the reign of George IV. He frequented the gardens and bowling-green which occupied the site of Beaumont-street, Marylebone. He erected a bust to Dryden in Westminster Abbey, where he himself lies buried, and a monument stands to his memory. A portrait of him is to be seen at the Charter-house.

Sheppard, Jack (b. 1700—d. 1724). His first robbery, consisting of two silver spoons, was committed at the "Rummer Tavern." His celebrated jump was from one of the first-floor windows of the "Black Jack" public-house, Portsmouth-street, Lincoln's-inn-fields, and after that known as "The Jump." Was tried at the Old Bailey, hanged at Tyburn, and buried in St. Martin's-in-the-fields.

Sheridan, Richard Brinsley (b. 1751—d. 1816), dramatic writer and orator; was a Templar. Lived at (No.— ?), Orchard-street, Portman-square; also, in 1800, at (No.— ?), Hertford-street, Mayfair; and during the last year of his life at Took's-court, Chancery-lane. He died at No. 17, Savile-row, Burlington-gardens, and lies buried in Westminster Abbey.

Sheridan, Thomas (b. 1721—d. 1788), actor; father of the great R. B. Sheridan; lived at (No.— ?), Bedford-street, Strand. A portrait of him hangs at the Garrick Club.

Shippen, William (b. 1672—d. 1743), Member of Parliament, and celebrated by Pope as the "Downright Shippen." Sir R. Walpole remarked that he was not corruptible. Was imprisoned in the Tower for a speech in Parliament. Lived half way down on the east side of Norfolk-street, Strand.

Shirley, James (b. 1594—d. 1666), poet. Educated at Merchant Taylor's School. He lies buried at St. Giles's-in-the-fields.

Shovel, Sir Cloudesley (b. 1650—d. 1707), a celebrated

admiral. Lived at (No.—?), Prescot-street, Goodman's-fields; also in Soho-square, where his body lay in state after his fatal shipwreck. He lies buried, and a monument is erected to his memory in Westminster Abbey.

Siddons, Mrs. (b. 1755—d. 1831), actress; lived for many years at Westbourne Farm, Paddington, on the site of the Terminus of the Great Western Railway; also at Siddons-house, Baker-street, Portman-square, on the east side, where she died. She lies buried in the churchyard at Paddington. A portrait and bust of her are to be seen at the Garrick Club.

Sloane, Sir Hans (b. 1660—d. 1762), eminent physician and naturalist. His collection, offered in his will to Parliament for £20,000, formed the origin of the British Museum. He lived at one corner of Southampton-street, next Bloomsbury-square. Portraits of him hang at the British Museum, College of Physicians, and the Royal Society. A monument is also erected to his memory in the churchyard of St. Luke's, Chelsea.

Smart, Christopher (b. 1722—d. 1771), poet and miscellaneous writer; lived within the rules of the King's Bench Prison.

Smith, Sir W. Sidney (b. 1764—d. 1840), Admiral, and hero of St. Jean d'Acre; lived in No. 72, Great Russell-street, Bloomsbury, in 1828.

Smith, James (b. 1775—d. 1839), one of the authors of the "Rejected Addresses." Born at No. 36, Basinghall-street; lived at No. 18, Austin Friars, Broad-street; buried in St. Martin's-in-the-fields.

Smith, Horace (b. 1779—d. 1849), brother of the above, and the other author of "Rejected Addresses;" born at No. 36, Basinghall-street.

Smith, John Raphael (b. 1750—d. 1811), engraver; lived at No. 11, Bateman's-buildings, Soho-square.

Smith, Rev. Sydney (b. 1768—d. 1845); lived and died at No. 56, Green-street, Grosvenor-square. He lies buried in Kensal-green Cemetery.

Smollett, Tobias George (b. 1721—d. 1771), novelist and historian; lived at the upper end of Lawrence-street, Chelsea (now destroyed).

Snelling, T. (d. 1773), the numismatist; known by his book on "Coins and Medals." Lived in Fleet-street, next to the "Horn" Tavern; this tavern is now No. 164, Anderton's Hotel.

Soane, Sir John (b. 1755—d. 1837), architect; designed the Bank of England as it at present stands, the picture-gallery of Dulwich College, and St. Peter's Church, Walworth; formed and founded the museum which bears his name in Lincoln's-inn-fields. He lies buried in the burial-ground of St. Giles-in-the-fields, adjoining the old Church of St. Pancras.

Somers, John Lord (b. 1650—d. 1716); Lord Chancellor, statesman, and orator; was a Templar. Lived in Newcastle-house and also in Powis-house, Lincoln's-inn-fields. Portraits of him hang at the Charter-house, and the Royal Society, Somerset-house.

South, Robert, D.D. (b. 1633—d. 1716), eminent theological writer; was born at Hackney; educated at Westminster School. He lies buried, and a monument is erected to his memory, in Westminster Abbey.

Southampton, Thomas Wriothesley, Earl of (d. 1667), Lord Treasurer. Lived in Bedford-house, Bloomsbury, now pulled down. It formed one of the sides of Bloomsbury-square; also in Essex-house, Strand.

Southerne, Thomas (b. 1660—d. 1746), poet, author of "Oroonoko and the Fatal Marriage;" a Templar. Lived for many years at Mr. Whyte's, an oilman, in Tothill-street, against Dartmouth-street, Westminster. He died at (No. —?), Smith-street, Westminster.

Southey, R. (b. 1774—d. 1843), Poet Laureate. Educated at Westminster School. Was a student at Gray's-inn. A bust to his memory is placed in Westminster Abbey.

Speed, John (d. 1629), antiquary and historian. Was a merchant tailor. Buried at St. Giles', Cripplegate.

Spelman, Sir Henry (b. 1562—d. 1640), antiquary and historian. Was a student at Lincoln's-inn. Lived and died at the Barbican.

Spenser, Edmund (b. 1553—d. 1599), Poet Laureate, author of "The Faërie Queen." Said to have been born in East Smithfield. He lived at (No. —?), King-street, Westminster, where he died. He lies buried, and a monument is erected to him, in Westminster Abbey.

Spragg, Sir Edward, Admiral in the wars against the Dutch. Lived at (No. —?), Suffolk-street, Haymarket. Buried in Westminster Abbey.

Staël, Madame de (b. 1766—d. 1817), novelist and general writer of great ability. Lodged, in 1813, at No. 30, Argyll-street, Regent-street, when on a visit to this country.

Stanley, Thomas (b. 1644—d. 1678), author of "The History of Philosophy," &c. Lived and died at his lodgings at (No. —?), Suffolk-street, Haymarket. He lies buried at St. Martin's-in-the-fields.

Steele, Sir Richard (b. 1671-6—d. 1729), a writer of great celebrity. Educated at the Charter-house. He lived at No. 20, on the west side of Bury-street, St. James's (now pulled down); from 1721 to 1724 at (No. —?), Villiers-street, Strand. He frequented the St. James's Coffeehouse, St. James's-street. A portrait of him hangs at Stationers' Hall.

Steevens, George (b. 1736—d. 1800), critic and commentator on Shakespeare. Born at Stepney, and baptised at Poplar Chapel. He died at Hampstead.

Sterne, Laurence (b. 1713—d. 1768), author of "The Life and Opinions of Tristram Shandy," &c.; he lived and died at No. 41, on the west side of Old Bond-street. He lies buried in the Bayswater Cemetery, facing Hyde-park.

Stillingfleet, Edward, Bishop of Worcester (b. 1635—1699), author of theological works of great repute. Educated at Christ's Hospital; was Rector of St. Andrew's, Holborn. Lived at (No. —?), Park-street, Westminster.

Stone, Nicholas (b. 1586—1647), sculptor. He was the master-mason to the Banqueting-house, Whitehall, and sculptor of the monument to Sir Francis Vere, in Westminster Abbey. He lived on the south side of Long-acre, and lies buried at St. Martin's-in-the-fields.

Stothard, Thomas, R.A. (b. 1755—d.1834), painter; was born and lived in Long-acre, also at No. 24, Newman-street, Oxford-street, from 1794 till his death. He lies buried at Bunhill-fields.

Stow, John (b. 1525—d. 1605), historian and antiquary; was a merchant tailor. His collection of annals and his "Survey of London" are in the British Museum. He was born in St. Michael's, Cornhill, and lived within Aldgate, between Leadenhall and Fenchurch streets. He was buried, and a monument in terra-cotta is erected to his memory in St. Andrew's-under-Shaft, but his remains have been disturbed.

Strafford, Thomas Wentworth, Earl of (b. 1593—d. 1641), statesman, was born in Chancery-lane, and baptised at St. Dunstan's, Fleet-street. He lived, in 1640, on the south side of Henrietta-street, Covent-garden. Tried at Westminster Hall, and beheaded on Tower-hill.

Strange, Sir Robert (b. 1721—d. 1792), engraver, chiefly of historical prints. He lived in 1756 at the "Golden Head," Henrietta-street; from 1765 to 1774 at (No. — ?), Castle-street, Leicester-square, and from 1782-85 in No. 52, Great Queen-street, Lincoln's-inn-fields. He lies buried in St. Paul's, Covent-garden.

Strutt, Joseph (b. 1749—d. 1802), antiquary and artist. He lived and died at (No.—?), Charles-street, Hatton-garden; and lies buried in the churchyard of St. Andrew's, Holborn.

Strype, John (b. 1643—d. 1737), historian; was lecturer at Hackney, where he died.

Stuart, James (b.1713—d. 1788), antiquary and traveller;

author of the "Antiquities of Athens;" lived at No. 45, Harley-street, Cavendish-square. Lies buried in St. Martin's-in-the-fields.

Stukeley, William (b. 1687—d. 1765), antiquary. Lived at (No.—?). Great Ormond-street, and on the south-west side of Queen-square, Bloomsbury. Was rector of St. George-the-Martyr, in this square.

Suckling, Sir John (b. 1613—d. 1641), poet and dramatic writer. He lived at (No. — ?), St. Martin's-lane.

Sullivan, Lake, engraver, Hogarth's assistant, lived and died at the "White Bear Inn," Piccadilly.

Sully, Maximilian, Duke of (d. 1641), Prime Minister of Henry IV. of France, and ambassador in England; lodged in Arundel-house, Strand.

Swift, Jonathan (b. 1667—d. 1744), poet, political, satirical, and miscellaneous writer; was Dean of St. Patrick's, Dublin. Lodged in Chelsea, over against Atterbury; also at (No.—?), Suffolk-street, Haymarket; and in Bury-street, St. James's, on the occasion of his last visit to London.

Sydney, Henry, Earl of Romney (d. 1704), the handsome Sydney of De Grammont's "Memoirs;" lived at Romney-house, which stood on the site of the Erectheum Club, St. James's-square. He lies buried in St. James's Church, Piccadilly.

WHITWORTH EXHIBITIONS.

The following arrangements have been printed and issued by Owens College, Manchester:—

The Trustees of Owens College are prepared to award seven exhibitions of £25 each, placed at their disposal by Mr. Joseph Whitworth, on the following conditions:—

1. Candidates must be not younger than 16 years on the 5th October, 1868, nor have been older than 25 years on the 1st May, 1868.

2. Successful candidates will be required to satisfy the trustees of Owens College that they will present themselves as candidates at the competition for the Whitworth Scholarships in May, 1869.

3. Of the seven Exhibitions

(*a.*) Two will be awarded in June, 1868, by selection of the principal and professors, to the two best amongst the sufficiently qualified students of the college of the session 1867-8, either in the day or evening classes, who shall declare themselves willing to hold the exhibitions on the conditions announced.

(*b.*) Two will be awarded, also in June, 1868, by selection of the principal and professors, to the two best amongst sufficiently qualified artisans (working for wages) who shall be recommended as fit candidates by the heads of the principal engineering workshops in and around Manchester.

(*c*). The three remaining exhibitions, together with any not awarded under *a* and *b*, will be offered in competitive examination in October, 1868, open to all persons whether previously students in Owens College or not.

4. The exhibitions under *a* and *c* (clause 3) will be awarded to those candidates who shall have shown the greatest proficiency in some or all of the following subjects:—

Arithmetic, Geometry, Algebra.
Natural Philosophy—Elementary Mechanics, and Heat.
Elementary Chemistry (inorganic).
Drawing—Geometrical and Mechanical.
Machinery and Tools.

Candidates under *a* are requested to attend at the College on Monday, the 22nd June, at 1·30 p.m.

Candidates under *c* will be required to send in their names to the principal on or before Monday, the 28th of September, and to present themselves for examination in the above subjects on Monday, the 5th day of October, at 3 p.m.

Candidates under *b* are requested to attend at the College on Monday, the 22nd June, at 8 p.m., when arrangements will be made for the selection—which will depend partly on their proficiency in the subjects specified above, and partly on their skill as workmen.

5. Successful candidates under *a* and *c* will be required to attend the following day classes in the session 1868-9, subject to the discretionary power of exemption vested in the principal in the case of regular students (see calendar):—

Engineering and Drawing.	Mechanics.
Mathematics.	Physics.
	Chemistry.

and otherwise to qualify themselves for competition in hand-craft work, as specified in Mr. Whitworth's scheme.

Successful candidates under *b* will be required to attend the corresponding evening classes (at least), but if they elect to attend the day classes instead, the class fees will be in their case remitted.

J. G. Greenwood, *Principal.*

11th June, 1868.

HAVRE EXHIBITION.

The catalogue, which, by some accident, failed to reach the writer in time for the notice contained in a preceding *Journal*, shows the extent of the exhibition and the relative importance of its various sections. It is published by Messrs. J. M. Johnson and Sons, of London, the *concessionaires* of the late Paris Exhibition, and, without being in the least unwieldy in size, its contents are not so curt and bald as is necessarily the case with catalogues of universal exhibitions. The number of exhibitors is about three thousand, but this does not include those in the annexed exhibition of the Fine Arts, which, as before stated, is not yet opened, with the exception of a small collection of pictures and other works of art by old masters.

The first group, entitled "Navigation," which includes models of ships and boats of all kinds; spars and rigging; methods of preserving and repairing vessels; medicine chests; nautical instruments and marine charts; naval telegraphs and signals; fisheries, maritime and fluvial; and life-saving and swimming means and appliances, includes more than four hundred exhibitors, and more foreign contributors, in proportion to natives, than any former exhibition. England, Holland, Denmark, Norway, and the United States appear upon every page, for the catalogue is not subdivided into countries. As regards great Britain, we find in the section of "plans and models of vessels" the names of Messrs. E. A. Allen, of London; Stephen Bishop, of Guernsey; Henry Burnelle, Glasgow; Forrest and Bar, Glasgow; Hamilton's Windsor Iron Works, Liverpool; Henderson, Coulborn, and Co., Renfrew; William Hughes, London; J. Kayll, Sunderland; L. M. Kilmer, Chester; James Laing, Manchester; James Lavoir, Quebec; Evan Leigh, Manchester; the London Engineering and Iron Shipbuilding Company; H. Lumley, London; George Myers, Rotherham; R. Napier and Sons, Glasgow; Palmer's Shipbuilding and Iron Company, Newcastle-upon-Tyne; Joseph Ritchie, London; Robinson and Co., Cork; Thomas Adamson, Greenock; the Universal Paint Company, London; Valin and Vallerand, of Quebec; Wade, Guy, and Co., London; Walker and Ragon, of London; Thomas Wishart, of Showe-street, Ayr.

In the section of propellors, there appears but one English exhibitor, Mr. Benjamin Colin, of Jersey; but this class is weak, including in all but a dozen exhibitors.

Class 2, Masts, sails, and rigging, comprises more than thirty exhibitors, with nothing from Great Britain but patent pullies and yacht fittings, shown by Mr. Fay, of Southampton.

In Class 3, amongst the exhibitors of iron-wire, and other cordage, are Messrs. Thomas and Scott, of Liverpool and Manchester; Reed, Lough, and Co., of London;

and Mr. T. P. Jones, of Dudley and Liverpool. The Board of Trade; Mr. R. T. Dunn, of Glasgow; Mr. Robert Murray, of Dingwall; and Mr. J. L. Ulex, show naval medicine chests. In the list of exhibitors of means of preservation of vessels, are Messrs. J. Bethell and Co., of London; McDougall, Brothers, of London and Manchester; Samuel Morton and Co., of Leith; and the Universal Paint Company, of London. The section of ship-fittings is not so strong in the British element as it might have been—the names of Mr. George Burnet, of Millwall; Messrs. Hawks, Crawshay, and Sons, of Newcastle; Mr. Henry Lumley, of London; Mr. Claude Martin, of Newcastle; and Mr. Edmund May, of Bath, are amongst the exhibitors.

In the class of naval instruments, charts, and telegraphic apparatus, are the names of Messrs. Emerson, Walker, and Co., of London; Messrs. D. McGregor and Co., of Glasgow and Greenock; Messrs. Rae and Co., of Carlisle; The Board of Trade; Commander Maury, of London; Messrs. Gisborne and Co., of Liverpool; Messrs. Holly and Co.; Mr. G. Hornsey, of Southampton; Messrs. Weir and Co., of Liverpool; Mr. Charles Frodsham, of London; Mr. Victor Kullberg, of London; Messrs. Parkinson and Frodsham, of London; Messrs. Reid and Son, of Newcastle; and Mr. William Weichert, of Cardiff.

The class of fishing apparatus and tackle is not so full as was to be expected, and out of thirty exhibitors the following are from Great Britain:—Mr. J. N. Hearder, of Plymouth; Messrs. W. Hounsell and Co., of Bridport; Kirby, Beard, and Co., of London; Woodfield and Sons, of Redditch; and Wadkin and King, of Manchester.

In the classes of life-saving and swimming apparatus appear the Board of Trade, and Messrs. R. Peacock, of Starcross; R. Donaldson, of Newcastle; B. J. Fells, of Dover; A. Leforestier, of London; and H. Richardson, of North Wales.

The second group, that of "alimentary matter," comprises between four and five hundred exhibitors, including in the class of bread-stuffs the only English name, that of Mr. G. Borwick, of London. In that of preserved and other provisions of all kinds, we find Messrs. Forbes, Alexander, and Co., of London; Bolman, Condy and Co., of Battersea; Mr. J. Coleman, of London; the Liebig Extract of Meat Company, of London, Paris, and Antwerp; Messrs. Kidd and Hunter, of Glasgow; Marshall and Co., of Aberdeen; J. T. Morton and Co., of London; H. Schooling and Co., London; Mr. C. Tindal (the Australian Meat Company), London. In these classes Great Britain is most imperfectly represented.

In the division of "potable liquors," which has exhibitors from every country, we have only noticed one from Great Britain, namely, that of Messrs. William Hay and Co., of Glasgow.

Passing over the class of clothing, we find in the perfumery class the names of Messrs. Price and Co.; Rimmel, and Schooling, jun., all of London.

In the class of machines, materials, and industrial processes, appear the names of the following exhibitors:—The British Seaweed Company, Glasgow; Messrs. F. Crace Calvert and Co., Manchester; McDougall, Brothers, London; R. F. Dunn, Glasgow; Parker and Co., Glasgow; J. M. Smith, Newington Butts; Henry Stephens, of London; Peacock and Buchan, Southampton; James Webster and Co., Birmingham; James MacJohn, of Liverpool; J. C. and John Field, London; Mactaggart, Boyd, and Co., Glasgow; Sir W. A. Rose and Co., London; Messrs. Anderson and Son, Belfast; the Patent Plumbago Crucible Company, of Battersea; Messrs. Charles Powis and Co., of Millwall; Byers and Sons Stockton-on-Tees and London; W. Baird and Co., of Glasgow; the Coedeac Coal Company, Cardiff; Hervain Iron Company, Cardiff; Messrs. William David and Co., of Glasgow; Mr. B. Jones, of Llanelly; Messrs. Lewis, Carr, and Co., Cardiff; the Llynvi Iron and Coal Company, Cardiff; Messrs. Nixon, Taylor, and Tory, Cardiff; the United Collieries of the North of England; Messrs. Harrison, Carr and Co., Newcastle; the Bedlington Coal Company, Newcastle; the Cowper and North Seaton Coal Company, Newcastle; the Hastings Hartley Colliery, Newcastle; the Chatwood Iron Safe Company, Bolton and Manchester; Messrs. Alex. Wilson and Co., Wandsworth-road; W. M. James, Son, and Co., and Adair and Co., Liverpool; J. and H. Gwynne, London; Shuttleworth and Kermann, Shoreham; A. Getting, Battersea; A. Robinson and Co., Liverpool; the Silicated Carbon Filter Company, London; Mr. Henry Stephens, of London.

In the classes devoted to the materials of construction, we find the names of Messrs. Francis and Son, of London, who exhibit cement for use in the construction of maritime ports. In the classes of general articles for exportation there are few if any British exhibitors.

In the classes of plans, manuscript communications, and printed books, the following British contributors appear:—Messrs. E. A. Allen, C.E., London; Henry Burnelle, C.E., Glasgow; B. Colin, Jersey; Leigh Evan, C.E., Manchester; J. J. Fetherston, Dublin; Forrest and Barr, Glasgow; Henderson, Coulborn, and Co., Renfrew; the London Engineering and Iron Ship Building Company; George Myers, of Moorgate, Rotherham, Yorkshire; Thomas Wisheart, Showe-street, Ayr; Commander Maury, London; and Mr. Scott, who sends the publications of the Meteorological Board of London.

The following particulars relative to the aquarium will not be uninteresting. There are forty-two tanks, the plate-glass fronts of which measure more than six feet six inches in length and thirty-nine inches in height; of these, two are devoted to zoophites, one to echinodermes, one to annelides, six to crustacea, two to African, and two to American animals, eight to mollusks, two to fresh-water fish, two to American reptiles, sixteen to salt-water fish. On each side of the principal aquarium are two grottoes devoted to the marine creatures and plants of Africa and America. Around the exterior of the aquarium is a canal of salt-water with rockwork, which is intended for large specimens of marine creatures; four fine seals are at present the only occupants. The aquarium was designed and carried into execution under the care of M. Lennier, the curator of the Havre Museum.

In the month of October it is proposed to hold conferences on the following subjects:—Naval construction; hydrography, navigation, meteorology, &c.; the saving of life; international commerce; fishing and agriculture; maritime hygiene and medicine.

AGRICULTURAL EXHIBITION OF THE SOUTH OF FRANCE.

The annual district exhibition of the South of France, organised by the Minister of Agriculture, took place, according to recent arrangements, at Montpellier during the first ten days of May. The southern region includes the departments of the Herault, Pyrenées-Orientales, Aude, Gard, Vaucluse, Bouches du Rhone, Var, Maritime Alps, and Corsica, coinciding nearly with the ancient provinces and districts of Languedoc, Provence, and Roussillon.

Those who have not visited the South of France can form little idea of the luxurious prodigality of the soil of these departments, which produce about six millions of pieces of wine per annum, more than a quarter of the whole made in France, besides an immense quantity of olive oil, fruit of all kinds, large amounts of silk, and grain of all kinds. Herault, the largest and richest of these nine departments, has suffered terribly from drouth, not a drop of rain having fallen in the neighbourhood of Montpellier for more than a year previous to the 5th of the past month of May. The grain crops of this district have of course suffered severely, and the rainfall has come too late to hold out much hope, while the severe frost of the winter, and the late chills and hail,

have, in many districts, swept almost every almond and olive from the trees, and made sad havoc in the vineyards situated in low positions, cold, with dampness, being a terrible enemy to the vine. Again, the breeders of cattle have been compelled, from the want of forage, to purchase food for the animals, and convey it by railway, at a ruinous expense. Such being the case, it is not surprising that the exhibition of fat cattle, sheep, and agricultural products should have been very limited for such a rich district. Some of the animals shown were fine, but the exhibition could not be accepted as representing fairly these nine rich departments, or even that of Herault, in which it was held. The agricultural implements, especially light ploughs, were better represented; and the collection of presses, pumps, and other material connected principally with the making of wine, exhibited admirable adaptation of parts, combined with simplicity, and consequent moderation in price.

Wine, of course, is included in the list of the agricultural products of the south, and the district show comprised about five hundred samples of wine, principally of the ordinary kinds; but the agricultural society of the Herault, and the municipal council of Montpellier, improved the opportunity by the organisation of a second exhibition of wines, of a more commercial character. This second collection of wines was very large, and attracted great attention; it comprised no less than eleven hundred samples in duplicate, that is to say, 2,200 bottles. Amongst the most remarkable wines are Roussillon, mountain, Langlade, St. George's, Taval, Marseillan, Piquepoul, and the famous sweet wines of Muscat and Alicante; but every kind of grape is now being cultivated in France, so that we have southern claret and Burgundy, port, sherry, and Madeira. The former are excellent wines, approaching their famous namesakes, while the latter are produced by the mixture of various wines, with the addition of Montilla sherry and certain extracts and essences. These imitations of port and other wines are to be condemned; the piquepoul and other wines from which they are made are so excellent, that no one who had drunk them in their purity would for an instant consent to their sophistication.

In the south wine becomes a wholesale commodity; it is no uncommon thing to find ten thousand hectolitres of wine, that is to say, five thousand pieces, in store in one vineyard, or twice or three times that quantity in the *celliers*, or storehouses, of merchants. The wine is generally kept in bulk, that is to say, in immense tuns, holding from four to twelve thousand gallons each, and, in some cases, as much as 16,000 to 17,000 gallons. The common wines of the country sell at first hand at from 6 fr. to 20 fr. the hectolitre, without cask, that is to say, from less than 3d. a gallon; while the finer kinds are worth 100 to 300 or more francs. The roads, rivers, and canals of the south teem with wine; and at Cette, Marseilles, and other ports, the quays, streets, and warehouses are covered and filled with casks of all sorts and sizes. Of course the cooper's trade is a very important one in such districts, and it is carried on in large establishments, sometimes separate, but often belonging to the wine merchant. The coopers have attained a great amount of dexterity, and the huge store tuns, often oval in form, are beautifully shaped, but no machinery has yet been introduced into the cooper's shop; the only innovation to be noticed is the introduction of staves cut by the saw, instead of being split as of old, but the opinion, or prejudice, in favour of the old system is still strong. A good deal of the oak used by the cooper is now obtained from the United States.

By the side of the wine exhibition, was another of flowers, fruit, and vegetables, in a climate in which the olive, the mulberry, the almond, and the vine flourish in the open air, and in which date and fan palms can be maintained in the open ground with the protection of a case of matting during the winter months, as may be seen in the Jardin des Plantes of Montpellier, one of the oldest in Europe. The flowers and fruit are luscious and full of perfume, and the exhibition comprised brilliant specimens of the former, and as much as the early season permitted of the latter. Amongst the vegetables were bundles of asparagus, specimens of that produced on a very large scale in the neighbourhood of Montpellier, between the rows of vines. The speculation has been a very successful one, and the asparagus is large and good.

The most important collection in this exhibition, however, was that of oranges, lemons, and citrons, produced at Ille, in the Pyrenées, in an establishment commenced by a gardener named Marqui; the plantations of orange and other cognate trees at Ille cover fifteen acres; the young plants are reared in conservatories, and afterwards planted against walls, being only protected by matting during the cold months. The collection at Ille comprises about three thousand trees, and seventy-two different varieties, collected in Italy, Spain, and France—they include oranges of Portugal, China, Majorca, Nice, Genoa, Turkey, Malta, and the famous Mandarine orange; the Lumie or sweet lemon, lemons of Spain, Italy, and China; citrons of every kind, from the small conical fruit of Florence, to the huge thick-skinned split fruit of Genoa; the bergamote, the bigarradier or Seville orange of France, Spain, and China; the Pampelmouse, Chadock, and other varieties of the species.

The exhibitions were held in the Peyrou, one of the two public promenades of Montpellier, and one of the most charming in France; it is situated in a plateau overlooking an extensive and lovely valley, with the Cervennes and the Pyrenées bounding the view, crowned by an hexagonal monument, which receives a stream of water conveyed by an immense aqueduct across the surrounding valley, while its walks are shaded by noble trees, amongst which the plane is remarkable for its great size and enormous leaves, and the Judas trees for masses of beautiful blossoms which spring directly out of the large branches. The famous old town of Montpellier, once the seat of Arab learning, which contains the oldest medical school in France, and the University with which Rabelais' name is for ever associated, was completely besieged during the continuance of the exhibition; one of the largest and best hotels in France had all its two hundred and more beds occupied, and other establishments were full to overflowing, while the streets and promenades were filled with a gay, bustling, well-dressed crowd from daylight till nightfall.

In addition to the exhibitions already mentioned, there was one of works of art, which presented many points of interest. The south of France has always contributed largely to the literature and art of the country, and amongst the three hundred or more pictures contained in the *salon* were some excellent works, especially portraits by native artists. One of the most distinguished of these gentlemen is the keeper of the museum and gallery of Montpellier. Having mentioned this establishment, it may not be uninteresting to state that it contains one of the best collections of pictures in France (out of Paris), including, amongst other work, two portraits by Raphael, one at least generally accepted as his, and some fine works by Rubens and other artists. In one room English visitors will be surprised to see the "Infant Samuel in Prayer," by Sir Joshua Reynolds. The musée includes also a fine collection of books, the basis of which was the library belonging to the poet Alfieri.

Fine Arts.

Museum of Art and Industry, Moscow.—The following additional particulars relative to the new Museum of Art, mentioned in the *Journal* of the 29th of May as recently inaugurated, are interesting. The government provided the building for the museum, and a sum equal

to £12,000 was obtained in a short time by public contribution, for the expenses of fitting and furnishing the museum. The idea of a museum originated with the council of manufactures and commerce in 1863. The Emperor gave his adhesion to the project in the following year, nominated M. T. de Boutowski organizer and director, and appointed a council, consisting of eight curators, to assist the director. The objects forming the nucleus of the museum were purchased in Paris, Berlin, and London, but a large number of donations have been received, and many more expected; amongst the early donors are M. B. Narischkine, M. A. Basilewski, Prince Kotchoubey, and Prince L. Radzwill. The new establishment is regarded as evincing a determination on the part of the Russian authorities and savants to improve the condition of education in all matters connected with the application of science and art to industry. The collection which has been amassed during the four years since the establishment was determined on, is said to be very remarkable, the collectors having determined that no objects but such as supplied excellent models for study should be admitted. The ancient art of Russia, allied at once to the Byzantine and the classic, will naturally form one of the most important elements in the new museum, and one of the galleries has been devoted to the history of Russian ornaments from the tenth to the eighteenth century; this art has some peculiar and original features, and, with the exception of what has been learned from the beautiful illustrated volumes published in Russia, and the objects seen at the Universal Exhibitions of London and Paris, not much is known in Western Europe. The professors, draughtsmen, and modellers of the Stroganoff school have reproduced the greater part of the interesting monuments of ancient Russian art, and M. Boutowski has prepared a grammar and a history of Russian ornament, the publication of which will doubtless be hailed with satisfaction in other countries besides Russia.

Paris Annual Exhibition of Fine Arts.—In a previous notice of the Paris *Salon* the awards of medals in the department of painting and drawing were noticed; it remains to notice the other awards. In the first place, the grand medal of honour for painting has been awarded to M. Gustave Brion, for his picture of "The Reading of the Bible in an Alsacian house;" a serious man of middle age, the master of the house, apparently delivers the words of the sacred volume, with a true air of solemnity, to a congregation of a dozen persons, principally women. The faces of the women are varied, and admirably rendered; and the painting is remarkably solid; and the sentiment admirably sustained throughout. The treatment is more in the style of the Belgian than of the French school; and it is remarked that the grand medal has never before been awarded to so quiet and unpretending a picture. This must be accepted as a compliment to the jury, for generally the highest honours in France have been awarded to artists whose works if equally, or even more, remarkable for technical beauties, had more of the popular artistic or meretricious in their conception and execution. The grand medal of honour in the section of sculpture has been awarded to the author of a still more grave and serious work than that of M. Brion: the sculptor is M. J. A. J. Falguière, a native of Toulouse, who won the grand prix de Rome in 1859, and obtained, besides, two other medals, one of the first-class at the Universal Exhibition last year. The subject is Tarcinus, a Christian martyr, with the motto from one of the fathers, "He chose to die from the blows of the Pagans, rather than deliver up the body of Christ." The figure is that of a young monk, recumbent and expiring, several stones lying around telling the sad fate of his martyrdom; the face is full of suffering and holy resignation; the attitude perfectly natural; and the drapery exquisitely modelled; a work at once so sad and so beautiful is rarely produced in modern times. The anatomical knowledge, the sentiment, and the execution are equally remarkable; and there can be no doubt of the thorough propriety of this award. Amongst the other sculptures to which medals have been given are a fine statue in plaster of a young man, nude, teizing a bird, by M. A. Thabard; Bacchus inventing Comedy, with a mask in his hand, by M. J. Tournois; a pretty figure of Narcissus, by M. Jean Gautherin; a noble statue, heroic in size, of Penelope carrying the bow and quiver of Ulysses to her admirers, by M. H. C. Maniglier; L'Amour Captif, a charming figure of the god bound to the pedestal of a grinning satyr, by M. F. Sanzel; a fine colossal statue of St. Paul and St. Peter, by M. C. Iguel, executed for a new church; Bacchus playing with a young Panther, by M. J. M. Caillé; a fine bold figure, nude, of a Reaper drawing the last drop from his Drinking-horn, by M. A. N. Perrey; an extremely graceful rendering of the old subject—the Broken Pitcher—a female figure, life size and most delicately modelled, by by M. E. Carlier; the Punishment, a man tortured by snakes, by M. Amy. In addition to these the following works by sculptors who had before received all the honours, except, perhaps, the Grand Medal of Honour, and who, therefore, are non-competing—A Victory after the Combat, a winged figure, heroic in size and admirably modelled, in her hands are a laurel wreath and a palm branch, which she is laying together (the sculptor is M. Prerre Torson); a beautiful figure, representing the Awakening of Spring, by M. P. Cabet; a noble Lioness, by the famous animal sculptor Cain; a Monument to the Memory of Marshal Masséna, in bronze, for the town of Nice, a clever work, but not sufficiently architectural in its treatment, by M. Carrier Belleuse; and the noble colossal figures Harmony and Poetry, for the fireplace of the saloon of the New Opera-house, by M. C. Cordier. The following works also deserve special notice—Democritus Meditating on the Seat of the Soul, with a skull in his hand, by M. Delhomme; a model, half-size, of one of the pediments of the New Opera-house, with figures representing Comedy and Drama, by M. N. J. Girard; and a Fawn Skipping, the figure being suspended in the air by means of the cord which touches the ground, a clever figure, by M. A. Courtet. Nearly everyone of the works above-mentioned are life-size, or larger, and all exhibit high qualities. Amongst the busts are several of ladies, deserving special attention; and one, of the Princess Anna Murat, Duchess de Mouchy, by the celebrated sculptor Carpeaux, is a work of great beauty. Altogether the sculpture in the present exhibition certainly exhibits more progress than the paintings, though, like the latter, it includes no works of high imagination or grand style. Careful modelling and exquisite finish are, however, to be found on all sides, and this is no small praise. In relief medal engraving two prizes only are awarded, one to M. Bissinger, for cameos, and another to M. Dubois, a medallion, representing "Horticulture," executed for the Mint. There are six medals awarded in the architectural section:—To M. Gosset, for the plans of a theatre now building at Rheims; to M. Hédin, for the plans for a Hôtel de Ville and market at Bellême, and for a theatre for Alençon; to M. Gaston Hénard, for designs for a church for the town of Brest; to M. Lafollye, for a series of plans and details of the Château of Pau; to M. Lorain, designs for a church for the town of Castellano; and to M. Simil, for a set of views and details of construction of the Roman amphitheatre of Nismes. Of the eight medals awarded in the section of engraving, four are given for etchings, one for lithography, and three for engraving on steel.

Manufactures.

The Manufacture of Lace in Italy.—The art of lace-making and embroidery is a great resource for the poor inhabitants of the town and province of Genoa. At Genoa there are ten manufacturers of embroidery and

six of lace, who supply the workpeople of the town and country with the raw material and designs to be executed at their own homes; the lacemakers are principally inhabitants of the Gulf of Rapallo. The Genoa embroidery is, as regards design, inferior to that of Paris, and superior as regards workmanship to that of Switzerland; however, they cannot compete with the perfection of the first and the cheapness of the other. The manufacture of lace, however, is in a better state, and the annual production is from 500 to 600 kils., of the value of from 450,000 to 500,000 francs. In Lombardy 5,000 women and girls are employed in making veils, collars, shawls, mantillas, fichus, etc., which are executed with much good taste. The raw material is principally obtained from Germany, France, and England. The products of this industry only suffice for the wants of the country. At Milan there are six manufacturers of this article, who give employment to upwards of 3,000 persons, who work principally at their own homes, and earn from 20 centimes to 1 franc per day. The price of the veils vary from 1·50 frs. to 140 frs. each, and the annual production of this industry is estimated at 400,000 francs. The two other centres of this industry in Lombardy are at Cantu and Sant'Angelo. At Cantu, which numbers only 6,000 inhabitants, this industry employs 1,700 women, who earn about 20 centimes a day, and whose annual produce amounts to 438,000 frs. The traders in this article make a profit of from 20 to 30 per cent. At Sant'Angelo the number of women engaged at this industry is about 600, and their earnings average from 50 centimes to 1 franc per day. The lace made at this place is of ordinary quality, and principally of cotton. The price of the lace varies from 10 centimes to 1.50 per braccio of Milan (equal to about 24 inches). The lace made of thread costs from one franc to two francs, and that of silk about two francs per braccio. The embroideries on bobinnet and tulle, both of cotton and thread, at Venice, have a ready sale in the country, and are also exported to Trieste. A considerable number of persons are employed in this industry. Embroidering and lace made of silk are also carried on extensively at Venice. At Palestrina the women also make point lace. In the Neapolitan provinces various kinds of lace are made. In 1863 the exports of lace amounted to 487,200 francs.

Commerce.

Russian Commerce.—It was stated at the end of last year, and the statement was quoted in the *Journal*, February 28th, pages 288–9, that there had been a very large increase in the amount received through the custom house during 1867, namely, six millions of roubles. We have now the official returns of imports and exports as compared with those of the year 1866.

Imports (expressed in thousands).

		1866.		1867.
Raw sugar........	pouds	1,415	....	853
Refined do.	,,	4	....	1
Tea from Canton ..	,,	292	....	462½
Coffee	,,	344	....	412
Oil	,,	931	....	879½
Wine	,,	546½	....	666
Do. in bottle	,,	137	....	169
Champagne	,,	835	....	844
Salt..............	,,	7,524	....	11,336
Tobacco, in the leaf	,,	124½	....	139
Rolled do. and cigars	,,	2½	....	3
Raw cotton	,,	2,372	....	2,531
Cotton yarns	,,	116	....	152
Dye woods	,,	480	....	586½
Indigo	,,	41	....	48
Lead	,,	501	....	510
Wool............	,,	117	....	196
Silk	,,	7	....	15
Cotton goods	,,	43	....	63½
Woollen do.......	pouds	57	....	82
Silks	,,	7	....	11
Linens	roubles	1,919	....	2,905
Exports.				
Cereals	tchetverts	12,249	....	14,973
Linseed and hempseed,	do.	1,690	....	1,942
Tallow	pouds	3 250	....	2,956½
Flax	,,	4,795	....	4,956½
Tow	,,	797½	....	526
Hemp	,,	3,271½	....	2,894
Do. tow	,,	52	....	55
Hemp and flax yarns	,,	397½	....	394
Untanned hides ..	,,	227	....	233½
Leather	,,	20	....	22
Bones	,,	645½	....	496
Wool	,,	1,234	....	790
Bristles	,,	97	....	87
Potash	,,	536	....	588
Iron	,,	517	....	397
Copper	,,	10	....	8
Cables and cordage	,,	342	....	259
Sailcloth and pieces	,,	24	....	29
Coarse cloth ..	archines	7,967	....	2,751
Wood..........	roubles	10,194	....	11,008
Furs	pouds	17½	....	22

A glance at the above returns shows that with the single exception of sugar there was an increase in every article of import, and in some cases, such as tea, coffee, salt, tobacco, silk, cotton, woollen and silk goods, and linens, to a very large extent. The case of exports is not the same; here we find an important increase in hempseed, leather, potash, sailcloth, wood, and furs, and progress in some few other items, with a positive falling off in tallow, flax, tow, hemp, bones, wool, bristles, iron, copper, cordage, and an immense deficit in the case of coarse linens.

The Fisheries of Italy.—The number of vessels and boats employed in fishing upon the Italian coast is 9,522, of a total tonnage of 29,976; 745 vessels, of 6,727 tons, were engaged in the deep-sea fishery, and the number of their crews amounted to 4,778. Of these, 352 vessels were engaged in Italian waters, 191 off French coasts, 32 Grecian, 139 the Roman States, 15 Turkish coasts, 9 the States of Tunis, 4 Egyptian, and 3 off the coast of Algiers; 311 Austrian vessels were also engaged in fishing off the Italian shores. The total number of fishermen registered on the maritime rolls amounts to 16,000. The annual amount of tunny fish *(Scomber thymnus)* caught on the Tuscan coast is 267,470 kils. The average exports of tunny from Sardinia every year amount to 1,042,800 kils. The quantity of this fish taken at the 22 fisheries on the coast of Sicily, also that taken at Chioggio, and on the coast of Sitria, without doubt is considerable. At the island of Elba, and on the coasts of Corsica and Sardinia there are apparatus for the purpose of catching this fish, called *tonnare;* they consist of various enclosures, into which the fish enter but cannot afterwards escape. The nets of which these enclosures are formed are sometimes as much as 300 to 500 metres in length. The tunny and the mackarel are sometimes pickled; the roe of the tunny and the mullet is sometimes dried in Sicily and Sardinia, and is known there under the title of *pottarga*, and is quite equal to that brought from Africa. The produce of the sardine and anchovy fishery on the coasts of Central Italy amounts to 750,000 kils. No returns have been made of the Genoese and Sicilian sardine and anchovy fisheries, which are considerable. The fishermen of Chiozza are 4,500 in number, with 50 *tartane* (one-masted, a vessel of lateen rig), 550 *bragozzi*, and 700 smaller fishing boats, which are engaged both at sea and on the lagunes. The sea fishery yields an annual return of not less than 4,000,000 frs. (£16,000). The fishery of the Comacchio, described in a former number of the *Journal*, is of great importance. The most important fisheries in Italy are those on the Neapolitan coasts, and employ 3,716 vessels, of 15,882

tons, of which 365 vessels, of 4,411 tons, are engaged in the deep-sea fishery. Upwards of 1,100 tons of fish are annually landed at Naples, of which half are caught in the gulf of Taranto, and the rest from Gaeta. The following are the exports of fish from Italy:—

Exports.

	Tunny. Kils.	Other kinds of fish. Kils.
1863	176,600	1,156,000
1864	206,841	1,627,731
1865	207,448	1,765,529

The produce of the fishery in the lakes of Lombardy may be estimated at half a million of francs (£20,000).

Imports of Grain at Marseilles.—The following are the imports of grain at Marseilles during 1867:—

Countries.	Wheat.	Maize.	Barley.	Oats.
	Quintals.	Quintals	Quintals.	Quintals.
Russia	2,312,039	11,055	12,044	5,542
Austria	33,028	..	..	40,769
Italy	457,148	4,719	7,664	195,181
Turkey	2,736,864	25,701	90,939	73,424
Egypt	80,397	..	19,487	..
Algeria	929	..	..	..
Barbary	..	3,705	..	..
Other countries	12,562	31	189	1,769
Totals	5,632,967	45,211	130,323	316,685

Turkey occupies the first place amongst the corn exporting countries; the Russian provinces on the Black Sea stand next; and Italy supplies a considerable quantity of grain of superior quality.

Exports of Cattle from the Island of Sardinia.—The following is the number and value of the head of cattle embarked at Porto-Torres for France during 1867:—

	Value.	
24,167 bullocks	2,826,500	francs.
1,291 cows	103,680	„
2,191 heifers and steers	209,000	„
151 calves under a year old	29,700	„
79 pigs	3,600	„
2,430 sheep and goats	15,550	„
718 horses	42,350	„
31,027 head	3,230,380	„

On this amount 130,617 francs were paid in Customs dues to Government.

Colonies.

Bones for Manure.—A new local industry, in the shape of a bone mill, has been introduced into Gipps Land. The want of a fertiliser more highly concentrated and richer in ammoniacal salts and the inorganic alkaline s bstances that give luxuriance to vegetation than the descriptions of manure hitherto available has long, remarks the *Gipps Land Times*, been experienced by the numerous farmers and general produce growers; and as it is universally confessed that the various preparations of bone manure possess combined these valuable properties, the erection of the requisite machinery for manufacturing the article will doubtless be highly appreciated.

Destruction of Forests in Victoria.—The *Ararat Advertiser* records the progress of destruction in that district as follows:—"In another year there will not be one of these trees in the whole district that has not been utterly destroyed by barking. Around the town of Ararat, and for miles around the various centres of population in the district, there is hardly such a thing as a wattle tree to be seen. Within the last fortnight we believe not less than five or six hundred tons of wattle bark passed through Ararat in waggons returning from up-country trips."

Pearls in West Australia.—A correspondent of the *Illustrated Australian News* directs attention to a discovery of considerable importance—the existence of an extensive pearl fishery on the north-west coast of Western Australia. He describes the fishing ground as stretching along the coast no less than a thousand miles. "There had been upwards of sixty tons of pearls obtained up to December, when circumstances obliged me to leave," he writes, "and these were purchased on the spot at the rate of £100 per ton. The banks at Perth will advance £100 per ton, not including the inside pearls, which are valued from £1 to £20 each. When I left the fishery there were about thirty men engaged in pearling. My shells have not reached Melbourne yet. but I will soon have them to submit for examination, I have also a small portion of shells worked, which I will also be glad to have inspected; and I will be glad to furnish any information upon the subject required."

Land in Queensland.—A new Land Bill has recently passed the Queensland Legislature, called the "Corn Lands Alteration Act of 1868," of which the following are the leading features:—The land is divided into agricultural and first and second class pastoral lands, which can be purchased as follows:—Agricultural land, 40 to 640 acres, at 15s. per acre, payable in ten annual instalments of 1s. 6d. per acre, on proof that the occupier has resided not less than two years on the land, and has expended not less than 10s. per acre on the land, or that he has fenced the whole with a good fence. Purchases of first and second class pastoral lands may be made at 10s. and 5s. per acre, payable in ten instalments. From 80 to 2,500 acres of 1st class, and from 80 to 7,680 acres 2nd class pastoral lands can be purchased. Land for sugar or coffee plantations, within ten miles of the coast, of from 820 to 1,280 acres, can be selected, and if one-tenth of the land is under cultivation in three years, in either sugar or coffee, the lessee is entitled to a deed of grant on payment of the balance of the ten years' lease.

Notes.

Paris Exhibition 1867.—Reports by Masters of Schools of Art.—The Committee of Council on Education, considering it desirable to hold out encouragement to masters and mistresses teaching in schools of art to visit the International Exhibition in Paris last year, with a view of studying those objects which might thus be made instrumental in benefiting the instruction given in art schools, offered to every such teacher visiting the Paris exhibition the sum of five pounds, in aid of his or her expenses, and an additional sum of two pounds for any one report which any such teacher might make, or any useful suggestions in respect to his or her duties or teaching derived from the study of the exhibition, such report having first been published in any journal, local, or otherwise, and approved of by their lordships. For each of the three best reports the following prizes also were offered:—For the best report, twenty pounds; for the second best report, fifteen pounds; and for the third best report, ten pounds. The International Exhibition was visited by 101 art teachers, of whom 28 made reports approved of by their lordships. The first prize has been awarded to Mr. W. J. Muckley, head-master of the Manchester School of Art; the second to Mr. Walter Smith, head-master of the Leeds School of Art; and the third to Mr. Dewar Campbell, master of the Bridport and Dorchester Schools of Art.

Gold Coinage in Belgium.—From a statement published by the Belgian Minister of Finance, the value of the 25-franc gold coins issued by the mint of that country in 1867 was 26,826,140 francs; the 5-franc pieces amounted to 18,465,720 francs; and smaller money to 14,737,000 francs.

The Conservatoire of Music at Milan.—From a report recently published by the director of the Conservatoire of Music at Milan, it appears that the total number of pupils of both sexes from 1850 to 1868 who completed their studies and passed their examinations, and who obtained an honourable diploma was 249, and they were as follows:—Singers, 77; pianists, 54; harpists, 4; organists, 16; teacher of singing, 1; violinists, 33; composers, 24; violincellists, 8; flute-players, 4; players on the hautbois; clarionette players, 4; fagottist players, 5; cornet players, 4; horn players, 3; player on the trombone, 1.

Railways in France.—On the 1st of January, 1868, the total length of railway opened to the public was 14,448 kilometers. 9,531 kilometers of line were in construction, and concessions for 613 kilometers of new lines have been given. The total length of the lines of telegraph in France are 32,225 kilometers, with 1,209 telegraph stations. In 1866 the number of messages sent amounted to 2,842,554. The number of letters carried by the posts in 1866 was 323,525,195, whilst in 1852 there were only 181,000,000 letters.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. Geographical, 8½. 1. Mr. J. G. Taylor, "Journey from Erzerum to Diarbekr." 2. The Bishop of Honolulu, "Volcanic Eruptions and Geography of Hawaii." 3. Dr. A. Rattray, R.N., "Physical Geography of Cape York Peninsula."
British Architects, 8.

Tues ...R. Medical and Chirurgical, 8½.
Ethnological, 8.

Wed ...Society of Arts, 4. Annual General Meeting.
R. Society of Literature, 8½.

Thur ...Zoological, 8½.
R. Society Club, 6½. Annual Meeting.
Mathematical, 8.
Society of Fine Arts, 8. Mr. Wyke Baylis, "On Certain Effects of Religion upon Art, with special reference to the Classic, Mediæval, and Modern Schools."

Fri.......R. United Service Inst., 3. Colonel Beauchamp Walker, "The Battle of Königgratz."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 1st June, 1868.*

264. East India (Chief Justices)—Correspondence.
306. Lee River Conservancy Bill—Special Report.
311. Boundaries of Boroughs—Report from the Select Committee.

Delivered on 3rd June, 1868.

127. Bill—Mines Assessment (amended).
137. ,, Local Officers Superannuation (Ireland) (No. 2).
141. ,, Petroleum Act Amendment (amended).
142. ,, Regulation of Railways.
143. ,, Endowed Schools.
247. Metropolitan Police—Accounts.
263. Poor Law Valuation (Ireland)—Returns.
283. Navy (The *Warrior*, &c.)—Return.
287. Agricultural Holdings—Return.

National Education (Ireland)—Thirty-fourth Report.
Neutrality Laws—Report of the Commissioners.

Delivered on 4th June, 1868.

131. Bill—Curragh of Kildare.
144. ,, Lee River Conservancy Bill (as amended by the Select Committee).
147. ,, Assignees of Marine Policies.
148. ,, Pier and Harbour Orders Confirmation (No. 2)
233. Turnpike Trusts—Return.
277. Shannon River—Report from the Select Committee.
281. Public Departments—Report.
281. (I.) Do. do.
291. Police Barracks (Ireland)—Returns.
308. Metropolitan Police—Estimate.

Delivered on 5th June, 1868.

149. Bill—Turnpike Acts Continuance.
284. Prisons (Religious Instruction)—Returns.
305. Freeman Franchise (Ireland)—Returns.
312. Metropolitan Board of Works—Statement.

Patents.

From Commissioners of Patents' Journal, June 12.

Grants of Provisional Protection.

Beer, hopping—1760—W. E. Newton.
Bonnets, &c., materials for—1563—H. B. and A. Mullord.
Braces—1706—H. W. Everard.
Brakes for carriages on common roads—1731—T. Smedley.
Butter, malaxating—1758—F. Hauducœur.
Carding engines, feeding—1722—J. Ferrabee.
Cartridges, turning and closing—1733—W. Buttery.
Cotton, &c., cleaning and preparing—1139—F. A. Calvert.
Cranes, &c.—1685—A. M. Clark.
Doors, &c., fastenings, &c., for—1646—A. G. Hutchinson.
Drinking fountains, cisterns, &c.—1754—R. Fell and R. Barlow.
Electric conductors, insulated—1750—M. Gray.
Filters—1738—W. B. Lord.
Fire-arms, breech-loading—1744—H. A. Bonneville.
Fire-arms, breech-loading, and cartridges—1736—B. Burton.
Gas burners, &c.—1751—J. Scholl.
Glass, &c., ornamenting—1747—J. Vidie.
Heating and ventilating apparatus—1250—J. H. Johnson.
Lamps, safety—1766—T. S. Horn.
Lamps, signal—1583—W. A. Brown and R. L. Jones.
Lead, &c., sheets of—1716—W. W., R., and M. W. Johnson.
Linen, &c., ironing and finishing—1627—A. M. Clark.
Liquids, facilitating the flow of—1764—R. H. Bentham.
Liquids, measuring, &c.—1458—D. P. Wright.
Looms—1620—J. W. Anderson.
Looms—1710—F. Hargreaves and J. R. Collins.
Matches, &c.—1762—J. and J. B. Palmer.
Meters for measuring liquids, gases, &c.—1692—J. Oury.
Millstones—1586—W. Walker.
Millstones, dressing—1740—A. M. Clark.
Motive-power apparatus—1774—E. Newton.
Motive-power machines—1310—R. Side.
Mowing and reaping machines—1748—H. and G. Kearsley.
Packing for steam engines, &c.—1734—I. B. Miller.
Packing presses—1208—J. C. Wilson.
Paper, finishing printed sheets of—1746—J. Morris.
Paper, removing ink, &c., from—1728—A. S. Macrae.
Ploughs, &c.—1737—W. R. Lake.
Railway carriages, &c., connecting and disconnecting—1770—J. Turnbull.
Railway vehicles, &c., coupling links for—1742—J. Dixon.
Railways—1743—H. A. Bonneville.
Rotary engines—1712—A. M. Clark.
Rotary engines, &c.—1732—W. E. Newton.
Ships, sailing, applying auxiliary power to—1756—W. Alexander.
Ships, steering—1723—H. J. Bakewell.
Sliver cans—1745—W. Cooper.
Spinning machinery, &c.—1702—J. S. Richard.
Steam engines, &c., governors for—1741—F. Wirth.
Stone dressing—1718—J. E. Holmes.
Stoves, register—1749—H. E. Mines.
Tannin juices, decolorizing—1725—C. E. Brooman.
Tenons and shoulders, cutting—1714—H. Ferguson and A. Mulvey.
Umbrellas, &c.—1589—T. J. Gathercole and T. R. Comyn.
Vegetable substances, preserving—1578—J. Dewar.
Wrist bands, &c.—1735—W. E. Debenham.
Yarns, &c., printing with one or more colours—1727—A. and C. Edmeston.

Inventions with Complete Specifications Filed.

Projectiles—1853—E. A. Dana.
Sugar factories, &c., feeding—1845—H. A. Bonneville.

Patents Sealed.

3548. L. A. Damm.
3554. H. Atkinson.
3558. W. and F. Bates.
3559. J. Hargreaves.
3566. A. M. Clark.
3567. E. and A. Tatham.
3569. L. A. W. Lund.
3580. J. Standfield.
3585. W. Simons and A. Carmichael.
3587. E. M. Du Boys.
3588. S. Marsters.
3589. F. L. and C. L. Hancock.
3590. W. A. Gilbee.
3604. H. H. Murdoch.
3614. W. H. Richardson.
3627. J. Kenyon.
3672. E. G. and E. E. Rafer.
3680. J. Clarke.
3703. J. Aschermann.
189. D. Timmins.
282. W. Ellis.
489. C. Blyth.
952. J. Abraham & T.R. Bayliss.
1236. A. V. Newton.
1314. W. R. Lake.

From Commissioners of Patents' Journal, June 16.

Patents Sealed.

3599. J. Hall.
3603. O. A. Hébert.
3608. J. S. Gisborne.
3612. A. Cochran.
3613. E. Breffit.
3624. L. L. Tower.
3643. W. W. Urquhart and J. Lindsay.
3657. A. M. Clark.
3663. J. Addie and F. Kohn.
3716. W. Wilson.
3720. A. M. Clark.
14. T. B. Daft.
57. Henry Smyth.
89. R. Winder.
248. M. Tildesley and J. Bird.
417. J. and J. Cash.
575. R. Fennelly and P. Kenny.
930. C. E. and J. Green.
970. V. A. Deaubeuf.
1042. J. Lyall.
1232. T. Forster.

Patents on which the Stamp Duty of £50 has been paid.

1578. G. E. Meek & W. H. Howes.
1629. R. A. Brooman.
1678. G. Haseltine.
3007. P. G. Gardiner.

Patents on which the Stamp Duty of £100 has been Paid.

1487. F. E. Schneider.
1654. H. J. Rouse.
1534. H. J. Kennard.
1533. G. Leach.
1553. A. R. M. de Normandy.

Journal of the Society of Arts.

FRIDAY, JUNE 26, 1868.

Announcements by the Council.

Final Examinations, 1868.

In the List of Prizes and Certificates, given in the *Journal* of the 12th inst., the following corrections should be made :—

831.—John Shaw was described as of the Halifax Mechanics' Institution; he belongs to the Halifax Working Men's College.

514—Brown, William, 20, Andersonian University, Glasgow, stated in the List of Certificates to have obtained a second-class in Geography, really obtained a second-class in Geometry.

684—Thorn, Andrew H., is the same as 676—Thom, Andrew H.

Institutions.

The following Institution has been received into Union since the last announcement :—

Cheltenham, Whitworth School of Practical Science.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

SEVENTEENTH ANNUAL CONFERENCE.

The Seventeenth Annual Conference of the Representatives of the Institutions in Union, and the Local Educational Boards, with the Council of the Society, was held on Friday, the 19th inst., at 12 o'clock noon. William Hawes, Esq., F.G.S., Chairman of the Council, presided.

The following is a list of the Institutions and Local Educational Boards represented at the Conference, with the names of their respective representatives :—

Carlisle Mechanics' Institute	Mr. Edmund Potter, M.P.
Chelmsford Literary and Mechanics' Institution	Mr. John Gibbs.
Croydon Literary and Scientific Institution	Dr. Lanchester.
Devonport Mechanics' Institution	Mr. W. Mogg. Mr. J. W. Ryder.
Epsom and Ewell Literary Institution	Mr. John Phillips (chairman).
Glasgow Institution	Mr. Alexander Craig.
" Tonic Sol-fa Choral Society	Rev. John Curwen.
Hastings Mechanics' Institution	Mr. J. Pitter.
Huddersfield Mechanics' Institution	Mr. John Dodds. Mr. William Marriott.
Lancashire and Cheshire Union of Institutes	Mr. Alderman Rumney. Dr. Pankhurst. Mr. Thomas Lawton (visiting agent).
Llanelly Mechanics' Institution	Mr. J. F. Adams (Hon. Sec.).
Lockwood Mechanics Institute	Mr. Josiah Berry (President).
London, Beauvoir College Evening Classes	M. Robert Griffiths.
" Birkbeck Literary and Scientific Institution	Mr. W. Douglas. Mr. J. H. Levy. Mr. G. M. Norris. Mr. J. Rigby Smith.
" City of London College	Rev. R. Whittington. Rev. J. Maskell. Mr. F. Reynolds.
" Metropolitan Association for Promoting the Education of Adults	Mr. W. G. Larkins.
" Royal Polytechnic Evening Classes	Rev. C. Mackenzie.
" Walworth Literary and Scientific Institution	Mr. Frederick Wood.
Oldham Lyceum	Mr. John T. Hibbert, M.P. Mr. John Platt, M.P.
Salford Working Men's College	Mr. John Plant.
Slough Mechanics' Institution	Rev. R. J. Simpson.
Southampton Athenæum	Mr. W. Johnson.
South Staffordshire Association	Lord Lyttelton. Mr. F. Talbot (Visiting Agent).

The Secretary read the following

Report to the Council of the Society for the Encouragement of Arts, Manufactures, and Commerce.

Gentlemen,—In laying before you a summary of the proceedings of the Union of Institutions, I have the pleasure of again recording an increase, and a very considerable one, in the number of the candidates who have availed themselves of the advantages of the Society's Final Examinations. The numbers this year examined have been 1,842, as compared with 1,439 examined last year, and this is the more remarkable as the number last year was very largely in excess of any previous year. The number of Local Boards has also increased, there being this year 135, whilst last year there were 120. But while I record so large an increase in the number of candidates examined, I regret that the number of those who have succeeded in obtaining certificates has not increased in the same proportion; for of the 1,842 who have this year submitted themselves for examination, 1,308 only have passed, as against 1,121 who were successful last year, out of 1,439. So that whilst the candidates have increased at the rate of about 27 per cent., the number of those passed has only advanced at the rate of 16 per cent. The percentage of successful candidates this year is only 71, as against 78 last year out of those examined. I append a table showing the comparative results of the two years :—

	1868.	1867.
No. of Local Boards at which Final Examinations were held	135	120
" Candidates examined	1,842	1,439
" " passed	1,308	1,121
" Papers worked	2,547	2,050
" 1st class certificates	318	343
" 2nd class "	608	517
" 3rd class "	801	664
" unsuccessful papers	820	526
" Prizes awarded..............	65	61

One very remarkable feature in the examinations is shown by this table, viz., that while there has been a very large increase in the candidates, the number of First-class Certificates is actually less than when fewer candidates presented themselves; it will also be remarked that a very large number of the papers worked obtained no certificates whatever, 820 being rejected, a very much larger proportion than the increased number of papers worked should have produced. The number of papers worked would appear to have increased at the rate of 22 per cent.; the number of papers in which no certificates have been awarded has increased by 44 per cent. These facts warrant me in again calling the attention of the Local Boards to the necessity of more stringent action with reference to the certifying candidates as qualified to attend the final examinations. I have on former occasions dwelt on the importance of the careful exercise of this duty on the part of Local Boards. The results of the present year show glaringly the unfortunate laxity which has prevailed. In several instances candidates have been permitted to attend whose knowledge of the subject has been literally *nil*, as not a single mark could the examiner award to the papers they have worked. The Local Boards should bear in mind how much unnecessary disappointment to the candidates would be avoided, as well as that serious discouragement which a rejection by examiners inevitably produces. It is not fair to the candidates that they should be permitted to come up to the examinations without some reasonable prospect of their being passed; and, irrespective of any consideration for them, the Boards should not forget the additional labour which is thus needlessly thrown upon the examiners in going over papers of candidates ignorant of the very elements of the subjects they are allowed to be examined in.

In making the above remarks on the examinations of the present year it is but justice to those candidates who have carried off certificates that I should point out that the standard of the examinations has remained the same, and that the character of the certificate indicates the same high degree of merit as on former occasions. Moreover, the number of prizes has actually increased, showing that a larger number of meritorious candidates have come forward. The examiners' remarks will be found in the appendix to this report.

The Prince Consort's Prize has this year been adjudged to Robert Creaser Kingston, aged 21, of the Royal Polytechnic Institution, gardener, who in this and the three preceding years has received the following First-class Certificates:—

1865. Arithmetic—First-class Certificate.
1867. Botany—First-class Certificate, with First Prize, and the Royal Horticultural Society's Prize of £5.
1867. Floriculture—First-Class Certificate, with First Prize, and the Royal Horticultural Society's Prize of £5, and also, together with Book-keeping (2nd-class Certificate), the *Gardeners' Chronicle* Prize of £3.
1868. Chemistry—First-class Certificate, with First Prize.
" Fruit and Vegetable Culture—First-class Certificate, with First Prize, and the Royal Horticultural Society's Prize of £5, and also, together with Mensuration (2nd-class Certificate), the *Gardeners' Chronicle* Prize of £3.

There are this year four other candidates who have each obtained the same number of First-class Certificates as the Prince Consort's Prizeman, but inasmuch as Mr. Kingston had obtained four First-class Prizes, a larger number than any of the others, the Council had no difficulty in awarding the prize.

The Special Prizes offered by the Royal Horticultural Society for gardeners, by the Proprietors of the *Gardeners' Chronicle*, by the Royal Geographical Society, and by Mr. Twining, have, with two exceptions, been taken. The particulars have already been published in the *Journal*. This year I am happy to state that several of the prizes to females, which were offered in compliance with a wish expressed by the Conference two years since, have been this year taken, and the number of female candidates has increased from 64 last year to 76 this year. A larger number of prizes has been taken by them, although fewer have passed than last year; only 54 this year, against 57 last year.

The Paris Exhibition of last year had the effect of rousing the attention of the public to the greater advantages in the way of education, which appeared to be enjoyed in France and other continental countries, by those engaged in industry, over those of similar classes in this country, whether artisan, manager, or manufacturer; and the importance of "Technical Education," as it has been somewhat loosely termed, has been a prominent topic of discussion. Early in the year the Society called together a Conference on this subject, which was well attended, and resolutions were passed affirming the necessity of a larger element of scientific instruction being introduced into education generally, and greater facilities for its being given. The Council were requested to form a committee

to draw up a report on the subject. That Committee has been, and still is, actively at work, and its report is in a forward state of preparation.

Mr. Whitworth's munificent gift, for the endowment of thirty scholarships, of the annual value of £100 each, for promoting the study of those branches of science which are connected with the engineering profession, is a noble example, which I trust will stimulate others, whether private individuals or public bodies, to render aid in this direction, and continue the good work which has been commenced. This Society, established for the promotion of Arts, Manufactures, and Commerce, is deeply interested in the question, and most of those present are probably aware that Mr. Whitworth has placed at the disposal of the Council the nomination of three artisans to exhibitions of £25 a-year each, to enable them to prepare for the competition which is to take place next year for the scholarships, an act which cannot fail to be highly appreciated by those assembled at the Conference.

In the Elementary Examinations held by such of the District Unions and Local Educational Boards as have availed themselves of the elementary papers issued by the Society, the certificates being awarded by the local authorities themselves, there has been a slight falling off in the number of candidates. The results of this year's Elementary Examinations are given in the following table :—

ELEMENTARY EXAMINATIONS, 1868.

Name of Union or Local Board.	Number of Centres.	HIGHER GRADE.				LOWER GRADE.			
		MALE CANDIDATES.		FEMALE CANDIDATES.		MALE CANDIDATES.		FEMALE CANDIDATES.	
		Examined.	Passed.	Examined.	Passed.	Examined.	Passed.	Examined.	Passed.
Aldershot and Farnham District	1	15	11	..	..	10	7	..	..
Belfast Science School	1	16	12	..	..	..	..	..	..
Blandford	1	..	..	..	..	..	..	4	3
Christchurch	1	4	3	1	1	32	26	29	21
Hastings and St. Leonards	1	2	2	..	..	..	..	..	..
Hertford	4	4	2	..	..	38	22	..	..
Lancashire and Cheshire Union of Institutes	48	225	104	7	3	854	357	249	124
Lichfield	1	..	..	..	..	11	7	..	..
Metropolitan Association	18	50	41	28	23	392	240	236	180
New Swindon	1	11	11	..	..	39	31	..	..
Rugby	2	3	2	15	5	1	1	19	13
Yorkshire Board of Education	18	104	88	..	..	427	248	..	..
TOTALS	97	434	276	51	32	1,804	939	537	341

Comparing these returns with those of last year, it appears that in 1867 these examinations were held by 19 District Unions or Boards at 113 centres; this year, only 12 District Unions or Boards have held them, at 97 centres. In 1867 there were 2,854 candidates, of whom 1,393 obtained certificates. Of these, 646 were candidates in the higher grade, of whom 392 obtained certificates; 2,208 in the lower grade, of whom 1,001 obtained certificates; this year the whole number of candidates examined was rather less, being 2,826, of whom, however, 1,588 obtained certificates, a much larger number than last year. Of these candidates, only 485 were higher grade, with 308 successful; and 2,341 lower grade, with 1,280 successful. Among the higher grade candidates were 51 females, obtaining 32 certificates; and among the lower grade were no less than 537 females, with 341 successful; while, last year, there were in the higher grade 45 females, 31 of whom were successful; in the lower grade, 413 females, with 230 successful.

The Examination by the Yorkshire Board of Education has this year, for the first time, been restricted to *adult* members of evening classes, and schoolboys, that made up one-half of the candidates in past years, have been excluded. Moreover, a special and independent examination for females has this year been introduced in Yorkshire with great success. The returns are not included in the number given, as the Examination is of a different standard.

It is remarkable that so slight a falling-off should have taken place in the total number of candidates examined, when it is mentioned that two important Unions—the South Staffordshire Association and the Worcestershire Union did not this year make use of the papers furnished by the Society, and consequently the returns of any Elementary Examinations they may have held do not appear in the foregoing table. Moreover, the important fact should not be overlooked that, although the number examined was slightly less than last year, the number passed was considerably greater, showing that the candidates came up better prepared. It is,

however, to be regretted that the number of higher-grade candidates is so much smaller, but it may be hoped that those who have been successful in obtaining certificates of the lower grade will not remain contented with this, which, after all, does little more than show that they have mastered the rudiments of a primary education, but will proceed to the higher grade, and ultimately to the Final Examinations of the Society.

It will be observed that the returns include the candidates examined by the Metropolitan Association for Promoting the Education of Adults. This association preferred, as on former occasions, to use elementary papers prepared by their own examiners, but essentially similar to those issued by the Society. In their elementary examinations the table shows that there has been a very considerable advance upon last year, but this has been entirely in the lower grade candidates, for the number of higher grade candidates is less. The proportion of females, however, is notably larger in the metropolitan district, the numbers being 264 this year, with 203 passed, while last year there were only 75 examined, with 40 successful. This Association also holds a special examination in needlework, and out of 118 candidates who came up to be examined in that subject, 68 obtained certificates; last year the number was only 60, with 33 certificates. The number of candidates for examination in religious knowledge, held by this Association under the auspices of the Bishops of London and Winchester, was 90 in the lower grade, and 23 in the higher. The returns in this subject are not yet sent in by the Examiners.

The reports of the Society's visiting officers, showing what has been done in their respective districts, and the remarks of the Examiners on the papers worked in the Final Examinations, are given at length in the Appendix.

Appendix.

Mr. Henry H. Sales, Visiting Officer for Yorkshire, writes:—

To measure the educational work of the Society of Arts in this county by the number of candidates at the Final Examinations, is to apply a fallacious test. The special function of the Society appears to be that of a pioneer in matters of Arts, Manufactures, and Commerce, and, having broken up the fallow ground, to leave the field for new territory as soon as a goodly number of husbandmen have entered into possession. The Universities' Local Examinations, the scheme of the Science and Art Department, and the examination of night-schools by the Whitehall Department, are all developments and extensions of plans originated by this Society, and still bearing its impress. Therefore, to confine this report to its present direct operations is to give a most inadequate conception of its labours, and of the results consequent thereupon.

The year that has intervened since my last report is remarkable for the commencement of new and enlarged exertions in every department of education. The activity that is becoming everywhere apparent is not in behalf of some novel scheme, or in the promotion of any uniform system. It is manifested in the abandonment of the fallacious smoke and free-and-easy theory by managers of Institutions for working men, and in making education the object to which all else must be subservient. Diverse in operation, it will be best to report upon educational efforts by first dealing with general organisations, and then with particular local action.

Yorkshire Union of Mechanics' Institutes.—In order of time, and in the amount of combined work done, this organisation occupies the first place. During the year the Central Committee caused an inquiry to be made respecting the state of scientific education in Yorkshire. On the presentation of the report of the Inquiry the following resolutions were agreed upon:—

"That the Report of the Agent of the Union on Technical Education in Yorkshire be laid before the Government.

"That the Committee, in submitting this Report to the Government, beg to recommend that a Royal Commission or Parliamentary Committee be appointed, to make an inquiry into the present state of Technical Education in this country, and on the Continent, with a view to devising such methods for its improvement in England as may render it more commensurate with the wants and conducive to the prosperity of this great manufacturing country.

"That the Committee think it their duty to draw the special attention of the Government to the want of properly trained and qualified Teachers of Science in this country, and to the consequent inefficiency of the scientific instruction given in Mechanics' and other popular Institutions, and Evening Classes, which are otherwise capable (with efficient teachers) of rendering the most valuable aid to practical science.

"That the Committee would also express their belief that Technical Colleges or Schools, of a superior kind, might with the greatest advantage be established in the principal centres of Manufacturing Industry in the United Kingdom."

The Central Committee have also determined to secure the services of the organising Agent of the Department of Science and Art, so that Elementary Science Classes eligible for State aid may be organised in its Mechanics' Institutes, and to give further assistance to the Local Committees in conducting the same.

The Yorkshire Board of Education.—Respecting this Board, the following remarks are made in the 9th volume of the Reports of the Schools Inquiry Commission:—"There is in Yorkshire an active Association, called the West Riding Educational Board. The varied programme of work is being carried out with remarkable energy and success. Its influence in sustaining the life of the various Institutes and Evening Classes of the district has been enormous; and the Board has been scarcely less successful in animating the private schools, since it has been mainly owing to its influence that the Local Examinations of the Universities have been rendered accessible to the schools of the Riding." During the past year this Board has been extended into a County Board, under the patronage of the Duke of Devonshire, Earl Fitzwilliam, Earl de Grey and Ripon, the Earl of Zetland, and Lord Wharncliffe; and its management vested in a Council, consisting of the leading county magnates. All this extensive educational machinery has its germ in a Local Board of the Society of Arts, established in 1858.

Free Libraries.—The multiplication of free public libraries is a good educational omen. At a meeting of burgesses, convened by the mayor of Leeds, in January last, a public library was agreed upon for that town. There is a proposal for the same object under the consideration of the inhabitants of Bradford, Darlington, and Hull

National Exhibition of Works of Art at Leeds.—This exhibition has been projected partly with the object of re-

ducing the debt upon the new infirmary, and partly to establish a permanent gallery of art in Leeds. Whether the pecuniary results will be satisfactory, is an open question; but the educational influence of the exhibition is self-evident. Connected with the exhibition, but under the management of the committee of the Philosophical Society, a series of lectures upon fine art is announced, being the first course of art lectures upon a large scale that has been given in the county.

Individual towns are making individual efforts for advanced education. A legacy of £1,000 has been left to the Institute at Barnsley, by its late president, Wm. Harvey, Esq. The trustees have invested the legacy; and with the income derivable from the investment, classes will be maintained for teaching Art and Design. An elementary drawing class has been commenced. In the autumn, Titus Salt, Esq., offered, through the president of the Mechanics' Institution at Bradford, the sum of £1,000 towards the erection of a new building, to which the president, H. W. Ripley, Esq., added the promise of £500. A few months since the Council of the Philosophical Society suggested the erection of a large building, in which the Mechanics' Institute, the School of Art, a Technical School, and the Philosophical Society might all be accommodated. The matter is still under consideration, and the joint committees hope to carry the project to a successful issue. The Bradford Philosophical Society, in addition to the general objects for which such societies are founded, has recognised "as an educational branch of the Society's work of very special importance" classes for instruction in science. Classes in chemistry, geology, and physiology are now in operation. Mr. Louis C. Miall reports concerning them:—"The most noticeable feature of this year's work is the success of the classes, which is only limited by the small accommodation at present provided. The success of the chemical class has been quite unexpected. I believe we could increase the attendance indefinitely if we had more space. The geological class uses the fossils, minerals, diagrams, microscope, &c., of the society's museum. In this class periodical examinations are held, which have been attended by all the members of the class. The results are, so far, very encouraging, and there is every reason to believe there are a number of young men in Bradford who are studying science thoroughly and efficiently. We intend to start a series of zoological demonstrations on Saturday afternoons." A valuable museum, containing a well-chosen selection of geological specimens, is attached to the society. The Committee of the Huddersfield Mechanics' Institution have opened a class for instruction in the chemistry of dyeing; and the large attendance of students is a proof that scientific studies will commend themselves to young men when they take the direction of special instruction in that which enters into the concerns of business life. The attendance of evening pupils at this institution is not only greater than at any other institution in the county, but the arrangement of study laid down by the executive committee is most judiciously conceived, and is attended with corresponding results. An Industrial and Fine Art Institution is in course of organization at Wakefield. In 1865 an "Industrial and Fine Art Exhibition" was held at Wakefield. So pecuniarily successful was the exhibition that the profits amounted to upwards of £3,000. In conformity with the Literary and Scientific Institutions Act, an institution has been formed for carrying out the following objects:—"The purposes of this institution shall be such of the following as the governing body shall from time to time determine, namely:—a School of Art, a Museum of Industry and Art, and periodical exhibitions for the encouragement of art and industry, and such other of the purposes, not included in the above, as are mentioned in the 33rd Section of the Literary and Scientific Institutions' Act, 1864, which purposes shall be carried out by such means as the governing body shall think best." The Art School has commenced its operations. At Eccleshill, Rothwell, and Otley, are being erected Mechanics' Institutions, in which class instruction is to form the prominent feature. The new Institution at Guiseley has been opened during the year. By the completion of the new building for the Mechanics' Institution at Leeds, accommodation is provided for art-students and the want of suitable rooms for the drawing classes, so long felt, is now supplied. The proceeds of the successful exhibition at York are to be applied to the promotion of art in that city, which has for some time contained a most efficient school of art.

The Examinations in Elementary Knowledge, introduced by the Society of Arts, for evening class pupils over the age of twelve years, increase year by year in popularity and usefulness. The managers of institutions for adult education are unanimous in their testimony to the good results that are produced by these examinations. On March 10th, 11th, and 12th, the examinations were held under the superintendence of the Local Educational Boards of the Institutions at Batley, Brighouse, Eccleshill, Gildersome, Garforth, Hebden-bridge, Holbeck, Huddersfield, Hunslet, Holywell-green, Leeds, Lockwood, Scarborough, Spinkwell-mills, Stockton-on-Tees, Stocksbridge, Wilsden, York. The results of these examinations are given in the table (p. 569,) and show a great advance on the number of adult candidates registered in 1867.

It has been discovered that in preceding years, not only were school-boys admitted in large numbers to the examinations, but the regulation requiring the minimum age of the candidates to be not less than 12 years had been extensively violated, and many were entered whose age did not exceed 9 years. Last year the regulations were rigidly enforced, and the number of *bona-fide* candidates was in excess of those of any preceding year, while at this year's examination a large increase upon 1867 was registered, giving very satisfactory results. The council of the Yorkshire Board of Education have instituted a prize scheme, which, though small in amount, is sufficient to generate a wholesome spirit of emulation among the candidates. To students of the higher grade, over the age of 18 years, three prizes of £2, £1 10s., and £1 are offered; and to students under the age of 18 years, three prizes of £1, 15s., and 10s. A prize of books, to the amount of £1, is also placed at the disposal of the committee of each Institution that presents twenty duly qualified candidates for examination. This year the prize has to be given to the committees of Brighouse, Eccleshill, Holbeck, Huddersfield, Lockwood, Stockton-on-Tees Mechanics' Institution, York Institution of Popular Science, Gildersome Literary Institution, and Garforth Working Men's Club. In addition to these county prizes, almost all the Institutions have a local prize scheme connected with the examinations.

Respecting the final examinations, I have little to report beyond what is contained in the Secretary's tabular statement. While entertaining the utmost loyalty to the scheme, and fully recognising the good it has done, and the multiplication of similar educational machinery it has produced, to which I have already referred, I must confess that I believe the time has arrived for the Council to take a comprehensive survey of the various schemes for adult education now in operation, with the view to the economy of labour, on the one hand, and the extension of educational advantages arising from examinations conducted by a well-qualified body, on the other. The examinations of the Department of Science and Art are rapidly extending, and, with the aid of the annual vote, present advantages that far outweigh the honorary distinctions of the Society of Arts. But though the ground that might be covered with our own scheme is being occupied by that of the Department, I do not suggest the discontinuance of the Final Examinations. By a very slight modification of the system a large area of usefulness yet unoccupied may be opened

up to the Society, and not one advantage now offered to the manual labour class withdrawn. The great want in middle-class education is an examination test within the reach of schoolmasters. This is not yet supplied by the Universities Local Examinations. The fees charged at these examinations exclude a vast number of pupils; and no one so much as the schoolmaster complains of the heavy fee being a bar to the entry of his most qualified pupils. It will be some time before the scheme of county boards, suggested by the Schools Inquiry Commission, will be sufficiently matured. In the meantime the Final Examinations may meet, to a great extent, the want so strongly felt. Without entering into details, I would suggest—

1. That the subjects be spread over six evenings, so as to give a student an opportunity of being examined in six subjects.
2. That the prizes be awarded under the same conditions as heretofore.
3. That a fee of two guineas be paid for each school sending twenty candidates or less to the examination, with an additional fee of one guinea for every ten candidates.
4. That the names of successful candidates from schools be published in a separate list.
5. That the age of candidates be reduced in the case of schoolboys to 13 years.

I have said that the Society has been a "pioneer," opening the way to incalculable beneficial results, and in the future not the least of these results would be the extension of our present system of Examinations to middle-class schools, whose pupils are the sons of the managers and foremen of manufactories, and the employers of labour, who, equally with the artisan population, deserve the consideration of the promoters of Arts, Manufactures, and Commerce. I most earnestly commend this subject to the consideration of the Council.

Mr. Thomas Lawton, of the Union of Lancashire Institutes, writes:—

During the past year I have delivered 37 public addresses, and have thus been enabled to explain to at least 10,000 people the examinations held under the auspices of the Lancashire and Cheshire Union of Institutes. I have visited 20 institutes for special consultation with committees, and have, while inspecting the evening classes of 58 institutes, examined in arithmetic and dictation 3,217 pupils. Two principal facts stand out as the result of my observations:—

1. That both in reference to class instruction and examinations we are effectually laying hold of the "masses."
2. That the average state of the elementary education of the pupils attending the evening classes is so low and defective that little progress can be made at present. The number of failures at my own inspections, and at the elementary examinations is very heavy. Out of the 3,217 pupils examined by myself, 595 were absolutely unable to write down a simple piece dictated to them, and 711 made three mistakes and upwards in spelling. The piece dictated generally consisted of 30 words, equal in difficulty to what would be expected from the third standard in an ordinary day-school; 1,300 were able to put down and work correctly a simple addition sum dictated to them.

The following statistics will further show the operations and position of the Union:—

Income last year, £393 13s. 5d.
Number of Vice-Presidents, each subscribing at least £2 2s. per annum, 104.

Results of Examinations (Elementary).

Number of candidates this year	1,335
Number of papers worked	2,800

Comparative statement of Certificate results.

1864	72
1865	171
1866	373
1867	477
1868	588

Society of Arts' Examination.

1864	247
1865	281
1866	272
1867	379
1868	423

Government Science Examination.

1864	518
1865	786
1866	633
1867	1019
1868	(not yet published)

Number under instruction in Science Classes for Lancashire and Cheshire.

1867	2159
1868	2769

Upwards of 20 new Science classes were opened during the past winter. We are making arrangements whereby every Institute in the Union will be enabled to secure instruction for its members in the principal trades of the respective districts.

A gratifying feature in respect of these classes is, that 14 out of the 30 science teachers engaged are or were artizans. I say were, because four of them have proved so successful in their class-work as to have been able to withdraw from their manual labour, and devote themselves exclusively to the profession of science teaching.

Extra Prizes of the Union.

Prizes are offered not only to the candidates obtaining the highest aggregate number of marks at the Society of Arts and the Government science examinations respectively; but also to candidates obtaining the highest aggregate number of marks in the following groups of subjects:—

Group 1.—Arithmetic; Book-keeping.
Group 2.—Electricity and Magnetism; Acoustics, Light and Heat.
Group 3.—Geometrical Drawing; Mechanical Drawing; Building Construction; Free-hand Drawing.
Group 4.—Mining and Metallurgy; Mineralogy; Geology.
Group 5.—Chemistry.
Group 6.—Vegetable Physiology; Animal Physiology; Zoology.
Group 7.—Domestic Economy; Political and Social Economy.
Group 8.—Geography; English History; English Literature; Logic and Mental Science.
Group 9.—Mathematics; Theoretical and Practical Mechanics.
Group 10.—Languages.

The examination of females in cutting-out and making some useful garment is doing good service. No candidate is allowed to compete unless she has previously obtained an elementary certificate.

The special district prizes of the Society of Arts will, I believe, secure a larger number of candidates in the manufacturing districts. I note with great satisfaction that nearly all our science teachers now recommend their pupils to take the Society of Arts Final Examination Papers.

Mr. F. Talbot, of the South Staffordshire Educational Association, reports as follows:—

Society of Arts Examinations.—The operations of the

above association for the year just ended, so far as they relate to the examination scheme of the Society of Arts, have been somewhat on a reduced scale. The number of certificates gained by members of institutions in union with the association is 61, from 10 institutions, against 88 from 11 institutions in 1867. From 1860 to the present time the average annual number of certificates taken has been 60, so that, this year, the average only has been reached. For the first time the association has offered prizes in connection with the Society's scheme. To five pounds offered by the Society, the Earl of Lichfield, a vice-president of the association, has added a like sum, and the Committee decided upon offering three prizes of £5, £3, and £2 respectively, to the three members of Institutions who should secure the 1st, 2nd, and 3rd places in this year's examination, in at least three out of six prescribed subjects, two first-class certificates, at least, being taken in those subjects by each prize-holder. It is to be regretted that not one of these prizes will be taken; and nothing, perhaps, shows more conclusively than this, that our great want throughout the Institutions of this district is that of systematic class instruction in some at least of those subjects of the Society's examinations which have a special value in the general industrial operations of this district. A noticeable feature in the present year's results is, that the pupils of two of the evening schools of the district, St. Peter's, Wolverhampton, and Messrs. Bagnall's, Gold's Hill, have taken between them 28 certificates. This fact is most suggestive as to the direction in which we may begin to look for some of those results, which do not appear as yet to be forthcoming, to any great extent, from the older Institutions.

Elementary Examinations.—These Examinations have been this year conducted by our own committee, with our own questions, owing to the Science and Art Department having, unfortunately, fixed the same evenings for their drawing examinations which had been previously appointed by the Society of Arts for these elementary examinations. Forty-three persons out of 55, of the average age of nearly 16½ years, gained Higher Grade Certificates, and 114 out of 210, of the average age of $16\frac{1}{10}$ years, gained Lower Grade Certificates. To show the valuable effect of these examinations upon the elementary education of the young people who work for and attend them, one school, which sent in 32 candidates, gained 31 certificates. There are prizes connected with this scheme to the value of £25. The Examiner to the Association, the Rev. H. Williams, of the Grammar School, Wolverhampton, reports well of the Scripture, Geography, and English History of both Grades, and well also of the Grammar of the Higher and the Arithmetic of the Lower Grade, but badly of the Arithmetic of the Higher Grade. He adds, "no scientific teaching can be of much use to those who are destitute of a thorough knowledge of arithmetic." On the whole examination he reports: "The results are highly encouraging and better than those of last year."

Special Examinations.—These Examinations are intended to encourage young persons to attend our night schools, and to persevere in improving the state of their elementary knowledge, between the time of their having received the Higher Grade Elementary Certificate, and their advancing to the study of such special subjects as are prescribed by the Programme of the Society of Arts. Several prizes of one pound each are attached to them, being given by Lord Lyttleton, the President, and several other noblemen and gentlemen of the district. This year 25 candidates passed the various examinations, and have been placed in order of merit. Speaking generally of the results of these examinations, the Examiner reports that the night schools are doing a great work, and deserve every encouragement; further, "There has been a very great improvement effected during the past year."

Industrial Exhibition for Night Scholars.—In the autumn of last year the Association organised an exhibition of industrial work produced by evening scholars. Articles were sent in from twelve schools, to the number of 174. Prizes to the amount of £7 14s. were awarded to the producers of the best articles. Several drawings, one in water-colour, after a sketch by Birket Foster, and some specimens of metal work, were admirably executed, and much of the needlework, both plain and ornamental, received a high degree of praise from the judges. Altogether the attempt was successful, and is to be repeated.

Athletic Sports Meeting.—The third annual gathering of evening scholars for athletic sports was held last year in Sandwell-park, kindly lent by the Earl of Dartmouth for the purpose. Upwards of 2,000 persons were present, and the various contests were carried on with excellent spirit during the day. An admirable address, upon "The Right Use of Athletic Sports," was delivered by the Hon. and Rev. W. H. Lyttelton, and the prizes were distributed by Mrs. James T. Chance, at the close of the day, to a very intelligent-looking and enthusiastic set of working boys, in whose looks and demeanour the black country might see everything to inspire its best hopes.

During the year the treasurer of the Association received the sum of £125, being a quarter of the surplus proceeds of the very successful Fine Arts Exhibition which was held at Dudley in the summer of 1866. The committee of the Association is now assisting to organise an Industrial and Fine Arts' Exhibition, to be held in Wolverhampton in the summer of next year, and which, from the way in which it is taken up, bids fair to be equally successful with that at Dudley. It is to comprise a special class for artizans' productions, which are to be executed after prescribed models and conditions, on the plan already carried out by the Society of Arts.

Mr. W. G. Larkins, of the Metropolitan District, reports as follows:—

A gratifying increase in the number of candidates examined in the elementary examinations has taken place this year; an increase the more remarkable, since it has occurred entirely in the lower grade. The number of those who passed is also greater in proportion this year, owing mainly to the fact that the candidates took up more subjects in which to be examined. There is no doubt whatever that these elementary examinations are doing most useful work, not only in preparing candidates for the higher and final examinations of the Society of Arts, but to a far greater extent in testing and confirming the knowledge imparted in the various evening classes and schools of the metropolis. Only a very small proportion of those that pass the lower grade examination have any aims beyond it; the importance, therefore, of fixing the knowledge of the few months of elementary study they undergo is not to be overlooked, and the true success of such elementary examinations is not to be measured by the number of candidates who make them a stepping-stone to something higher. The majority of those candidates who come up to the final examinations are of a totally different stamp from the candidates just mentioned, and thus the elementary and final examinations are thus doing a distinct and important work. With a view to encourage candidates who have passed the elementary examinations to enter upon the final examinations, the Metropolitan Association offered prizes of the total value of £16 to the two male candidates and the two female candidates who should stand highest on the Society of Arts' return. As the conditions of these prizes have scarcely been understood, the result has not been great, but next year it is anticipated that a much larger number will compete for them. In the metropolis there are few institutions that afford facilities at one and the same time for elementary instruction and instruction of a more advanced character. Most institutions and evening classes are frequented by a class of members peculiar to the district in which they are situated, and who, year by

year, maintain the same average intellectual attainments. No comparison can therefore be made between the work done at any one with the work done at any other. Though some classes seem to be achieving a success, marked by the members carrying off prizes and certificates, that success may be after all far less than that achieved by classes whose members are in a different position of life; a position that neither increases their aptitude nor their capability for receiving knowledge. I mention this because the increase in the number of candidates in the Final Examinations, from Institutions that have for years held the Elementary Examinations is not commensurate with the increase in the number of candidates in the latter, and also to show how difficult it is, in giving results, properly to estimate the advance made. The Institutions, generally, seem to be steadily going on. It is worth notice, however, that the greatest activity and proficiency are manifested by those that offer the greatest educational facilities. There is no doubt that the stir that the last year has witnessed, with regard to the education question, has affected all classes, and next year will probably make this more manifest.

EXAMINERS' REMARKS.

The Examiner in *Arithmetic* says:—"As a whole, the papers this year show a very marked improvement upon those of last year, many of them showing unmistakeable evidence of a correct knowledge of principles and great accuracy in arriving at results."

The Examiner in *Book-keeping* says:—"This year's papers generally show a greater amount of comparative proficiency than those of any former year; it is especially noticeable that the number of candidates who have gained first-class certificates is greater, in proportion to the total number examined, than in either 1866 or 1867."

The Examiner in *Algebra* writes:—"Of the candidates in the examination in this subject about 50 per cent did not pass, but among these were several who seemed to have gone in to the examination without any adequate knowledge or preparation. Of the rest, however, I can report favourably, while of two or three candidates I cannot speak too highly. It would in my opinion be advisable that the candidates in future examinations should be cautioned against sending up mere results without giving the working by which they are obtained."

The Examiner in *Geometry* says:—"The candidates in this subject have on the whole done very well. Some have shown great aptitude in solving geometrical problems, and some of those who have not passed have come very near indeed to the limit. The result is satisfactory. The best candidate showed a remarkable knowledge of geometry."

The Examiner in *Mensuration* says:—"A larger number than usual have been examined this year in mensuration. The paper has been very well done by most of the candidates, if we except the questions on the mensuration of solids. Very few have shown themselves to be 'familiar with the different rules for measuring and estimating artificers' work.' One obtained no marks at all, inasmuch as his answers, which were all wrong, were sent up without his work."

The Examiner in *Trigonometry* says:—"The number of candidates for examination in trigonometry has increased, and the quality of the answers is better than that in the last few years."

The Examiner in *Conic Sections* reports that "the work this year is very creditable to the candidates. One indeed has done remarkably well, and another has shown a knowledge of the principles of projection which is seldom met with. Such work is sufficient to justify the Society in retaining the subject within the range of these which it examines."

The Examiner in the *Principles of Mechanics* says:—"While much gratified by the increased number of candidates for examination in my department, I regret to observe that many of them have scarcely appreciated the gravity of the examination, for they are either apparently unfit to pass it, or have not bestowed sufficient study in order to master the first principles of the subject on which questions, for the most part of no very high order, but suited to test a respectable acquaintance, have been submitted to them. In contrast with the failure of so many that it has pained the Examiner to review their papers, is to be fairly placed an increase in the number of those who have earned the first and second class certificates of the Society."

The Examiner in *Practical Mechanics* says:—"This has been a most satisfactory examination, as will be seen by the number of certificates awarded."

The Examiner in *Navigation and Nautical Astronomy* says:—"The paper of one of these candidates is remarkably good. He evidently possesses a good knowledge of the subjects. Had he worked out the lunar distance he would have obtained nearly full marks. The other candidate ought not to have presented himself; he is unacquainted with the definitions of Navigation and Nautical Astronomy, and has evidently attempted to work the paper without having devoted to the subject a sufficiency of time to attain any clear idea of what he is about. The candidates (at least one of them) do not seem to understand that only one question in each section is to be worked, and that marks will be given to one only."

The Examiner in *Electricity and Magnetism* "has much pleasure in remarking that among the unusually large number of papers he has received, more attention has been paid than hitherto to the important subject of the mariners' compass and its deviations; but the Electric Telegraph, and especially its mechanicism, being the most important practical and commercial bearing of the whole subject, has not generally met with the attention to which it is entitled. He further regrets being compelled to observe, that in some few instances an almost total ignorance of the entire subject has been manifested."

The Examiner in *Light and Heat* says:—"The candidates generally have shown a want of preparation for answering questions in writing, by losing time in uncondensed and superficial discussion; more accurate reading and frequent practice in writing out answers to examination questions are recommended to them."

The Examiner in *Chemistry* says:—"The chemical papers of this year show upon the whole an improvement upon those of last year. They are certainly a good deal better than some years ago."

The Examiner in *Mining and Metallurgy* says:—"The papers are this year very creditable."

The Examiner in *Botany* says:—"Although I can rank but one paper in the first-class, yet, upon the whole, the result of the examination is satisfactory. Attention appears to have been fairly distributed over the general field of botanical science, and one or two of those in the second-class may rank well in the first another year."

The Examiner in *Floriculture* says:—"The replies are this year more intelligibly shaped to meet the questions than on former occasions; but there is, in many cases, great need of improvement in regard to the handwriting and diction. In all the papers there is a manifest deficiency in regard to the correct spelling of the names of plants, the orthography being in some instances quite disgraceful, as *colea* and *coleous* for *coleus*, *ephyfillum* for *epiphyllum*, *hyasinth* for *hyacinth*, *hoetia* for *hoteia*, *ammeranthus* for *amaranthus*, *camelia* for *camellia*, *Erisina erbstei* for *Iresine Herbstii*, *helliotrophe* for *heliotrope*, *gauldfusia* for *goldfussia*, &c."

The Examiner in *Fruit and Vegetable Culture* says:—"Not only are the candidates more numerous than on former examinations, but their papers are of a much higher order, and of a quality superior to those which have

TABLE I.

Results of the Final Examination of 1868.

NAME OF LOCAL BOARD.	No. of Candidates Examined at Previous Examination by Local Board.	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who Passed at Final Examination.	No of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
Aberdeen	30	25	15	13	17	3	7	5	...	2
Accrington	...	...	9	9	20	1	6	11	...	...
Alderley Edge	4	4	5	4	12	...	1	5	...	1
Aldershot and Farnham	6	6	7	7	14	4	4	4	...	...
Ashford	10	9	10	10	12	7	3	2	...	...
Ashton-under-Lyne	2	2	7	4	10	...	1	5	...	3
Bacup	30	30	20	15	36	3	5	13	...	5
Banbury	...	...	1	1	1	...	1	...	...	...
Belfast (Academy Science School)	23	23	28	24	59	8	19	21	3	4
,, (People's Literary Institute)	9	9	11	11	14	6	8	...	...	...
Bewdley	...	...	2	1	2	...	...	1	...	1
Birmingham and Midland Institute	47	40	46	41	63	9	22	21	1	5
Blandford	...	...	1	1	1	...	1	...	...	...
Bolton (Mechanics' Institution)	7	7	10	4	10	2	...	2	...	6
,, (School of Science)	...	...	25	13	32	...	1	12	...	13
Bradford	20	17	21	14	30	4	8	11	...	7
Bristol (Young Men's Christian Association)	...	...	6	6	10	1	2	7	...	...
Bromley Kent)	3	3	2	2	4	...	1	3	...	...
Brompton (New)	19	17	8	1	8	...	...	1	...	7
Burnley	24	no retrn.	20	18	30	3	4	13	...	2
Burrage-road School (Plumstead)	26	21	38	11	38	...	2	9	...	27
Bury (Lancashire)	20	18	23	7	26	1	1	6	...	16
Carlisle (Mechanics' Institute)	3	3	8	7	8	1	5	1	...	1
Chatham, &c.	...	...	2	2	3	1	1	1	...	...
,, (St. Mary's Science School)	30	30	13	...	13	...	...	..	...	13
Chelmsford	5	4	9	7	9	...	3	4	...	2
Cheltenham	2	2	2	2	6	...	1	3	...	...
Chorley	9	9	11	9	16	3	5	6	...	2
Christchurch	..	...	2	2	2	...	...	2	...	...
Clitheroe	...	..	3	2	3	1	...	1	...	1
Compstall	25	25	19	3	23	1	1	3	...	16
Cork (Catholic Young Men's Society)	10	9	7	6	10	3	3	2	...	1
Crewe	13	12	14	8	20	...	3	6	...	6
Dean Mills (near Bolton)	...	...	1	1	3	...	...	2	...	...
Denton and Haughton	19	19	15	3	24	...	...	5	...	12
Deptford	8	8	10	10	20	3	7	5	2	...
Derby	...	...	6	6	10	3	2	5	...	...
Devonport	18	18	22	20	39	17	13	4	7	2
Droylsden	28	28	27	7	35	1	3	6	...	20
Dudley (Mechanics' Institution)	9	9	9	5	9	1	1	3	1	4
Earlstown	17	15	10	4	13	...	...	4	...	6
Eccleshill	1	1	3	3	3	1	...	2	...	...
Edinburgh (Watt Institute)	10	10	12	11	19	7	4	5	...	1
Failsworth	5	5	5	...	5	...	...	...	...	5
Faversham	...	...	2	2	5	3	...	...	...	...
Freetown (Glossop)	1	1	5	4	6	2	...	2	..	1
Galgate	..	...	2	1	3	...	...	2	...	1
Guilford	...	...	2	2	2	1	1	...	...	...
Glasgow (Athenæum)	46	39	40	37	46	4	13	23	2	3
,, (Institution)	4	4	5	5	5	1	2	2	...	...
,, (Mechanics' Institution)	60	54	56	49	62	9	26	19	2	7
,, (Pop Evg. Classes, Anderson. Univ.)	64	55	58	55	67	5	15	42	1	3
,, (Tonic Sol-fa Society)	30	28	30	18	30	2	6	10	...	12
Glodwick and Analytic Institution)	43	41	39	7	44	...	...	8	...	32
Gloucester (Free Library)	...	...	26	12	35	...	1	12	...	14
Guisboro' (Yorkshire)	...	...	1	1	1	...	...	1	...	...
Halifax (Mechanics' Institution)	34	34	23	10	34	...	1	12	...	13
,, (Working Men's College)	30	27	35	35	45	4	16	19	1	..
Handsworth	15	15	7	5	8	...	3	2	...	2
Haslingden	...	...	6	3	12	...	2	3	...	3
Hastings and St. Leonard's	...	...	5	5	7	1	4	2	...	...
Hertford	2	2	3	3	3	...	2	1	...	..
Heywood	...	..	10	3	10	...	...	3	...	7
Holbeck	...	...	5	5	15	2	3	6	...	...
Holywell Green (near Halifax)	3	3	6	5	7	1	...	4	...	1
Huddersfield	6	6	13	11	19	...	12	2	...	2
Hull	4	4	6	5	7	3	3	...	...	1
Hulme (Working Men's Institute)	...	...	13	9	13	1	1	6	1	4
Hyde	6	6	5	2	9	...	..	3	...	3
Ipswich	14	12	10	10	14	7	2	5	...	...
Kidderminster	...	...	3	3	4	1	1	1	...	...
King's Lynn	6	6	7	5	10	4	2	1	...	2
*Lancashire and Cheshire Union	12	12	11	...	12	...	...		...	11
Lancaster	...	...	18	10	21	...	2	9	...	8
Leeds (Church Institute)	5	5	6	5	10	3	1	3	...	1
,, (Mechanics' Institution)	30	30	33	25	57	5	16	21	2	8
,, (Young Men's Christian Association)	17	13	8	8	12	2	4	5	...	...
Lichfield	3	3	7	6	9	1	3	3	...	1
Liverpool Institute	37	37	30	27	58	6	12	18	...	3
Lomeshaye (Evening School)	10	10	12	8	12	...	2	6	...	4

* These Candidates were examined at the Manchester Mechanics' Institution.

TABLE I.—(CONTINUED).

NAME OF LOCAL BOARD.	No. of Candidates Examined at Previous Examination by Local Board	No. of Candidates who Passed Previous Examination by Local Board.	No. of Candidates Examined at Final Examination.	No. of Candidates who Passed at Final Examination.	No. of Papers Worked at Final Examination.	No. of First-class Certificates awarded.	No. of Second-class Certificates awarded.	No. of Third-class Certificates awarded.	No. of Prizes awarded to Candidates.	No. of Unsuccessful Candidates.
London (Beauvoir College)	16	16	18	18	18	9	9	...	2	...
,, (City of London College)	48	44	57	52	78	25	21	24	5	5
,, (Royal Polytechnic Institution)	24	23	31	27	54	13	15	20	10	4
,, (Metropolitan Association):—										
(Birkbeck Lit. and Scien. Inst.)	29	25	37	36	54	18	22	12	7	1
(Lambeth Evening Classes)	98	No retrn	29	25	40	4	8	12	...	4
(St. Stephen's, Westminster)	11	11	5	5	11	...	4	3	...	...
(Stepney Deanery)	11	9	7	6	7	...	5	1	...	1
Louth	2	2	2	2	2	...	1	1	...	...
Macclesfield	...	...	5	2	6	...	1	2	...	3
Malvern	...	..	6	6	10	2	4	2	...	...
Manchester (Mechanics' Institution)	88	79	64	48	92	11	29	28	1	16
Marple	1	1	1	1	1	...	...	1	...	...
Middlesbro'	...	...	4	3	4	...	2	1	...	1
Mossley	...	...	5	5	5	...	5	...	..	...
Newcastle (Church of England Institute)	1	1	2	2	3	...	1	2	...	...
New Mills	8	8	10	4	14	...	1	5	...	6
New Swindon	26	16	15	13	17	1	7	7	...	2
Oldbury	5	5	5	2	5	...	1	1	...	3
Oldham (Lyceum)	30	30	29	11	43	2	5	9	...	18
Padiham (Evening School)	...	...	4	2	4	...	...	2	...	2
Paisley (Artisans' Institution)	6	6	16	13	20	4	6	7	..	3
Parsonstown	11	10	8	7	14	2	5	5	...	1
Patricroft	12	12	8	5	8	..	2	3	...	3
Pembroke Dock	10	10	10	10	14	8	4	2	...	...
Portsmouth	6	6	12	11	26	10	12	3	2	1
Preston	70	70	20	12	30	2	3	10	...	8
Redditch	...	..	4	4	5	1	...	4	...	...
Richmond (Surrey)	7	7	8	8	18	6	10	1	9	...
Rugby	15	14	16	15	28	4	14	9	...	1
St. Helen's (Lancashire)	13	10	3	3	3	...	...	3	...	...
Salford (Working Men's College)	30	30	53	42	68	10	26	18	1	11
Scarborough	4	4	4	3	4	...	2	1	...	1
Sheerness Dockyard	32	29	25	21	44	4	16	15	...	4
Slough	4	4	3	2	3	...	..	2	..	1
Southampton	26	25	22	20	38	8	16	9	2	2
Southport	1	1	1	1	1	...	1	...	...	...
Stockport	25	25	25	12	32	4	3	7	1	13
Stockton-on-Tees	2	2	2	2	4	...	...	3	...	...
Stourbridge	3	3	2	1	2	...	1	...	..	1
Tottington	3	2	3	2	4	1	1	1	...	1
Wakefield	7	7	4	2	4	...	1	1	...	2
Walsall (Church Institute)	...	...	2	2	2	...	1	1	...	...
Wednesbury	19	18	9	4	17	.	3	6	...	5
Werneth (Mechanics' Institution)	...	...	2	1	2	...	..	1	...	1
West Bromwich (Gold's Hill)	7	7	11	10	19	1	5	7	1	1
Whaleybridge	...	...	4	...	4	..	...	...	...	4
Woolwich (Royal Arsenal)	50	50	49	27	78	1	12	18	...	22
,, (St. Thomas's Schools)	69	66	54	22	63	1	5	21	...	35
,, (Western Mission Science School)	8	7	8	3	8	...	1	2	...	5
Wolverhampton	4	4	14	13	22	...	5	13	...	1
Worcester (Catholic Institute)	2	2	2	1	4	...	...	3	...	1
,, (Mutual Improvement Society)	...	...	2	2	3	2	...	1	...	...
,, (Railway Literary Institute)	3	3	3	3	7	1	4	2	...	...
York	5	5	16	14	24	...	3	12	...	2
Totals	1,844	1,596	1,842	1,308	2,547	318	608	801	65	534

Number of Local Boards, 135.

been submitted to me on previous occasions. It will be observed that while there are four who have passed in the first-class, there is but one who has come out third, and none in the class of 'not passed.' I have to observe further that, in subjects relating to culture, the answers are generally good; but in almost all cases, where those under consideration are the identification and nomenclature of the different varieties of fruits and vegetables, there is a great deficiency. I would therefore urge on candidates to study the individual characteristics of both fruits and vegetables, so that they may be able readily to distinguish one variety from another, and to acquaint themselves with the conditions under which the numerous varieties are known to succeed best."

The Examiner in *Animal Physiology* says:—"The characters of this year's papers were very much the same as those of last year. There was the same display of technical terms, often incorrect, and very frequently quite irrelevant to the question, and the same bad spelling of common words. Though a larger number of papers were sent in, the best papers of this year were not so good as those of last year."

The Examiner in *Domestic Economy* says:—"Some of the papers are remarkably well done, and show a very comprehensive knowledge of the subject; but a large proportion of them betray a lamentable deficiency in primary education and the power of literary composition. I have never met with exercises written for an examination which displayed such bad spelling."

The Examiner in *Political and Social Economy*, in speaking of the two papers for which prizes have been awarded, says:—"The first is a remarkable paper, and the second is very good."

The Examiner in *Geography* says:—"The average merit of the first and second class answers fully equals, and perhaps surpasses that of the correspond-

ing papers of former years. But those of only third-class merit are numerous, and the number of failures is large. I feel sure that in many cases the failure is due not so much to mere want of sufficient preparation as to absence of a thoughtful appreciation of the real nature of the task undertaken. In the case of the greater number of failures (and in not a few of those ranked as "third-class") the candidates seem to have supposed a mere schoolboy treatment of the subject to involve all that was required; and no preparation for any higher test than would be applied to ordinary school geography—and that of a very elementary kind—appears to have been resorted to. If the candidates were to examine more fully the conditions of the programme issued by the Society, and paid stricter attention to its injunctions and recommendations, they would stand a better chance of successful competition for the higher honours at its disposal. I venture to suggest whether more might not be done through the medium of the preliminary examinations, in furtherance of such a purpose. I can only repeat what I have urged on former occasions—that methodised study, with the aid of good appliances, directed persistently (for at least some length of time) to a definite object, can alone lead to the desired result. Mere generalities and loose scraps of information will not suffice. Geography is nothing if it be not precise and exact in detail, as well as comprehensive in its scope."

The Examiner in *English History* says:—The papers are not equal to the average of last year; and I regret to state that they contain more numerous instances of flagrant bad spelling than on any previous occasion. I think the different secretaries of the Institutions in Union with the Society of Arts should have their attention called to the fact that the candidates, in gathering up their papers, do not always put them together with due regard to the pagination. The consequence is that the Examiner is under the necessity of rearranging the papers of some of the candidates, which is at times very perplexing."

The Examiner in *English Literature* says:—"The work of the present year does not on the whole fall below the average of past years, but there is not so large a proportion of candidates in the first class as on some previous occasions."

The Examiner in *Logic and Mental Science* says:—"The papers show a general improvement on those of the last two or three years. There is only one exhibiting the decided inferiority I before noticed, whilst two or three of the papers are highly creditable."

The Examiner in *Latin and Roman History* says:—"The Latin was fairly done this year; the translations

TABLE II.

Number of Papers Worked in each Subject in the Four last Years; with the Result for the Year 1868.

SUBJECTS.	1865.	1866.	1867.	1868. No. of Papers Worked.	1868. No. of First-class Certificates.	1868. No. of Second class Certificates.	1868. No. of Third class Certificates.	1868. No. of Papers in respect of which no Certificate was awarded.
Arithmetic	446	383	520	528	128	160	147	93
Book-keeping	275	209	235	255	62	90	86	17
Algebra	68	65	87	76	6	12	19	39
Geometry	26	30	41	36	4	7	17	8
Mensuration	43	40	55	78	9	28	22	19
Trigonometry	10	9	9	20	2	3	5	10
Conic Sections	1	7	8	5	1	2	2	..
Navigation, &c.	4	2	1	2	1	..	..	1
Principles of Mechanics.. ..	11	16	27	52	4	5	3	40
Practical Mechanics	15	18	38	53	1	21	22	9
Magnetism, Electricity, &c. ..	19	8	32	41	1	5	16	19
Light and Heat	7	7	35	28	..	7	11	10
Chemistry	107	80	76	92	12	27	33	20
Animal Physiology	84	48	45	121	..	14	85	22
Botany	12	19	16	16	1	4	4	7
Floriculture	..	6	9	16	3	10	3	..
Fruit and Vegetable Culture ..	..	8	9	13	4	8	1	..
Mining and Metallurgy.. ..	6	3	1	1	1	..	..	..
Political and Social Economy ..	5	6	8	7	2	..	3	2
Domestic Economy	13	6	34	32	8	5	6	13
Geography	87	86	98	114	14	31	38	31
English History	94	78	86	99	6	31	34	28
English Literature	30	39	29	33	3	12	13	5
Logic and Mental Science ..	15	8	4	9	2	3	3	1
Latin and Roman History ..	9	9	9	21	2	10	7	2
French	99	116	118	148	10	20	65	53
German	19	10	12	16	2	2	9	3
Italian	4	5	2	3	..	1	2	..
Spanish	10	6	6	6	1	4	1	..
Free-hand Drawing	56	55	85	108	7	41	46	14
Geometrical Drawing	128	132	240	421	..	19	68	334
Music	40	39	71	97	21	26	30	20
Totals	1,744	1,571	2,050	2,547	318	608	801	820

might have been put into better English, and the syntactical parsing might have been fuller, but the usual standard was well maintained on the whole."

The Examiner in *French* says:—"The papers are on the whole very fairly satisfactory, and I have much pleasure in recommending 95 candidates for certificates. But the proportion of decidedly good papers is below the average of former years. The translation of English into French continues the weakest part, and bears throughout the evidence of extremely superficial study. In some groups of papers, all bearing a strong family likeness, it is grievous to notice the effects of that cramming system which has lately crept into so many school-rooms, and which it is the duty of all earnest educators to denounce and discourage. I would again warn the candidates, and especially their teachers, that two or three foolscap sheets of ready-made literature, and 'cut and dried' history, however accurately got up, cannot secure any great number of marks when, of all the grammatical questions in the same paper, not one is correctly answered, or when nearly every word in the translation is an offence against one or other of the most elementary rules of the language. Candidates aiming at a first-class certificate in French, ought at least to know how to spell, *inter-alia*, the name of the sovereign whose life they are sketching. In one such paper the name of the hero of the Carlovingian dynasty is murdered throughout into Charleimage. Nor does the mother-tongue fare better at the hands of most candidates and one pretentious paper is headed 'Grammer' *(sic)*."

The Examiner in *German* says:—"The direction, how much of the different sections of the paper was to be worked out by each candidate, has not been strictly adhered to by some. Only three candidates have tried to render the German idioms into English. The essay has been well-handled by one candidate. Unfortunately, some of the candidates, not having seen the Kensington Museum, were unable to describe a visit there; one of them, however, substitutes a visit to Peel-park, Manchester, the description of which is of equal merit."

The Examination in *Italian* says:—"In the papers for this year, whilst I discover some small improvement over those of last year, as regards grammatical rules, I find evidence still of sensible deficiency with respect to forms of expression and the construction of Italian. More extended reading is also absolutely necessary."

The Examiner in *Spanish* says:—"Some improvement is evinced in the Spanish papers this year as compared with the preceding, notwithstanding four of the candidates show themselves defective in the rules of grammar in the translation from English into Spanish, which can be removed by a careful attention to syntax."

The Examiner in *Freehand Drawing* says:—"There is a great increase in the number of candidates this year, and the work done is rather above the average. The answers to the question relating to the proportions of the human figure are much more satisfactory than those of last year—18 out of 109 having given correct replies."

The Examiner in *Geometrical Drawing* says:—"The examination in Practical Geometry this year has been very unsatisfactory, especially as compared with that of last year. The two papers were as nearly as could be of the same extent, and both extremely elementary. The two results are, in 1867, about 30 per cent. gained a first or second class—about 40 failed to pass; in 1868, only 16 per cent. have gained a second class, and only one candidate has obtained a first class—no less than 334 out of 421 have failed to pass. I might almost use the very same expressions on this occasion that I did last year, in commenting on the causes of this extraordinary result; even the plane geometry is greatly inferior, and the drawing not so good; but of any knowledge of the geometry of the plane and line in combination there is little indication, and there is a reckless neglect or misconception of the conditions of the question."

The Examiner in *Music* says:—"On the whole the papers are inferior to those of many former years. Of ninety-seven papers I have been enabled to place only twenty-one in the first class. In the others (even in some of the second class), there are many examples of simple processes done in a very slovenly way; *e.g.*, putting compressed into full score, showing imperfect knowledge of the theory of the stave. Some candidates still attempt the harmony and counterpoint questions, evidently without having had the slightest preparation for them. In some of the 'non-passed' papers (twenty in number) not a single question has been answered correctly. In 'musical history' there is considerable improvement."

TABLE III.

This Table shows the ages of the 2162 Candidates from whom return papers were received. Of these, 1835 underwent the Final Examination.

Age.	No. of Candidates.	Age.	No. of Candidates.
16	251	31	23
17	279	32	11
18	283	33	20
19	246	34	13
20	207	35	14
21	176	36	6
22	140	37	7
23	105	38	9
24	85	39	2
25	68	40	6
26	57	41	2
27	42	42	4
28	38	43	1
29	36	46	1
30	30	Total	2,162

TABLE IV.

Occupations, Present or Proposed, of the 2,162 Candidates from whom Return Papers were received:—

Accountants (and Clerks)	5	Cabinet-case makers	3
Agents	3	Cabinet-makers	12
Ammunition maker	1	Calenderer	1
Architects	12	Calico-printers	2
,, Clerks	3	Caligrapher	1
Army accoutrement maker	1	Card-makers	2
Artist	1	Carder	1
Assistants—Broker's	1	Carpenters	28
,, Cook's	1	Cartridge-maker	1
,, Editor	1	Carver and gilder	1
,, Laboratory	3	Cashiers	2
,, to a provision dealer	1	Caulkers	2
,, Surveyor of taxes	1	Chaser	1
Bakers	3	Cheesefactor	1
Blacksmiths	10	Chemists	9
Block-cutter	1	,, and Dentist	1
Boat-builder	1	,, and Druggists	13
Boiler-makers	4	,, Photographic	1
Book-binder	1	China-packer	1
,, keepers	63	Civil Engineers	5
,, sellers	2	,, Service	1
Boot and shoe-makers	9	Clerks—Bankers', Commercial, &c.	454
Brass-finishers	3	,, Builders'	2
,, founder	1	,, Colliery	1
,, turners	2	,, Corresponding	2
Brazier	1	,, Customs'	2
Bricklayers	6	,, Gas-works'	2
Brickmaker	1	,, Engineer's	1
Broker (ship-insurance)	1	,, Estate agents'	2
Brush-maker	1	,, Insurance	3
Builder	1	,, Law, &c.	23
Butchers	2	,, Ordnance Survey	2
		,, Poor-law	1
		,, Post-office	1

„ Railway.. .. 16
„ Short-hand .. 1
„ Surveyors' .. 2
„ Telegraph .. 1
Clogger.. 1
Cloth-dresser 1
„ finisher 1
„ lapper.. 1
Coach-makers 2
„ painters 2
Coal-agent 1
„ dealer 1
Collectors 7
Colour-mixer 1
Colourist 1
Commercial travellers.. 5
Compositors 7
Confectioner.. 1
Contractor 1
Cooper 1
Cop-booker 1
Copper-smiths 2
Cork-cutter 1
Corn-merchant 1
Corrector of the press.. 1
Cotton-mill, employed in 1
Creeler 1
Curriers 2
Customs' officer 1
Cutler 1

Dental mechanist .. 1
Dentists 2
Designers 5
Die-sinker 1
Dispenser 1
Divinity, student in .. 1
Dockyard apprentice .. 1
Domestics 4
Drapers and assistants 16
Draughtsmen 28
Dressmakers.. 2
Druggists, &c. 3
Dyers 5

Edge-tool maker.. .. 1
Engine-drivers 2
„ erectors 3
Engineers and apprentices 126
„ mechanical.. 3
Engravers 5

Factory-hand 1
Fancy box-maker .. 1
Farm-servant 1
File-cutter 1
Fitters 72
Flax-dressers 4
„ trade, in the .. 1
Flour-dealers 2
Florist 1
Fruiterer 1
Fuller 1

Gardeners 24
Gas-fitters 2
„ meter inspectors .. 2
„ „ maker .. 1
„ works, employed in 1
Glass-engraver 1
„ painter 1
„ stainer 1
Glover 1
Governesses 9
Grey-looker 1
Grinders 2

Grocers and assistants.. 16
Gunmaker 1

Hammerman 1
Harness-maker 1
Hatters 5
Hosiers 3
House-decorator 1
„ keeper 1

Index-taker 1
Inland Revenue officers 2
Iron-founder 1
„ moulders 3
„ turners.. 8
Ironmongers 6

Jewel-case maker .. 1
Jewellers 6
„ engraver .. 1
Joiners 78

Labourers 8
Lamp-manufacturer .. 1
Leather-dresser 1
„ seller 1
Letter-carrier 1
Linen-trade, in the .. 3
Lithographers 3

Machine-joiners 2
„ worker 1
Machinists 5
Maker-up 1
Managers 3
Manufacturers 5
Masons 5
Mast and block-maker 1
Mat-makers 3
Measurer 1
Mechanics 84
Medical students.. .. 2
Merchants 2
Metal-roller 1
Miller 1
Mill-hands 3
„ man 1
„ wrights.. 17
Milliner 1
Minder 1
Miners 2
Moulder 1
Music-copyist 1
„ seller 1

News-agents 2
Normal student 1

Office-lads 6
Oilman 1
Optician 1
Organists 2
Overlookers 8
Overseer of roads .. 1

Packers 2
Painters—House, &c... 9
Paper-maker 1
Pattern-cutter 1
„ designer.. .. 1
„ makers 40
Pawnbrokers 2
Photographers 3
Photographic instrument maker 1
Pianoforte-maker .. 1
Picture-frame maker .. 1

Piecers 8
Plan-tracer 1
Planers 4
Plate-layer 1
Plumber, &c. 1
Pocket-book makers .. 2
Police-serjeants 2
Porter 1
Power-loom tenter .. 1
Printers.. 21
„ readers 2
Pupil-teachers 44
Putters-out 2

Railway carriage builder 1
Reporters 3
Roller-coverers 3
Rope-makers 2

Saddlers 3
„ ironmonger .. 1
Sailor 1
Salesmen 22
Sanitary tube-maker .. 1
Sawyer 1
Seal-engraver 1
Schoolmasters 29
„ mistresses 3
Science student 1
Scripture-reader 1
Self-actor minders .. 7
Serjeant-major 1
Sewed-muslin manufacturer 1
Ship-broker 1
„ carpenter 1
„ carver 1
„ wrights (and apprentices).. .. 41
Shopmen 5
Silversmith 1
Smiths 7
Soap-boiler 1
Soldier 1
Solicitor 1
Spindle-makers 2
Spinners 10
Staff-serjeant 1
Staircase-maker 1
Stationers 3

Stereotyper 1
Stone-masons 10
Store-keepers 2
Student in Arts 1
Stuff-trade, in the .. 1
Surgeon 1
Surveyors 7

Tailors 10
„ and draper.. .. 1
Tailoress 1
Teachers (other than pupil-teachers).. .. 69
Time-keepers 8
Tin-plate workers .. 5
Tobacco-manufacturer 1
Tobacconist 1
Tool-maker 1
Townsman 1
Turners.. 23
Tutor 1
Twisters 3

Umbrella-maker 1
Upholsterers 2

Warehousemen and lads 84
Warpers 2
Waste-dealers 2
Watchmakers 5
Weavers 48
Weighing-machine filer 1
Wheel borer.. 1
„ wrights 7
Whitesmith 1
Winders 5
Wine and spirit merchant.. 1
Wire-drawer 1
Wood-carver 1
„ engravers 2
Wool-sorters 12
„ staplers 2
„ trade, apprentice to 1
Writers 7

Undetermined, or not stated.. 65

Total .. 2,162

The report of the discussion at the Conference will appear in next week's *Journal.*

ANNUAL GENERAL MEETING.

The Annual General Meeting, for receiving the Report from the Council, and the Treasurers' Statement of Receipts, Payments, and Expenditure during the past year, and also for the Election of Officers, was held, in accordance with the bye-laws, on Wednesday, the 24th inst., at four p.m., Seymour Teulon, Esq., Treasurer of the Society, in the chair.

The Secretary having read the notice convening the meeting, the minutes of the last Annual General Meeting, and of the subsequent Special General Meeting, were read and signed.

The Chairman then nominated Mr. Botly and Mr. Cook as scrutineers, and declared the ballot open.

The Secretary then read the following

ANNUAL REPORT OF THE COUNCIL.

As directed by the bye-laws, the Council now lay before the members, at the Annual General Meeting, the report of their proceedings during their year of office.

Visits of Artisans to the Paris Exhibition.

In the Council's last Report it was stated that the Council were endeavouring to raise a fund for the purpose of assisting a number of selected workmen to visit and report upon the Paris Exhibition. The Council succeeded in raising, by subscription amongst members of the Society and others, the sum of £1,039 19s. 6d., being materially aided by the Government, who contributed £500. The Council were thus enabled to assist about eighty workmen, each of whom, without a single exception, delivered his report to the Society. These reports were printed in a volume, which was issued at the commencement of the year. That the edition has been sold off, and the work is now out of print, is a sufficient indication of the interest which the reports excited in the public. The Council have thought it right to continue this course of action, by assisting Robert Coningsby, one of the reporters of last year, to visit the United States of America, and report on the state of the principal manufactures there, and on the condition of the artisan, it being the opinion of the Council that the information thus obtained could not fail to be valuable, especially to the artisan class in this country.

Society's Visit to Paris.

Following the precedent set on the occasion of the Paris Exhibition of 1855, a visit of members to the Exhibition of 1867 was organised. A place of rendezvous or reception-room was taken for their use in Paris, where their letters could be addressed, appointments made for meeting, and parties arranged for visiting special departments of the Exhibition, and the numerous manufacturing establishments, which were most freely thrown open by their proprietors for inspection, as well as the public works, which the authorities readily gave permission to be visited. The members had special opportunities of inspecting the water-works as well as the great sewers of Paris, engineering achievements which were viewed with much interest.

Cantor Lectures.

The Cantor Lectures were this year delivered by Richard Westmacott, R.A., F.R.S., Professor of Sculpture in the Royal Academy, "On Art, especially including the History and Theory of Sculpture" (a course of three lectures); by Dr. Letheby, M.A., Professor of Chemistry in the London Hospital, and Medical Officer of Health and Food Analyst for the City of London, "On Food," (a course of four lectures); and by Dr. F. Crace Calvert, F.R.S., "On Chloride of Sodium, or Common Salt, the Products Obtained from it, and their Applications to Arts and Manufactures," (a course of four lectures). Each course was largely attended by the members and their friends.

Artistic Copyright.

The Bill for Consolidating and Amending the Law of Copyright in Works of the Fine Arts has been carefully revised and has been brought into the House of Lords by Lord Westbury.

Technical Education.

The jurors and others who visited the Paris Universal Exhibition last year were struck with the great advance which continental nations had made in Arts and Manufactures as compared with our own, as evidenced by the display made at that great gathering of industrial results, and this they attributed to that want of technical education on the part of our manufacturers and artizans which was so readily accessible to the people of the continental nations. They pointed out that, in their opinion, unless steps were taken in this country to afford our people equal facilities, we should soon be outstripped in the race of industrial progress by our foreign competitors. The subject naturally attracted the attention of the Council of this Society, founded for the Encouragement of Arts, Manufactures, and Commerce, and early in the year it was thought right to call together a Conference on this subject, to which were invited all who were known to take interest in it, whether as connected with manufactures or with the Universities and other leading educational bodies throughout the United Kingdom, as well as members of both houses of Parliament. The Conference was well attended, and extended over two days. A full report of its proceedings was published in the *Journal*. Mr. Wm. Hawes, Chairman of the Council, presided on each day; and the following resolutions were passed:—

Moved by Dr. Lyon Playfair, F.R.S., seconded by Earl Russell, and resolved—

1. That to establish and maintain a system of technical education adequate to the requirements of Arts, Manufactures, and Commerce in the United Kingdom, the three following educational reforms should be effected:—1st. In the universities, grammar schools, and other educational institutions for the upper and middle classes of society, instruction in science and art should be placed on the same favourable footing as other studies; 2nd. Efficient means of primary and secondary instruction should be brought within the reach of the working classes everywhere, and encouragement should be given to the study of the elements of science and art in the upper classes of all primary schools which receive aid from Government; and 3rd. Special institutions for technical instruction, including museums, adapted to the wants of the various classes of society, and to the industries of the country, should be established and maintained in the United Kingdom.

Moved by Mr. Harry Chester, seconded by

the Right Honourable Wm. Cowper, M.P., and resolved—

2. That in such measures as may be desirable for the general provision of the means of efficient primary and secondary education, it would be right to consolidate and improve, rather than overthrow, what has already been done, but that the voluntary principle requires to be supplemented by local rates for education.

Moved by the Rev. W. C. Lake, seconded by Mr. Antonio Brady, and resolved—

3. That while this Conference acknowledges the benefits which have ensued from the educational clauses of the Factory Acts, it is of opinion that the legislature ought as soon as practicable to provide that all children between certain ages, and not those only who are employed in remunerative labour of a certain character, should receive education during at least a minimum number of hours in each year, security being taken that the education be conducted in efficient schools.

Moved by Mr. Samuelson, M.P., seconded by the Rev. Henry Solly, and resolved—

4. That the Council of this Society be requested to appoint a standing Committee to take such steps as may give effect to the foregoing resolutions, to support all such well-advised schemes for technical education as may be brought before it, to send such deputations to the Government as may seem expedient, and to re-assemble this Conference when desirable.

The Council at once, in compliance with the terms of the last resolution, appointed a Committee, which at its first meeting delegated to a Sub-Committee, whose names have already appeared in the *Journal*, the duty of preparing a scheme of technical education calculated to promote the advancement of Arts, Manufactures, and Commerce in this country. This Sub-Committee has been actively engaged in the prosecution of its duties, and, acting on the power confided to it, has obtained the valuable services of the following gentlemen as colleagues:—Professor Hirst, F.R.S., Prof. Williamson, F.R.S, Dr. Frankland, F.R.S., Samuel Redgrave, Dr. David S. Price, Sir Daniel Cooper, Bart., T. D. Acland, M.P., General Sir W. Codrington, K.C.B., Captain Toynbee, Thomas Gray, Professor W. A. Miller, F.R.S., Dr. Voelcker, J. P. Seddon, of the Royal Institute of British Architects, and R. Phené Spiers, President of the Architectural Association. The Sub-Committee has held frequent meetings, and its report is in a forward state of preparation. It will then be submitted for adoption to the General Committee, and when finally completed will be published in the *Journal*.

The Council have already notified to the members, through the Society's *Journal*, the noble gift of Mr. Joseph Whitworth, of one hundred thousand pounds, for the endowment of "thirty scholarships, of the annual value of £100 each, to be applied for the further instruction of young men, natives of the United Kingdom, selected by open competition for their intelligence and proficiency in the theory and practice of mechanics and its cognate sciences, with a view to the promotion of engineering and mechanical industry in this country." In order to prepare for carrying this into effect, Mr. Whitworth has at once created sixty exhibitions, of the value of £25 each, to be held for the ensuing year, the object being that they be given to enable youths, under certain conditions of age, to qualify themselves to compete for the scholarships in May next. The nomination to three of these exhibitions Mr. Whitworth has placed at the absolute disposal of the Council of the Society of Arts, to be given to artisans. The Council will, now that the examinations are over, at once proceed to make their selection of the three artisans who will be proposed to take advantage of Mr. Whitworth's munificent gift.

The Council take a deep interest in the success of this patriotic endeavour, on the part of a private individual, to establish the commencement of a system of technical instruction, and they trust that others in their localities will be stimulated to act in a similar spirit, and that their efforts will be aided by assistance from Imperial funds for an object which is, in reality, so wide-spread in its importance as to be properly designated Imperial.

East London Museum.

In connection with the subject of Industrial and Art Education, the Council note with great satisfaction the efforts now making by Mr. Antonio Brady and others to establish a Museum in the East-end of London, and they are happy to state that Parliament has voted £20,000 for the erection of the Museum on the site which has been purchased by a subscription set on foot by Mr. Brady. A conditional purchase of 4½ acres of land at Bethnal-green, being part of the Green itself, was made, and the site thus acquired was offered to the Government for the purpose of erecting the Museum thereon. This site has been accepted by Government as admirably adapted for the purpose, being within an easy walk of upwards of a million of people, mostly of the artisan class. The Museum is intended to be educational in the widest sense of the word, and it is hoped that it may be found useful in enabling our workmen to compete on more equal terms than at present with the skilled workmen of foreign countries, especially in matters of taste. The Council have had great pleasure in voting the sum of 100 guineas to aid in the purchase of the site referred to.

Albert Medal.

The Albert Gold Medal, founded to reward distinguished merit in Promoting Arts, Manufactures, and Commerce, has this year been awarded to Mr. Joseph Whitworth, F.R.S., LL.D., "for the invention and manufacture of instruments of measurement and uniform standards, by

which the production of machinery has been brought to a degree of perfection hitherto unapproached, to the great advancement of Arts, Manufactures, and Commerce."

This medal was instituted to reward "distinguished merit in Promoting Arts, Manufactures, or Commerce," and has been awarded in previous years, as follows:—

In 1864, to Sir Rowland Hill, K.C.B., "for his great services to Arts, Manufactures, and Commerce, in the creation of the penny postage, and for his other reforms in the postal system of this country, the benefits of which have, however, not been confined to this country, but have extended over the civilised world."

In 1865, to His Imperial Majesty the Emperor of the French, "for distinguished merit in promoting, in many ways, by his personal exertions, the international progress of Arts, Manufactures, and Commerce, the proofs of which are afforded by his judicious patronage of Art, his enlightened commercial policy, and especially by the abolition of passports in favour of British subjects."

In 1866, to Professor Faraday, D.C.L., F.R.S., for "discoveries in electricity, magnetism, and chemistry, which, in their relation to the industries of the world, have so largely promoted Arts, Manufactures, and Commerce."

In 1867, to Mr. W. Fothergill Cooke and Professor Charles Wheatstone, F.R.S., in recognition of their joint labours in establishing the first Electric Telegraph.

Harvesting of Corn in Wet Weather.

The injury which accrued to the harvest of last year, from the prevalence of wet weather, drew the attention of the Council to the consideration how far it would be possible, by any arrangements or mechanical contrivances, to overcome such damage, and they resolved to offer the Gold Medal of the Society, and a Prize of Fifty Guineas, for the best Essay on the Harvesting of Corn in Wet Seasons.

They suggested in their offer that the first part of such essay—after noticing the various systems at present adopted in damp climates for counteracting the effects of moisture upon cut corn in the field, and for avoiding such exposure in wet seasons by peculiar harvesting processes—should furnish a practical and analytical exposition of the best available means:—

1st. Whereby cut corn may be protected from rain in the field.

2nd. Whereby standing corn may, in wet seasons, be cut and carried, for drying by artificial process.

3rd. Whereby corn so harvested may be dried by means of ventilation, hot air, or other methods; with suggestions for the storage both in the ear and after threshing.

4th. Whereby corn, sprouted, or otherwise injured by wet, may be best treated for grinding or feeding purposes.

They also suggested that the whole be supplemented by a statement of practical results, and the actual cost of each system described, and authenticated estimates of any process proposed for adoption, based on existing but incomplete experiments. They did not, however, bind the writer to the order or limit the treatment of the subject, provided it were kept within the scope of practical experience and utility. The essays were to be sent in to the Society on or before the 1st of January last.

Twenty essays were sent in, and were placed in the hands of Messrs. C. Wren Hoskyns, C. S. Read, M.P., and J. C. Morton, who, at the request of the Council, kindly undertook the duty of judging their merit. These gentlemen have unanimously recommended the Council to award the Gold Medal and the Fifty Guineas to Mr. W. A. Gibbs, in respect of the Essay sent in by him; and the Council have had much pleasure in making the award to that gentleman. The Essay is now in the printer's hands, and will shortly appear. In the opinion of the judges the plan proposed by Mr. Gibbs, and practically demonstrated by him on a large scale, is likely to prove a valuable remedy for the evil, placing the farmer in a more favourable position, and rendering available for the public a larger supply of food.

Food Committee.

This Committee has been very regular in its attendance, and much very interesting matter has come before it. In the *Journal* has been published from time to time the information the Committee has collected. The following is the report which the Council have received:—

In presenting their second report to the Council, the committee appointed to inquire respecting the food of the people, beg to state that during this session they have been engaged in the pursuit of inquiries of a like nature to those which occupied them in the preceding one. As the general character of these inquiries and their bearing on the subjects referred to the committee, were sufficiently pointed out in their first report, it will be needless to take up the time of the Council with any lengthened preface, and the committee will therefore at once proceed to present a *résumé* of their work under appropriate heads.

I.—As respects the Possibility of Increasing the Supply of Food.

Under this head the committee have to state that they have now had an opportunity of examining a further supply of the dried and powdered meat (both beef and mutton) from Queensland, of which they mentioned having seen a very small sample last year. It is prepared in Brisbane, and the agents for its sale in Great Britain are Messrs. Orr and Honeyman, of Princes-square, Glasgow. A member of this firm attended before the committee, and gave full information respecting the preparation. It is unsalted meat, and is sweet and good to the taste. An analysis made by Dr. Swaine Taylor (to whom the best thanks of the committee are due for gratuitously rendering them on this and other occasions valuable scientific assistance) determined it to be a

nutritious article consisting of fibrous animal matter, and containing nothing objectionable. It therefore deserves a favourable report; but from its powdered condition, and a not very prepossessing appearance, the committee do not feel able to predict that it is likely to be used on a large scale as a food for the people. It must also be observed, that, unless carefully kept, such pulverised animal substances are liable to become infested with acari.

In reference to the question of preserving whole joints or carcases, the system of Messrs. Bailey and Medlock has claimed much attention. It consists in treating the meat to be preserved, either by steeping or injection, with bisulphite of lime. The Committee have made many experiments, both by way of injection and of external application, in order to test the value of this system, and are of opinion that the process will be found of use for preserving meat for a brief number of days for domestic use, or in the hands of salesmen, but they are not prepared to state that the facts before them at present prove that carcases can be usefully kept by Bailey and Medlock's plan for long periods, or during importation from abroad.

For the latter purpose it has been proposed, by influential persons at Sydney, to resort to a different instrumentality—that of cold. They assert that when the meat is placed in a closed vessel, the temperature of which is reduced from without, none of the bad effects follow which are said to arise when provisions are frozen by actual contact with ice. At present the promoters of this plan are understood not to have decided in what form they can most economically provide the refrigeration, which must, of course, be kept up during the voyage by some artificial means, and no meat thus preserved has as yet arrived in this country preserved by this process. The Committee look with interest at the scheme, and hope to hear of some practical trial of it, which may determine its value. In connection with this plan they desire to record their satisfaction at the energetic manner in which the subject generally has been taken up in Australia.

Mr. Robert Atkins laid before the Committee a scheme for bringing live cattle from South America, in large steamers especially constructed for the purpose, but at present they are not prepared to express any opinion upon it, and they await further information.

Fish.—On this important and promising topic a great amount of evidence has been taken, both as respects sea and river fishing. Instead of going into this in detail, it appears most desirable to urge upon the Council the expediency of constituting some permanent body to deal exclusively and effectually with the subject. If a Piscicultural Committee could be organised in connection with the Society, those most interested in the question, and most competent to undertake it, would be attracted to take part in the work, and much benefit to the whole country might be the result. It is possible also, in the event of the Council moving with energy in this direction, that the Fishmongers' Company might be induced to co-operate with them in some useful manner. Many interesting points might thus be dealt with, upon which the present Committee have not time or means to enter with effect.

Poultry.—It seems probable that cottagers, farmers, and others might do much more in the way of raising poultry than they now do. It is therefore suggested that the Council should take measures to induce the associations which hold the poultry shows at the Crystal Palace, at Birmingham, and elsewhere, and also the agricultural societies, the farmers' clubs, and the societies for improving the condition of the labouring classes, to offer prizes for poultry—not in reference (as now) solely to the purity of breed, but with relation also to its value for food, that is to say, prizes for poultry killed, plucked, and ready for table. It is probably also that the Society of Arts might, through its affiliated institutions throughout the kingdom, do somewhat to diffuse a better knowledge of the conditions that would enable the country gentleman, the farmer, the owner of a small villa, and the cottager, to keep poultry for sale at a profit.

Fungi.—The Committee have taken some interesting evidence as to the edible character of large classes of fungi, of which no use is now made in this country, but they feel that the first step must be to disseminate more accurate information in schools, and by other like methods, before the subject could be safely or profitably suggested to the public in connection with human diet; and the Committee have satisfaction in stating that the evidence given before them by the Rev. M. J. Berkeley on this subject has been brought to the notice of the Royal Horticultural Society, and that that society has already begun to take measures to diffuse useful information respecting it.

Bread.—In their former report the Committee alluded to a French process for grinding corn, by which a larger percentage is said to be utilised and less rejected with the bran than on the common system. They are happy to say that a complete and valuable report has since been made to them on this subject by Mr. Le Neve Foster, who took occasion, when at the Paris Exhibition, to make a careful inspection of the system at the Boulangerie Scipion. The report is published in extenso in the *Journal* (vol. xvi., No. 789), and does not bear abridgment. The plan now adopted appears to differ somewhat from the idea which the Committee had been led to form of it, the method employed being an ingenious system of dressing, in which a current of air is made to play an important part, and not one of decortication; but the great point of interest remains as before, viz., that a large saving in the grain is said to be effected without the product acquiring the distinctive character of brown bread. It is much to be desired that the attention of millers and others should be directed to the subject, with a view of considering whether it would be practicable to introduce the system more generally.

II.—Better Distribution of Food.

Markets.—Much varied and valuable evidence has been taken by your Committee on the subject of markets, both for the sale of fish and of meat. The general bearing of this evidence has been in favour of one great central depôt for produce of all kinds as the medium of communication between the producer or importer and the retailer, with depôts for the consumer in various parts of the metropolis, radiating from this common centre, and supplied from it, but this subject is one of such vast importance to the community, that your Committee propose further investigation before adopting as sound the principle which has been urged upon them with great force and ability.

Milk.—To increase the supply of good milk has been felt by your committee to be worthy of special attention. And while they are unable to state that, in their opinion, this has been hitherto accomplished, they desire to draw attention to the fact that, in one instance at least, possibly in more, shops for the sale of pure milk have been opened in a poor district by the owner of a country farm, who sells through his own agents. They believe that something may be done by the Society to help and ensure progress, and they would propose that prizes be offered for the best form of milk-can for conveying it from the country, and also for an improved railway van in which the cans might be stowed, so as to ensure, as far as possible, the milk arriving in town in good condition. While on the subject of milk, your Committee would direct the attention of the Council to the mode adopted at Zurich, in Switzerland, for its preservation. Fresh milk is evaporated to the consistence of a thick syrup, and with the addition of some sugar, to help as a preservative, an article of diet is produced which is of great value; the globules of milk remain unbroken, and when the preserved and condensed milk is diluted with a proper proportion of water, a fluid is produced which, except that it is a little sweeter than ordinary milk, cannot be distinguished from it. Where fresh milk is

not to be procured, or can only be procured with difficulty, this preparation forms a valuable article of diet.

The Committee would suggest, as likely to prove most beneficial, that prizes should also be offered for improved railway vans for conveying meat, as the information obtained by your Committee leads strongly to the inference that much good would result to the community from alteration and amendment in the modes of transit at present adopted.

III.—Cooking.

Of the various methods for cooking and implements in its aid, which have been brought before the Committee, two are specially worthy of notice. 1st, that invented by Captain Warren, and extensively used by the army authorities; 2nd, the Norwegian box for cooking meat, vegetables, &c., without the continued intervention of fire. The former consists of a stove, so ingeniously constructed that nearly all the heat given out by the combustion of the fuel employed is utilised, and by the use of about 20 lbs. of coal the rations of 100 men for a whole day are either roasted, baked, or boiled, with the special addition of a mode of cooking peculiar to Captain Warren, and called after his name, "Warrenising." This consists in using jacketed vessels, so constructed that whatever is contained in them is thoroughly cooked by steam without the articles of food being in any way exposed directly to its influence. This may either be accomplished by the waste steam given off in the other processes on the stove, or on a common fire, by the use of vessels specially constructed, which may be obtained at little more than the cost of the most ordinary utensils. Food thus cooked retains fully its flavour, and much of the loss consequent upon other modes of cooking is prevented. The Norwegian apparatus, which promises to be of much value in certain cases, consists of a tin vessel, of any given shape, into which the food to be dressed is placed; the vessel is then filled with boiling water, and allowed to remain on a fire and boiled for a few minutes, and afterwards shut up for two or three hours in a box thoroughly padded with felt, which so retains the heat that at the expiration of the period the meat and the vegetables are found to be thoroughly cooked, and the water of immersion to retain about 170 degrees of temperature.

IV.—Instruction of the Labouring Classes in Cooking.

An institution, the working of which has been carefully inspected and reported upon by two members of the Committee, claims notice under this head. It is called the Industrial Kitchen, and is situated at 14, Oxford-mews, Paddington. In a room of the simplest description, and with the aid of one of Benham's stoves, plain joints, puddings, broths, &c., are cooked, under the management of a good plain cook, assisted by girls from the national school. The institution is mainly supported by voluntary contributions, and the subscribers have the privilege of giving tickets to the sick and infirm poor of the neighbourhood (but not to street beggars), which entitle them to receive portions of the cooked provisions upon a very trifling payment. Twelve of the elder girls in the parochial school are selected to assist, and these take weekly turns, two serving at a time, so that each girl serves one week out of six. It is this feature of the plan which entitles it to mention here, as presenting the means of giving schoolgirls a practical knowledge of plain cooking, and forming them to industrial habits, without materially interfering with their education. The Committee cannot but think that if some such plan were more generally adopted in connection with schools for the poorer classes, a great step would be taken towards removing the ignorance now so prevalent as to the best and most nutritious food, and as to the proper and most economical way of preparing it. They believe that the attention of all educational authorities might profitably be directed towards the encouragement and extension of similar institutions. They are aware that there are many other institutions which give valuable instruction of the same kind to the children of the poor; but attention is drawn to this one on account of the simplicity of its arrangements and its very practical character. The Committee have not been able as yet to devote much attention to that very important branch of their inquiries, the adulterations of food, and frauds in the use of weights and measures of food. They have only further to add, that they are of opinion that they can usefully continue their inquiries in connexion with the important matters entrusted to them, and they therefore beg to recommend to the Council, that the Committee be reappointed, and permitted to resume its labours during the next session of the Society.

(Signed) Benj. Shaw, *Vice-Chairman.*

Musical Education Committee.

In consequence of the unsettled state of the Royal Academy of Music, and until evidence be afforded that the Academy is able or not of itself to improve its organization, it has not been judged expedient to bring the reports of the Committee to the notice of Her Majesty's Government. The Council have felt, also, that the present position of Parliament was not favourable to a consideration of the subject. But they have the satisfaction of seeing that Mr. Disraeli has recognised the fact, that a large grant would be requisite for an efficient institution, and that "Her Majesty's Government were of opinion that provision for a cheap musical education should form part of our national system." The Council are happy to find that these opinions entirely accord with those expressed in the reports of the Committee.

Memorial Tablets.

The following tablets have been fixed on houses formerly occupied by—

Lord Byron, 16, Holles-street, Cavendish-square, now occupied by Messrs. Boosey and Co.

His Imperial Majesty Napoleon III., 3a, King-street, St. James's; now occupied by Madame Berti.

Leave has been obtained to affix similar tablets on the former residences of Benjamin Franklin, Sir Joshua Reynolds, Lord Nelson, and James Barry, but the progress in fixing these and others has been delayed by experiments in the manufacturing, which Messrs. Minton, Hollins, and Co., have been making.

Biographical notices of remarkable persons have been inserted in the *Journal* as far as the letter S. The publication of the remainder will shortly be resumed.

Art Workmanship Prizes.

The competition this year was well sustained, the numbers of those competing being about the same as last year. The prizes awarded by the judges, Messrs. Richard Redgrave, R.A., and M. Digby Wyatt, amounted to £198 10s., an increase on the amount of the previous year, which was £182 8s. 8d. The report of the judges was read to a meeting of the Society, held on Wednesday evening, the 12th of February, when the competitors were invited to attend. This report has already been published in the *Journal*. The

programme for the current year has been issued, and, following the suggestions of the judges, has been very materially changed. The recommendations of the judges were as follows:—

Firstly, we think the time has arrived when animation might be given to future competitions by a considerable change of programme. Especial prominence might be given to evidence of ability in processes not commonly practised in this country—such as several of those involved in the manufacture of Venetian glass; in the execution of enamelling, both upon earthenware and metal bases; in the application of painting and lacquering, as in Japanese and Cashmerian work; in Damascening, both after the Milanese and Oriental systems, &c. From such efforts new branches of national industry might possibly arise; and, at any rate, working men would be induced to exercise their ingenuity and to acquire that pliability or general aptitude in which, as compared with the French art-workman, the English artificer is somewhat deficient.

Secondly, the apportionment of the money prizes requires revision, so as to bring the rewards offered into better proportion to the labour or outlay risked in the different sections by the workmen entering upon the competition; regard being, of course, had to the special branches of art industry in which temporary stimulants might seem most needed.

Thirdly, prizes might be offered for evidences of proficiency in two or three branches of industry not yet included in the Society's programme, as stained glass, jewellery, brass-rule cutting, the application of turning to artistic wood or metal work, &c. Some such changes, and the withdrawal of all hackneyed models, would probably tend to relieve the apparent monotony of the Society's competitions; and, after a year or two's interval, the leading features of the present programme might be reverted to with a fresh and lively interest on the part both of the art-workmen and of the public.

The Society is much indebted to Messrs. Redgrave and Wyatt for their valuable services in acting as judges, as well as for the assistance they have given in drawing up the programme for the present year.

UNION OF INSTITUTIONS.

The details of the proceedings of the Society under this head are given in the Secretary's report, read to the Conference on Friday, the 19th instant. It is gratifying to find that the Society's efforts in this direction, to stimulate young men to continue their education after leaving school, are bearing good fruit year by year; the numbers presenting themselves for examination are increasing, and this year there has been a large accession of candidates.

FINANCE.

The financial statement of the Society's affairs is appended hereto.

TREASURERS' STATEMENT OF RECEIPTS, PAYMENTS, AND EXPENDITURE, FOR THE YEAR ENDING 30TH MAY, 1868.

Dr.

		£ s. d.	£ s. d.
To Cash in hands of Coutts and Co., 30th May, 1867		826 3 10	
Do. do. the Secretary		16 6 2	
			842 10 0
To Subscriptions received during the year, from Members and Institutions in Union		5,326 10 6	
Life Contributions		252 1 0	
Donation by A. Davis, Esq. (3rd)		21 0 0	
			5,599 11 6
To Dividends on Stock:—			
Consols, £4,746 19s. 5d.	139 8 11		
Do. North London Exhibition Trust, £167 7s. 3d.	4 18 3		
Reduced 3 per Cents. £434 8s. 6d.	9 10 3		
		153 17 5	
To New 3 per Cents.:—			
Dr. Fothergill's Trust, £388 1s. 4d.	11 8 1		
India 5 per Cent. Notes, 52,000 Rupees	248 17 9		
		260 5 10	
			414 3 3
To Examinations:—			
The Worshipful Company of Coachmakers		3 0 0	
The Royal Geographical Society		5 0 0	
The Royal Horticultural Society		24 0 0	
The Rev. Dr. Temple		5 5 0	
Charles Brooke, Esq., F.R.S.		2 2 0	
Fees from Local Board Candidates, &c.		7 2 6	
			46 9 6
To Art Workmanship:—			
The Worshipful Company of Salters		21 0 0	
Sale of Examples		9 15 6	
			30 15 6
To Sale of Books:—			
Jury Reports		2 2 0	
Artizans' Reports		22 8 2	
Journals, &c.		29 8 11	
			53 19 1
To The Prince Consort's Prize		26 5 0	
The Artizans' Paris Visit Fund		857 2 6	
The South Australian Institute		450 0 0	
			1,333 7 6
			£8,320 16 4

Cr.

	£ s. d.	£ s. d.
By House and Premises:—		
Rent, Rates, and Taxes	264 13 6	
Insurance, Gas, Coals, and House Charges	158 13 5	
Repairs and Alterations	158 9 11	
		581 6 10
By Office:—		
Salaries, Wages, and Commissions	1,691 16 7	
Stationery and Printing	194 11 0	
Advertising	38 9 8	
Postage Stamps and Parcels	122 10 6	
		2,047 7 9
By *Journal*, including Stamps and Distribution to Members	1,542 2 4	
Library, Bookbinding, &c.	94 17 3	
Conversazione	175 11 11	
		1,812 11 6
By Union of Institutions, including Examination Prizes, Postage, Stationery, Printing, &c.	751 19 6	
Art Workmanship Prizes	239 14 5	
Society's Albert Memorial Medal	47 6 9	
Harvesting Prize	15 3 0	
Paris Exhibition	106 12 8	
		1,160 16 4
By Committees:—		
Food	66 18 7	
Musical	16 1 6	
Artistic Copyright	33 5 11	
Memorial Tablets	4 15 6	
Technical Education	57 1 11	
		178 3 5
By South Australian Institute	525 13 8	
Prince Consort's Prize	26 5 0	
North London Exhibition Prize	4 18 8	
Artizans' Paris Visit	942 17 2	
Artizans' Reports	29 18 4	
Donation to the Jerusalem Exploration Fund	10 10 0	
Repayment of Money received in excess	1 0 0	
		1,541 2 10
By Cantor Lectures		155 5 2
By Invested in purchase of £220 4s. 8d. Reduced 3 per Cent. Stock	203 3 3	
Power of Attorney to Messrs. Coutts and Co.	0 6 6	
		203 9 9
		7,680 13 7
By Balance of Cash in hands of Messrs. Coutts and Co., 30th May, 1868	617 3 9	
Ditto in hands of Secretary, Petty Cash	22 19 0	
		640 2 9
		£8,320 16 4

LIABILITIES AND ASSETS.

Dr.

	£	s.	d.	£	s.	d.
To Sundry Creditors:—						
Sir W. C. Trevelyan	70	0	0			
The Prince Consort's Prize	26	5	0			
North London Exhibition Trust	2	8	11			
Examination Prizes (Society's)	208	0	0			
Do. Royal Horticultural Society's Prizes	25	0	0			
Do. *Gardeners' Chronicle* Prize	3	0	0			
Do. T. Twining, Esq., Prize	5	0	0			
Examiners' Fees	268	16	0			
Artizans' Reports	320	16	5			
Tradesmen's Accounts	612	19	1			
Harvesting Prize	52	10	0			
East London Museum Donation	105	0	0			
				1,694	15	5
* Excess of assets over liabilities				3,926	9	0
				£5,621	4	5

Cr.

	£	s.	d.	£	s.	d.
By Reduced 3 per Cent. Stock, £434 8s. 6d., at 92½	400	4	3			
Consols, £146 19s. 5d., at 95¾	141	4	0			
Invested in India 5 per Cent. Rupee Notes	353	11	6			
Subscriptions due and in course of collection, £2,195 11s. valued at	1,756	9	0			
Barry's Pictures and other Property, do	2,000	0	0			
Prince Consort's Prize	26	5	0			
Royal Horticultural Society	25	0	0			
Gardeners' Chronicle	3	0	0			
Thomas Twining, Esq.	5	0	0			
South Australian Institute	11	15	5			
Sale of Artizans' Reports	188	12	6			
				4,911	1	8
Cash in hand of Messrs. Coutts and Co.	617	3	9			
Do. London and Westminster Bank	70	0	0			
Do. Secretary, Petty Cash	22	19	0			
				710	2	9
				£5,621	4	5

* The above is exclusive of the value of the Society's lease of premises.

STOCK STANDING IN THE NAME OF THE SOCIETY AT THE BANK OF ENGLAND.

	£	s.	d.
Consols	£4,914	6	8
New 3 per Cents.	388	1	4
Reduced 3 per Cents.	434	8	6
India 5 per Cent. Rupee Notes	Rs. 52,000		

TRUST FUNDS INCLUDED IN THE ABOVE.

	£	s.	d.	
Swiney Bequest	£4,500	0	0	Consols, chargeable with a sum of £200 once in five years.
John Stock's Trust	100	0	0	,, chargeable with the Award of a Medal.
North London Exhibition Trust	167	7	3	,, chargeable with the Award of the Interest as a Money Prize.
Fothergill's Trust	388	1	4	New 3 per Cents., chargeable with the award of a Medal.
Cantor Bequest	5,049	9	7	Invested in India 5 per Cent. Rupee Notes, 52,000 rupees.

JOHN MURRAY, SAMUEL ANDREWS, } *Auditors.*

Society's House, Adelphi, 15th June, 1868. P. LE NEVE FOSTER, *Secretary.*

The CHAIRMAN said he trusted the long report which had been read would be satisfactory to all the members present. It embraced a very large amount of work which had been done during the past year, and to some extent shadowed forth the Society's proceedings for the ensuing one. It was almost impossible, even for those who paid the greatest attention to the business of the Society, to imagine how extensive was the range of its operations.

Professor TENNANT suggested that, during the vacation they might usefully reprint in the *Journal* the description of the paintings with which their walls were adorned.

The CHAIRMAN approved of the suggestion, and said if there were an opportunity it would be carried out.

The CHAIRMAN then put to the meeting that the Report be received and adopted, which was carried unanimously.

The CHAIRMAN said he would take the opportunity of expressing, on his retirement from the treasurership, an office which necessarily brought him into almost daily contact with the officers of the Society, his high sense of the value of their services. He could testify to the large amount of work got through by them, and in reference to the department of Finance, with which he was more especially conversant, he had much pleasure in stating that at the end of three years' service as treasurer, he had not discovered one single error in the books.

Mr. BOTLY, as a very constant attendant at the Society's meetings, begged leave to propose a cordial vote of thanks to the officers for the admirable manner in which they had discharged their duties during the past year. He visited Paris with the Society, and certainly the officers on that occasion had done their utmost to render the visit a pleasurable one to all parties. The courtesy which was invariably displayed by them towards the members on all occasions was worthy of the highest praise, and he felt sure the meeting would be unanimous in passing the vote of thanks which he begged to propose.

Mr. WHITE felt the greatest pleasure in seconding the motion, and for his own part he thought such a compliment should not end in mere words. The expenses of living had so largely increased of late years that he had found in other societies with which he was connected that the salaries of officers whose services had been found valuable had been raised. As a private member, he had no wish to interfere in this matter; but he trusted the Council, seeing they had good and efficient officers, would bear this matter in mind, and give them that material encouragement which, in his opinion, they ought to receive.

The CHAIRMAN said he had great pleasure in putting the motion. The past year had been a very heavy one indeed, but the business had been thoroughly well done, and the officers were always ready and anxious to do their best to further the objects of the Society.

The motion having been carried unanimously,

Mr. LE NEVE FOSTER, secretary, on the part of his colleagues and himself, said how very much gratified they were at such a strong expression of opinion from the members. They were always desirous of doing all that lay in their power to promote the interests of the Society, and with regard to the observations which Mr. White had so kindly made in reference to their salaries, he would only say that they had every confidence in the Council, who, he felt sure, would do that which was right and just, both as regarded the members on the one hand, who contributed the funds, and the officers, whose services the meeting had been pleased to recognize in such a cordial manner, on the other. On the part of his colleagues and himself, he most heartily thanked the meeting for their kind expression of opinion.

Mr. ANTONIO BRADY said he should be much pleased, with the permission of the Chairman, to give some information with reference to the East London Museum. The Society of Arts had materially assisted this great work, and had considerably diminished the difficulty of raising the necessary funds. The hundred guineas which the Society had so liberally given induced many others to do the same. It would be satisfactory to the meeting to know that he believed he had got nearly all the money which was necessary for the purchase of the site. He anticipated that very shortly they would have a public ceremony for the laying of the foundation-stone, when he hoped any members of the Society who took an

interest in the welfare of the working classes at the East-end would honour them with their presence. It was intended that the museum should be educational in a very varied sense, and that both art and technical education should be there given in the best possible manner. When the French minister went down to the Chamber of Deputies a little while ago and stated that the French had been in the habit of supplying our manufacturers with art designs, it was rather a pregnant fact when he added that he wanted more money to enable them to keep pace with the giant-strides which England was making in art, by reason of the advantages which they had at South Kensington. The promoters of the East London museum felt that if South Kensington had done such great things, when it was practically inaccessible to the working men at the East-end, they might expect very much greater results if they could bring art education to their very doors. The new museum would be within a two-miles' walk of a million of people, and he did not think a better site could have been obtained. It had been made a condition with the trustees that it should be open every week-day evening until ten o'clock. He was in hopes that they would participate in a division of those wonderful Turner drawings which were now stowed away in Trafalgar-square.

Mr. WHITE said he had known the locality for some forty years, and the situation of the museum was most excellent, being within reach of all the mechanics of the East-end, particularly of the descendants of the French refugees. He had taken great interest in the neighbourhood, and hoped the undertaking would be thoroughly successful.

The CHAIRMAN was much pleased to hear from Mr. Brady that such good progress had been made, and that the works would really be commenced within a short period. Being himself a descendant from a French refugee, he might be permitted to say that they owed a large debt to those men, and he did not know how they could better repay them than by erecting a museum in their midst. Spitalfields and Bethnal-green owed their origin to the refugees from France, who brought to this country those trades to which we were largely indebted for our national prosperity, and there was no better way of repaying to their descendants—who were now becoming scarce there, owing to the removal of the silk manufacture to Manchester and Macclesfield—than by establishing this museum. Those who had read the "Artisans' Reports," published by the Society, must have noticed that most of the writers attributed a great deal of the superiority of the French workman to his being able to see fine examples of art in the museums and public buildings of Paris. There was no doubt that improvement in our public buildings had been going on rapidly of late years; and if we could establish museums within reach of working men it must have a beneficial effect.

Sir WALTER STIRLING, Bart., was much pleased to hear of the countenance and support which the Society had given to the East London Museum, and took occasion to refer to a subject which had been much spoken of lately, the removal or demolition of Temple-bar, which he much deprecated. The structure might not be quite perfect, but was a very good specimen of the architecture of the period, and London abounded with buildings not so well worthy of preservation. It would be a great pity, in his opinion, to remove it, even considered merely as an embellishment, and apart from its historical associations.

The ballot having remained open one hour, and the scrutineers having reported, the Chairman declared that the following members had been elected to fill the several offices. The names in *Italics* are those of members who have not, during the past year, filled the offices to which they have been elected:—

COUNCIL.

PRESIDENT.

H.R.H. the Prince of Wales, K.G.

VICE-PRESIDENTS.

Sir W. H. Bodkin (Assistant Judge)	C. Wren Hoskyns.
Sir J. P. Boileau, Bart.	Lord Henry G. Lennox, M.P.
Right Hon. H. A. Bruce, M.P.	*Sir John Lubbock, Bart.*
Duke of Buccleugh.	Lord Lyttelton.
Harry Chester.	*Sir R. Montgomery, K.C.B.*
Henry Cole, C.B.	Right Hon. Sir John S. Pakington, Bart., M.P.
Lord de l'Isle and Dudley.	Thomas Twining.
J. P. Gassiot, F.R.S.	*Joseph Whitworth.*
The Earl Granville, K.G., F.R.S.	Lord Justice Sir William Page Wood, F.R.S.
William Hawes.	The Archbishop of York.

ORDINARY MEMBERS OF COUNCIL.

F. A. Abel.	*Major-Gen. Sir Vincent Eyre, C.B.*
John Bell.	*Peter McLagan, M.P.*
Antonio Brady.	Samuel Redgrave.
Edwin Chadwick, C.B.	Benjamin Shaw.
Hyde Clarke.	*Seymour Teulon.*
Sir Daniel Cooper, Bart.	*James Ware.*

TREASURERS.

John Murray. | Philip Wright.

AUDITORS.

Samuel Andrews. | *Henry Vaughan.*

SECRETARY.

Peter Le Neve Foster, M.A.

FINANCIAL OFFICER.

Samuel Thomas Davenport.

The CHAIRMAN proposed a vote of thanks to the scrutineers, Mr. Botly and Mr. Cook, for their services, which was carried.

Mr. BOTLY, after acknowledging the compliment, said he had been much pleased with what he had heard as to the favourable prospects of the East London Museum, and suggested that arrangements should be made for supplying refreshments to the working classes there at the lowest possible charge.

Mr. BRADY said he had not thought it necessary to go into these matters of detail, but the refreshment department had been specially provided for in the conditions. They were convinced that many men frequented public-houses for the sake of the comforts and society which they found there; and if the same, or better accommodation could be afforded elsewhere, they would avail themselves of it, and take their wives and families. He also hoped they would be able to establish, at the museum, music classes, which he considered had a very humanising influence; in short, it was intended to make the museum an educational institution of the highest order.

Mr. WHITE, from his knowledge of the neighbourhood, where he had worked for some time in the same direction as Mr. Brady, though on a smaller scale, was certain there would be no lack of response on the part of the working classes to any efforts made for their advantage. He hoped there would be lectures and explanations given, the living voice being added to the inanimate object, in order to make it thoroughly intelligible.

At the conclusion of the General Meeting a Special Meeting was held, when the following candidates were balloted for and duly elected members of the Society:—

Ball, Ferdinand Mercer, Mayfield-cottage, Mortimore-road, Kilburn, N.W.
Browne, J. H., 1A, Holland-park, Notting-hill, W.
Catterall, Joseph, Preston, Lancashire.
Charlton, J. S., Thrale-house, Streatham, Surrey.
Cronin, Daniel, 30, Bloomsbury-square, W.C.

Croxton, George, 64, Warwick-square, S.W.
Davis, W. S., Whitworth School, Cheltenham.
Eastwick, Edward Backhouse, C.B., 38, Thurloe-sq., S.W.
Ellis, Richard, Camberwell-grove, S.E.
Evans, Henry Sugden, 154, Holland-rd., Kensington, W
Galt, William, Port Stewart, County Londonderry.
Gee, George Edward, High-street, Chesterfield.
Hawksley, Thomas, C.E., 30, Great George-street, S.W.
Leigh, James, Stockport.
Pochin, Mr. Alderman, Manchester.
Trotter, Clarence E., 8, Shrewsbury-road, Bayswater, W.
Whitehead, Lieut.-Col. Frederick George, 25, Clifton-gardens, W.

Mr. Hyde Clarke proposed a vote of thanks to the Chairman, for his services on that occasion, and also as treasurer for the last three years. He desired to include the Council in this vote, and especially the Chairman of the Council, Mr. Hawes, who had so actively and efficiently performed the duties of the office, and the value of whose services the Society was at all times most ready to recognise.

The vote, having been seconded by Mr. P. L. Simmonds, was carried by acclamation.

The Chairman briefly thanked the meeting on behalf of the Council and himself, and the proceedings terminated.

ROYAL ACADEMY OF MUSIC.

The following is extracted from the *Times*' report of the debate in the House of Commons on Thursday, the 18th instant:—

Mr. Otway asked the First Lord of the Treasury whether it was true that the Government had announced their intention of withdrawing the small grant of £500 which had for some years been granted to the Royal Academy of Music; and whether the Government contemplated the creation of any institution for musical education, to be supported from the public funds.

Mr. Disraeli said the grant had been already withdrawn, no provision having been made for it in this year's estimates, and on notice being taken of that omission an explanation was given. The discontinuance of the £500 had not been fatal to the institution, for the aid which it required was much larger, and the Government, after investigating the matter, were of opinion that they would not be authorised in recommending any enlargement of the grant, the results of the institution not being, in fact, of a satisfactory character. They were of opinion that provisions for a cheap musical education should form part of our national system; but, although the subject had engaged not a little of their attention, he was not prepared to say anything further upon it at present.

Fine Arts.

Restoration of Works by Jean Goujon.—The façade of the Hôtel Carnavalet, formerly the residence of Madame de Sévigné, but now destined to contain the Museum of the City of Paris, has been completely restored, and the scaffoldings removed. The sculptures by Jean Goujon have been treated with the greatest care, and present excellent examples of his singularly pure and graceful style; they consist of a group of two children, in a medallion, supporting the arms of the original proprietors of the mansion; three trophies of arms, a winged figure with the feet on a mask and a cornucopia in one hand, and two lions. The repairs of the interior are also proceeding rapidly. For the benefit of visitors to Paris, it may be stated that the Hotel de Carnavalet is in a street formerly called the Rue Culte Sainte Catherine, but recently named after the famous inhabitant of the mansion, the Rue de Sévigné, near the Place Royale, and not far from the Place de la Bastile.

Local Exhibitions of Art in France.—This is the grand season for these provincial exhibitions. On the 5th of July the new museum of the town of Amiens will be first used for an exhibition of works of art, under the management of the local Society of the Friends of Art. The Emperor has just sent the committee one gold and two silver medals, as his contribution to the prize-list. The Arras exhibition is announced to open on the 23rd of August. This late date is selected in order that works exhibited at Amiens may appear also at Arras; such arrangements are of great importance to artists; and it may be mentioned that at the present moment, besides the Amiens and Arras exhibitions, those who are now withdrawing their works from the great Paris Exhibition have the option of the Havre exhibition also. The arrangements and advantages of the Arras exhibition are much the same as those at Amiens.

Exhibition of Fine Arts at Besançon.—The Exhibition of the Society of the Friends of Art, now open at Besançon, contains 406 works, being full 100 beyond the ordinary number exhibited there, and in a few days the sales have amounted to 17.000frs., of which about one-half are to the authorities of the town and the Society, and the rest to private individuals; the works purchased by the Society are to be distributed by lottery. The names of several well-known Parisian artists are in the list of those whose works have been sold.

Extraordinary Robbery of Works of Art.—Fourteen armed robbers entered the celebrated château of the Vista Ægre, near Madrid, the property of the Marquis de Salamanca, a few days since, surprised and imprisoned the servants, and carried off works of art valued at more than £4,000 sterling. Amongst the articles taken are, a massive silver statue of the Virgin, with a crown of gold, two silver crucifixes, candelabra, salvers, and a mass of precious stones.

Manufactures.

Regulation of Juvenile Labour in France.—A new code of regulations with respect to the labour of young persons in factories is to be shortly laid before the Corps Legislatif. The following are said to be the principal provisions:—The age to which six hours of labour is the maximum, is to be increased from twelve to thirteen years; from ten to fourteen, children may be employed in coal and other mines, but not more than four days in the week. All young persons, to the age of sixteen, to have time to go to school during two hours of the day. Young persons between the ages of thirteen and sixteen years may be employed, as at present, during ten hours per day, but they are not to be allowed to manage steam engines or other machinery. No young person above thirteen years of age is to be employed in a factory or mine without proof that he or she has received three years' primary instruction. With respect to girls, the regulations will be more particular than those of the law of 1841 now in force. In the first place they are to be utterly excluded from working in subterranean galleries of mines, and no girl under eighteen years of age is to be employed more than ten hours a day. The primary education and religious instruction of minors, will be the object of regulations to be made by the local commissions of surveillance, and the regional inspectors now existing will have for assistants, the inspectors of the asylums, the guards of mines, the inspectors of infant asylums, and the delegates of the societies for mutual assistance, and of the bureaux of public charity.

Gold and Silver Plate in France.—The goldsmiths' trade is almost entirely concentrated in Paris, but there are some makers of church plate at Lyons. Fine silver is worth on an average 220frs. the kilogramme; the law allows the employment of two different standards of alloy for solid plate; but the first of these is almost exclusively employed. This is worth 212frs. 62c.,

while the second is only worth 180frs. the kilogramme. Silver and gold are applied by the electro-chemical process upon articles made either of brass or of white metal (*maillechort*), which is brass, with the addition of nickel. The prices of the metals which enter into the manufacture of these alloys are as follow: Copper, 200frs. to 300frs. the 100 kilogrammes; zinc, 75frs. to 80frs.; nickel, 12frs. to 13frs. The manufacture of plated ware is rapidly disappearing. The operations which contribute to the production of goldsmiths' work are very numerous. The metallic alloys are melted in crucibles; they are afterwards cast in moulds of beaten earth or sand; when taken from the mould, the articles pass into the hands of the chaser. The chaser's work is, however, economically replaced in the case of stamped work by presses and steel dies. By means of these processes are produced table ornaments, certain objects of art and various pieces of goldsmiths' work, which are also made by means of the lathe, the hammer, and stamping. Mounting consists in uniting the various parts of a work together; this is done by means of soldering, and also of screws and nuts. Spoons and forks are made by means of rollers, on which the forms of the article are engraved. The other processes are hand-engraving and biting in with acid, enamelling, engine-turning and polishing, with special lathes; and, lastly, finishing, which includes rouge-polishing and burnishing with steel, agate, and other tools. Goldsmiths' work is done almost exclusively either in large shops, or at the houses of master workmen, employing a certain number of assistants and apprentices; very few work entirely alone. The proportion of men to women employed in the business is four to one. The number of females engaged has, however, increased, since the introduction of electro-plated work, the polishing of which is entirely performed by them. The average rate of wages in Paris is 5frs. a day for men, and 2frs. 40c. for women. The manufacturers generally sell their productions either to retail dealers or to merchants and agents for exportation. The annual value of the productions, including plated ware, is 43,000,000frs., of which only about 4,000,000frs. worth are exported.

Colonies.

Sugar in Queensland.—A Brisbane paper, of the 17th May, says:—"The sugar crop goes on satisfactorily, the ratoons looking particularly well. There is considerable anxiety amongst the growers as to how the cane is to be crushed and manufactured. Meetings have been held in several farming centres, and proposals for the formation of mill companies have been propounded. The presence of men of skill and experience in sugar-making and capitalists is much wanted. Many experiments are being tried with Roberts' diffusion process for extracting the cane juice, and several very fair samples of sugar, made after that method, have been shown."

The Diggings in New Zealand.—Shortland, the principal digging township in Auckland, which already possesses three banks and several good hotels, is 48 miles from Auckland; there is water carriage all the way, and steamers are constantly plying to and fro, and make the trip in about four hours. There are about 3,000 men on the above diggings, and the number is steadily increasing. About eight miles from Shortland there is another township, where 1,500 men are living. About six months ago claims on these diggings were only of nominal value. A share in what has since turned out one of the richest claims, could have been bought for £5, and the holder now refuses to take £15,000 for his interest in it. The whole claim is valued at £100,000. Other claims, supposed to be even richer, have since been discovered. Many claims that were abandoned have been resumed by men with capital, who are reaping a rich harvest from their investment. Australian and West Coast diggers speak very highly of the capability and permanence of these gold fields. It should be clearly understood that they are not poor men's diggings, a considerable amount of capital being required before a claim can be worked profitably.

Notes.

Progress of the Suez Canal.—The works of the great maritime canal are progressing in a most satisfactory manner. The portion of the works of excavation up to the 15th of May are as follows:—

	Cubic metres.
Total amount excavated up to 15th February, 1868	36,555,369
Amount excavated from 15th February to 15th March	1,554,630
Amount excavated from 15th March to 15th April	1,486,898
Amount excavated from 15th April to 15th May	1,797,000
Total excavated to 15th May	41,393,897
Remaining to be excavated	32,721,233
Total excavation in canal from Port Saïd to Suez (160 kils.)	74,115,130

The average amount excavated per day during three months ending 15th May, has been 53,761 cubic metres, so that to complete the works of excavation 610 days will be required, supposing the same average daily progress is made.

Correspondence.

Turkish Tobacco in Natal.—Sir,—Your former correspondent, Mr. John Robinson, editor of the *Natal Mercury*, who read a paper on Natal before the Society some years ago,* writes to me that the coarse Turkish tobacco seed of Anatolia I sent to the colony suits some districts better than any other quality, and that the fresh grown seed is thankfully received. I certainly considered the quality so inferior as to be of little value; but this example shows it is desirable, in the case of seeds, to send to a colony every variety.—I am, &c., Hyde Clarke.

32, St. George's-square, S.W.

MEETINGS FOR THE ENSUING WEEK.

Mon......R. United Service Inst., 8½. 1. Captain E. A. Inglefield, "Naval Tactics; with some Remarks on the recent Experimental Cruising of the Mediterranean and Channel Squadrons." 2. Captain Edmund Wilson will Exhibit and Explain certain Models, illustrative of his Plans for Armour-plating, working heavy Guns, &c."

Wed ...Obstetrical, 8.

Fri.......Geologists' Assoc., 8.
Archæological Inst., 4.

Sat ......Social Science Assoc., 3. (At the House of the Society of Arts.) "On the Natural Laws regulating the Rate of Wages and the Supply and Demand for Labour." The Rt. Hon. W. E. Gladstone, M.P., in the chair.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 9th June, 1868.

139. Bill—Metropolitan Foreign Cattle Market (corrected copy).
301. Trinity College (Dublin), &c.—Returns.
Public General Acts—Cap. 16 to 30.

Delivered on 10th June, 1868.

145. Bill—Bankruptcy Act Amendment.
154. ,, Representation of the People (Scotland) (amended).
156. ,, New Zealand Company.
157. ,, Larceny and Embezzlement.
159. ,, Local Government Supplemental (No. 4).

* See *Journal*, vol. xi., p. 424.

130. (iv.) Railway and Canal Bills—Fifth Report.
256. East India (Bengal)—Return.
Ritual Commission—Second Report, Evidence, &c.
Manufactures, Commerce, &c.—Reports from Her Majesty's Secretaries of Embassy and Legation (No. 3, 1868).

Delivered on 11th June, 1868.

160. Bill—Local Government Supplemental (1868) (No. 5).
279. Committals (Scotland)—Return.
285. East India (Lieutenant Grey)—Despatches.
303. Metropolitan Foreign Cattle Market Bill—Report, Evidence, &c.

Delivered on 13th June, 1868.

167. Bill—Registration.
165. „ Boundary (amended in Committee).
169. „ Drainage Provisional Order Confirmation.
328. Coolie Emigration—Memorial.
Public Petitions—Twenty-fifth Report.

Delivered on 15th June, 1868.

123. Bill—Railways (Ireland) Acts Amendment.
158. „ Courts of Law Fees, &c. (Scotland).
162. „ Inclosure (No. 2).
168. „ Ecclesiastical Commissioners.
166. „ Representation of the People (Scotland) (as amended on consideration, as amended).
41. Customs, &c.—Statement.
315. China and Japan—Reports.
323. Plymouth Breakwater Fort—Drawings.
327. Boundary Commission—Return.
329. Curragh of Kildare—Report.
Nova Scotia—Despatches.

Delivered on 16th June, 1868.

129. Bill—Probate of Wills, &c. (Ireland.)
168. „ Ecclesiastical Commissioners (corrected copy).
170. „ Sea Fisheries—Lords Amendments.
115. (i.) Army (Manufacturing Establishments)—Returns.
324. Mail Service (Asia and Australasia)—Account.
East India—Statistical Abstract (1857 to 1866) (Second Number)

Delivered on 17th June, 1868.

319. Roehampton Gate (Richmond Park)—Correspondence.
Public Petitions—Twenty-sixth Report.

Delivered on 18th June, 1868.

140. Bill—Entail Amendment (Scotland) (amended in Committee).
171. „ Petroleum Act Amendment (amended in Committee, and on re commitment).
172. „ County General Assessment (Scotland) (amended in Committee).
289. Fire Insurances—Account.
Foreign Office Agencies—Correspondence respecting the Abolition.
Army (Breech-loading Arms)—Reports.

Patents.

From Commissioners of Patents' Journal, June 19.

Grants of Provisional Protection.

Alum, &c.—1799—C. D. Abel.
Anvils, &c., combining and casting various qualities of metal in the manufacture of—1827—D. Foster.
Boilers—1560—M. Sefi
Boilers—1828—G. Hartley and P. Robertshaw.
Boilers, &c., tubes for—1824—W. E. Everitt.
Bread, biscuits, &c.—1634—D. Riddell.
Bricks—1616—G. Smith.
Cans, &c.—1809—W. E. Newton.
Carbonic oxide, &c.—1831—C. E. Brooman.
Cartridges—1791—C. E. Brooman.
Casks, cleansing—1724—J. Adams.
Chlorine, &c.—565—W. Weldon.
Cock and valve combined—1755—W. Dalziel.
Conservatories, &c., ventilating, &c.—1729—J. Morgan.
Corkscrews—1843—J. Page.
Corks, drawing—1810—J. Law.
Corks, drawing, &c.—1812—F. Schäfer.
Drawing boards for stretching drawing paper—1784—J. Harman.
Driving belts, bands, or straps—1811—L. Sterne.
Fabrics, textile, producing designs on—1760—W. Maclean.
Fabrics, &c., separating animal from vegetable substances in—501—W. E. Gedge.
Fibrous materials, machinery for preparing, &c.—1836—J. Worth and A. Barker.
Fibrous materials, spinning or twisting—1795—J. B. Farrar.
Fruit, cleaning and drying—1814—R. Soans.
Furnaces, consuming hydrocarbon oils in—1786—N. D. Spartali.
Furnaces, supplying fuel to—1826—W. Rye.
Garden engines and hydropults—1798—R. W. Page.
Gas—1785—H. Hirzel.
Gas meter indexes—958—G. B. Paterson.
Gas meters, wet—1215—E. Dubois and E. Casper.
Gunboats, &c., manœuvring—1790—T. Field.
Horse rakes—1759—W. E. Newton.
Horse-shoes—1835—J. Ashton.
Hydrostatic presses, &c.—1781—R. Lüthy.
Iodine—1819—C. D. Abel.
Iron and steel—1833—C. E. Brooman.
Lace, &c., clipping—1776—L. Hamel.
Lamps—1695—E. Jones.
Liquid meters—1818—L. W. Wright.
Locks—1842—A. M. Clark.
Messages, &c., apparatus for receiving—1757—T. Drake.
Motive-power apparatus—1837—J. Petrie, jun., and J. Fielden.
Motive-power machinery—1273—J. E. F. Lüdeke.
Paving—1807—G. A. H. Lillie.
Petroleum, &c., deodorizing—1839—W. Firth.
Pick-axes—1752—J. Reidy.
Pictures, &c., mounting—1838—N. Salamon.
Pipe joints—1816—J. H. Johnson.
Pipes and cigar holders—1813—F. Roe.
Ploughing apparatus, steam—1792—O. Reynolds.
Propellers, screw—400—G. Roper.
Pumps for actuating the pulp in paper-making machines—1787—I. B. Harris.
Railway chairs and rails—1348—J. Liddard and G. Buxton.
Railway points, manufacturing—1802—J. Tate.
Railway rolling stock, &c.—1847—T. C. Gregory.
Railway tickets, &c.—1487—F. T. Hall.
Railway trucks—1817—J. H. Johnson.
Railway wheels, &c.—1720—H. A. Dufrené.
Sealing wax, appliance for holding—1832—F. Schäfer.
Sewing machines—1779—H. A. Bonneville.
Ships' blocks—1830—M. Rives.
Silk, dressed, assorting the fibres of—1761—T. Greenwood.
Smoke, prevention of—1796—D. Jones.
Spinning machinery—1844—C. D. Abel.
Spirit levels—1793—W. R. Lake.
Sugar, manufacturing—1780—A. Smith.
Sulphate of lime, obtaining and utilising—1841—M. Henry.
Thrashing machines—1763—J. R. Hambling.
Tobacco, manufacturing—1771—J. Drabble and J. S. Raworth.
Tobacco, pulverised, sifting—1773—J. B. Gardner.
Umbrellas—1789—R. Turner.
Valves—1753—H. and F. Bailey.
Venetian blinds, raising and lowering—1805—J. Avery.
Venetian blinds, &c.—1820—H. J. Crockett.
Watches—1797—G. P. Reed.
Weaving—1782—T. Burrow and S. Keith.
Windows, &c., hanging and supporting—1708—T. Craig.
Wine, &c., cooling—1775—J. Nuellens and M. Neuhaus.
Wood, impregnating with oleaginous and saline matters—1800—C. H. Wells.
Wool, &c., condensers for working—1823—E. Fairburn.
Wool, &c., machinery for washing—874—J. Petrie, jun.

Inventions with Complete Specifications Filed.

Cranes—1924—G. Davies.
Horse collars—1947—W. Leonard.
Wheat, &c., hulling—1943—W. R. Lake.

Patents Sealed.

3635. C. G. Wilson.	10. W. J. Fraser.
3637. J. Davison.	26. M. E. Roy and L. Prevett.
3642. C. W. Lancaster.	58. W. Avery.
3649. J. Dawkins.	271. J. H. Johnson.
3660. F. Render.	329. W. E. Newton.
3666. W. Hewitt.	357. C. E. Brooman.
3667. G. J. and T. C. Hinde.	1270. W. Lund.
3670. B. and J. B. Bowen.	

From Commissioners of Patents' Journal, June 23.

Patents Sealed.

3645. W. Walker.	68. L. Simon.
3652. F. A. Abel.	138. J. Kidd.
3655. P. F. Tranchat.	225. C. E. Brooman.
3664. G. E. Allshorn.	227. C. E. Brooman.
3669. N. Greenhalgh, W. Shaw, and J. Mallison.	257. T. L. G. Bell.
3673. J. Edge.	291. C. E. Brooman.
3677. J. M. Rowan.	323. H. Aland.
3679. H. Higgins and T. S. Whitworth.	473. A. F. Bayford.
3706. M. A. F. Mennons.	634. G. T. Bousfield.
3707. M. A. F. Mennons.	711. S. Sharrock.
3708. M. A. F. Mennons.	923. B. E. R. Newlands.
3709. T. Messenger.	943. H. Chamberlain, J. Craven, and H. Wedekind.
7. A. M. Clark.	1057. H. Jones, jun., and W. F. De la Rue.
12. C. W. May.	1369. F. C. Hills.
23. T. P. A. Key.	1400. J. Booth.
37. J. Nixon.	1405. J. H. Johnson.
67. J. Tomlinson.	

Patents on which the Stamp Duty of £50 has been Paid.

1866. J. P. B. Le Patourel.	1641. G. Haseltine.
1658. J. Scholl.	1902. J. Walton.
1719. W. E. Newton.	1679. J. Gale, jun.
1791. J. W. Swan.	

Patents on which the Stamp Duty of £100 has been Paid.

1509. F. Potts.	1547. T. Mellodew, C. W. Kesselmeyer, & J. M. Worrall.
1562. A. W. Gibson.	1653. J. W. Graham.
1582. J. Cullen.	

Journal of the Society of Arts.

FRIDAY, JULY 3, 1868.

Announcements by the Council.

Workmen's Holidays.

A discussion having taken place on this subject at the Conference of Representatives (see page 598,) the Council would be much obliged to any manufacturer or other employer of labour who, having tried the plan of allowing his workmen to take their holidays at once, rather than piecemeal, would kindly communicate his experience to the Secretary of the Society of Arts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Seventeenth Annual Conference.

The Seventeenth Annual Conference between the Council and the Representatives of the Institutions in Union and Local Educational Boards, was held on Friday, the 19th ult., at 12 o'clock, noon. William Hawes, Esq., F.G.S., Chairman of the Council, presided.

The Secretary having read the annual report to the Council, which appeared in last week's *Journal*,

The Chairman invited discussion upon the Report, and also upon the Programme of Examinations for the ensuing year, as well as upon the following list of subjects which had been suggested :—

1. How can the Institutions best aid in the advancement of Technical Education?
2. Would it be desirable for the Society of Arts to promote the issue of a series of text-boooks in relation to Technical Education, especially suitable for Working Men?
3. How far can the Society and the Institutions co-operate with the Department of Science and Art in carrying out the objects of Mr. Whitworth's munificent endowment?
4. What further efforts can be made by the Society of Arts to obtain the co-operation of other Societies and of the great Public Companies in its educational movement?
5. How far is it possible to unite in one system, or to establish any connexion between, the various systems of Examination which are now available for the Working Classes in different parts of the United Kingdom?
6. How can the Society aid in promoting visits of Working Men to various Foreign Centres of Industry?
7. How far would it be desirable for Working Men to take their holidays all at once rather than piecemeal?
8. What arrangements would enable the Working Classes to make more extended use of the Public Museums and Galleries which may be available for their instruction and amusement?
9. Under what arrangements could Collections of Useful and Interesting Objects of Art and Nature be sent to Country Institutions in circulation from the Metropolitan National Museums?

The Chairman said he should be happy to hear any observations, either on the report which they had just listened to, or on any of the subjects indicated for discussion. The report showed that considerable progress was being made in the educational work of the Society. He thought the remarks of Mr. Sales, the visiting agent in Yorkshire, called for special attention, because, although he stated that he was still as anxious as ever to promote the progress of the Society's examinations, he went on to suggest such alterations as would really almost tend to neutralise the operations of the Society, for he undoubtedly wished to bring its examinations so completely into union with the examinations of the Science and Art Department, that it would be very difficult for them to maintain a separate existence. There was no doubt that it would be very desirable for the Society to co-operate as far as possible with the Department of Science and Art, and this formed the subject of one of the suggestions which had been circulated,—How far was it possible to unite into one system, or to establish any connection between the various systems of examinations which are now available for the working classes in different parts of the United Kingdom? At present there were four distinct bodies which held examinations,—the Society of Arts, the Department at South Kensington, and the Universities of Oxford and Cambridge. To a certain extent they all went over the same ground, but still there were great distinctions between them, and it appeared to him that each had its respective vocation, and, judging by results, that each was specially accessible to a different section of society, while the competition which was thus secured, he could not but consider as very beneficial. He also believed that, in consequence of the Society of Arts' examinations being purely voluntary, and entirely independent of any Government or public body, there was greater confidence in the certificates which they granted than would generally be felt if there were no other body of examiners than those appointed by the Science and Art Department. It was, no doubt, a difficult question, and he hoped everyone present would make known his opinions upon it. Then, another question for their consideration was, How could they best aid in the advancement of technical education? The answer to that would appear to be, by promoting, in every possible way, the formation and progress of science classes; for in proportion as these increased, so would art exhibitions and other things of a like nature be promoted. For example—the Leeds Exhibition, which primarily was calculated to attract and interest a higher class of persons, had still been found to have a great effect in stimulating the desire for and appreciation of art and science teaching amongst the working classes. Still they wanted a more methodised system, but until the advantages resulting from technical education were more thoroughly appreciated, not only by the working classes, but by those above them, they could not hope to produce the results they were striving for. Another subject put before them was the desirability of the Society promoting the issue of a series of text-books. No doubt this was important, but it was beset with difficulties, inasmuch as it would bring them into competition with authors, publishers, and booksellers, so that it would require very strong arguments to induce the Society to undertake anything of that kind. The next point was, how far could they co-operate with the Department of Science and Art in carrying out the objects of Mr. Whitworth's munificent endowment. Mr. Whitworth had given them three Exhibitions, and the

Council would have carefully to select, as far as possible, from its prize-men of recent years, who might be within the limited age, such artisans as would be most likely to benefit by Mr. Whitworth's generosity. Another question of some importance was, how the Society could aid in promoting the visits of working men to foreign centres of industry? They were all aware of what had been done in this way with regard to the Paris Exhibition, and probably most of those present had seen the reports which had been prepared by the workmen who had been sent over. He could not repeat too often that these reports had been printed, with but very slight corrections indeed, in the form in which they had originally been sent in. It had been a matter of serious consideration by the Council what should be done this year in the same direction, and they had, after some deliberation, and at the request of several working men, sent one of the best of their Paris Exhibition reporters, Mr. Coningsby, to America, in order that he might report upon the state of industry and the condition of the artisan there, it being the opinion of the Council that such a report, from a working man's point of view, could not be otherwise than most useful to the same class in this country. They had thought it better the first year to confine themselves to one experiment of this character, and they had chosen the United States, partly on account of the valuable information to be obtained there without much difficulty, in reference to labour-saving machinery, and partly on account of the facilities afforded by the circumstance of the language of that country being the same as our own. In a foreign country the reporter would have had considerably greater difficulty in obtaining information, and altogether the Council thought it required more consideration before they sent any number of men to foreign centres of industry. Still he had a very strong opinion himself that this was one of the best modes of educating not only the individual workman but the class to which he belonged; it was doing what a Government could never do, for the workmen would look very differently upon such reports to what they would upon those prepared by gentlemen of a higher class. Nothing was so important as to impress upon working men a knowledge of their own deficiencies and of their own real powers, and such reports as these would teach them both one and the other. As to working men taking their holidays all at once rather than piecemeal, that was a very important subject, but one very difficult to deal with. Taking the branch of industry with which he was acquainted—that of collieries—if they could persuade the men to take their holidays and stay away from the works, say for a fortnight or three weeks at a time, instead of taking them in bits, it would be an enormous economy; for in many instances the men were paid every fortnight, and invariably two-thirds of Saturday, and nearly all Monday and often part of Tuesday, were completely wasted, so that all the fixed staff and the better classes of *employés* of the whole colliery were standing still during this time, and the expenses of this set of men for nearly one-quarter of the week were completely wasted. The same observations applied to many other branches of trade, engineering for instance, though not so much as formerly, for in this matter they had improved very materially. When he first mixed with working men in London, it was a very rare case to find any large proportion of men at work on a Monday, but a great improvement had taken place in this respect. It was therefore well worthy of consideration whether the Society could, by any form of prize or anything of that sort, promote this movement which was going on, although not so rapidly as could be desired. As to facilitating the opening of public museums and galleries, his opinion had been rather strongly formed on that subject, and he did not see that there was any means of doing this, except by opening them systematically in the evenings, and, for his own part, he should also say on Sunday afternoons. In looking at the people who went to museums and galleries abroad, and the very great attention which they devoted to them (not merely walking there for the sake of walking and being seen, as was sometimes the case with other classes of society), he had been much pleased to see the great interest which they took in the pictures, and the way in which they appeared to study them. He did not think they could produce any material effect in encouraging taste for art amongst the working classes, unless museums and picture galleries were open at any rate every evening. In this direction the Royal Academy had set a very good example, which was very suggestive, because it was rather singular that most of the institutions under the control of Government made no advance whatever in the direction of assisting in the education of the working classes, whilst the Royal Academy, which was so often abused, had taken the first step, and opened their collections during the evening at a reduced price of admission. In museums under Government control, with the exception of that at South Kensington, but little progress had been made. The public were deeply indebted to one gentleman, whose name he need hardly mention, Mr. Cole, who had very zealously and ably worked in this direction, and had done everything he could to promote the interests of the working classes. As, therefore, they had the South Kensington Museum and the Royal Academy open in the evening, he saw no reason why they should not open the British Museum and the National Gallery, in the evenings at any rate, and he hoped ere long they would be open on Sunday afternoons. The last question which had been suggested for their consideration was—What arrangements could be made for sending collections of useful and interesting objects of art to country institutions? That was a question of considerable practical difficulty, and he should be glad to hear any suggestions that might be offered upon it. It was a very important point, but he did not see, unless Government took it up on a very large scale, that much could be done. In conclusion, he would just call attention to a rather important letter which had been sent to the Society, because it affected the report on a somewhat important point. It was a letter from the Rev. Mr. Whittington, of the City of London College, on the subject of the award of the Prince Consort's prize. He should not have thought it necessary to notice it, if it had simply come from Mr. Whittington himself, but that gentleman stated that it was written with the knowledge and approbation of the authorities of the college. The Chairman was proceeding to read the letter, when

Mr. Chester rose to order. It appeared to him that this was a matter with which the Conference had nothing to do. It was distinctly a matter for the Council, and he did not see how the Conference could deal with it.

The Chairman said, of course he had no wish to read the letter if the meeting did not consider it advisable. He could only say that the Council had considered the matter very carefully, and did not wish to avoid discussion upon it. They were quite satisfied that the award had been fairly made.

Mr. Chester said it was usual, before entering upon the questions put down on the rota paper, to make a few observations on the report, which he should wish to do very briefly. He thought the Conference were much indebted to the Council for causing the report to be communicated to them, as it contained so much useful information both in itself and the appendices attached to it; but he thought it would be much more useful if in future years arrangements could be made by which the report should be issued a week or ten days before the meeting of the Conference, so that the gentlemen attending might be familiar with the subjects, and better able to enter into discussion of the various points referred to. For instance, he thought, on full consideration, the report was calculated to give an unduly unfavourable impression of the year's working to those not familiar with the subject. The Secretary had pointed out what was, no doubt, perfectly correct, that the total number of those

who had been examined in the elementary examinations, on the Society's particular form of paper, was really less this year than last; but there had been really, on the whole, as he gathered, a considerable increase in the number of those elementary examinations, because he found that South Staffordshire and Worcestershire used separate papers, and therefore did not come into the general return, and also that a considerable part of the operations of that important body, the Yorkshire Board of Education, were not included. He found that, as usual, the Secretary had considered it his duty to make some comments on local boards not being sufficiently stringent in the previous examination of candidates. No doubt he had grounds for what he said, but at the same time they must consider that this system was constantly extending, and came each year to be adopted by people who had had no previous experience of its working, and therefore they ought not to be surprised when they found a considerable number of failures reported. He thought, from the reports of the examiners themselves, that, on the whole, they were not dissatisfied with the results.

Mr. G. M. Norris (Birkbeck Institution) wished, before passing to the discussion of the questions which had been announced, to make a remark on the manner in which the Prince Consort's prize was awarded. He did not wish to discuss the grounds on which the Council came to their decision, but simply to say that it would be very desirable if the principle on which the award was made was more fully explained to the candidates, that all the candidates might know whether they must get a first-class each year in order to obtain it. When the prize was adjudged to Mr. Smith, two years ago, there was another individual who had not obtained a first class in each year, but he had, in fact, the same number of certificates as Mr. Smith, and, consequently, if the prize had been adjudged then as it had been now, it would have gone to Mr. Meadows, who obtained it the next year. He only wished that the matter might in future be clearly put before the candidates, that they might really know what was necessary in order to obtain the Prince Consort's prize.

The Chairman said the whole matter was under the consideration of the Council, and he believed some new conditions would be issued for next year.

The Rev. John Curwen (Glasgow Tonic Sol-Fa Society) said he had a memorial to present to the Council in reference to the examinations; and he should respectfully ask the Conference to give him their support. The memorial asked for a separate musical examination for Tonic Sol-Fa-ists. The memorial had been signed by the first prize-man for 1868, the second prize-man for 1867, and by 64 gentlemen in all; and in presenting it he wished briefly to say, that the persons who made that request were a large majority of those who had passed, and had gained certificates in this year's examinations in music. Seventy-seven certificates had been granted, out of which number 52 were Tonic Sol-Fa-ists. Of those who had taken the first-class there were 17 Tonic Sol-Fa-ists, and only 4 who were not. It was evident, therefore, that a large proportion of those who attended the examinations in music attached considerable importance to this matter, and he hoped, therefore, it would secure the attention of the Council. The proposed new examination was not an examination in theory, but in the practice of musical composition, the present one being one of theory only. In making this proposition they meant no disrespect whatever to the eminent musician who conducted the present examinations, but they only wished to have free scope for their own efforts in musical education. It was hardly necessary to enter into any explanation of the advantages of the Tonic Sol-Fa system, but if it were necessary he should be happy to do so; but he might say that Mr. Benedict had visited their classes, and also Mr. Macfarren, who had expressed their approbation; and Mr. Turle, of Westminster Abbey, Mr. Goss, of St. Paul's, and other gentlemen also bore testimony to the results which had been produced.

Mr. Griffiths (Beauvoir College) begged to move the following resolution:—

"That this Conference, having heard a statement of Mr. Curwen's plan for a system of prizes and certificates in elementary musical composition, in connection with the Tonic Sol-fa School, beg to recommend them for the adoption of the Council."

Although a considerable proportion of those who gained certificates at the examination, as at present conducted, were Tonic Sol-fa-ists, those candidates had to give a considerable time to studying portions of the subject with which they had not previously been acquainted, simply for the purpose of passing the examination, and this they regarded as a disadvantage to them. As a member of one of the local boards, he could congratulate himself that his board, at least, had not fallen into the error of passing gentlemen to the final examination who were unprepared; they had only passed 18 for examination, and 18 certificates were given.

The Chairman then put the resolution to the meeting, which was carried unanimously.

Mr. Levy wished to draw the attention of the meeting to a subject which he believed had already come under the notice of the Council, and upon which he should like to have the opinion of the conference. He referred to the examination in political economy. The programme for last year gave Mr. Fawcett's Manual, and Stephens' Commentaries on the Laws of England as the text-books; and as to the latter book they were told that any edition, not earlier than the third, would do. It appeared, however, that the third was the latest edition but one, and on applying to the booksellers, whose names were mentioned, it appeared that there were no copies to be had at the low price mentioned in the programme, and that the work could not, in fact, be obtained for less than four guineas. It seemed to him, that if the Council wished to encourage the study of political economy by the working classes, it was not desirable to give, as a subject of study, a text-book costing four guineas, which would, in fact, utterly shut them out from the examination. Moreover, there was this further consideration. This book was no doubt very valuable, but still the knowledge contained in it was not a knowledge of political economy, and it appeared to him that the Society was acting inconsistently in giving a man a second-class certificate in political economy, when, so far as the examination was concerned, he need not necessarily know even what it meant. A second-class certificate might be given to a man who had studied Stephens' Commentaries only, and who had never looked into a book on the subject of political economy. Political economy of itself was sufficiently difficult, but when to it was added the study of civil government, it appeared to him to be requiring too much.

Lord Lyttelton said that civil government was certainly a very different thing from political economy.

The Secretary said that, as Professor Neate was not present, he might state what he knew to be that gentleman's views on the subject. He thought that the bare study of political economy was not so likely to be profitable to the class of persons who came up to their examinations as if its practical application to civil government were to some extent added to it; and he stated that the only text-book he could find applicable to this subject in the English language was certain chapters in Stephens' Commentaries on English Law. When the great cost of that book was pointed out to him, and the difficulty of getting it, he said there must be some older editions which could be had at a cheaper rate, and he (the Secretary) then made it his duty to make inquiries, and he had arranged with Messrs. Wildy that they would supply copies of the third edition, as long as they had them, at one pound, but it appeared that those had now been all sold off. He was perfectly aware of the objection which had been raised by Mr. Levy, and he was now negotiating

with the proprietors of Stephens' Commentaries, with a view to their publishing those chapters which alone were required at a cheap rate, and if those negotiations could be satisfactorily concluded, it would answer all the objections that had been made.

Mr. Chester thought it hardly desirable that examiners should require particular chapters of a particular work to be studied. He had always thought the great principle which they had laid down was, that they would reward knowledge however it was acquired. They might mention certain books, for the sake of convenience, but they should not insist upon their being studied.

Mr. Norris said he believed the present political economy examination certainly militated against a greater number of candidates going up. As Mr. Levy had said, a man could get a second-class certificate without knowing anything at all of that science; but if he wanted to get a first-class certificate he must study Professor Fawcett's work on Political Economy proper. With reference to a cheap edition of the third and fourth books of Stephens' Commentaries, he did not think it would be possible to produce it at a less price than a guinea; and although some portions of them were very valuable, they included such things as ecclesiastical law, and various other matters, which really had nothing to do with the subject of political economy. If the Council really wished to have the subject studied more generally, he thought it would be very advisable to revert to the old plan, and have political economy alone, and let alone civil government, as it was called.

Mr. Gibbs (Chelmsford Literary and Mechanics' Institute) thought that political economy itself had a much more direct bearing on the interests of working men than civil government. A great deal of evil between working men and their employers was caused by ignorance of this subject. Some years ago it was required of those who aspired to a first-class certificate to study Stuart Mill's work. He believed that book might now be obtained for five shillings, and he should think it was as good now as it used to be; at any rate they ought to do whatever they could to make the study of political economy popular.

Mr. Rigby Smith said he had presented himself in this subject before the change had been made, or he should certainly not have come up in it. Beyond the mere inconvenience of the present system, there was a much deeper question involved, but, taking the question of inconvenience first, it was rather curious that although the examination might be in civil law, or whatever else was contained in Stephens' Commentaries, the certificate was for "Political Economy," so that the examination was for one thing, and the certificate was given for another. This, of course, was a mere question of arrangement, which might easily be altered; but there was a much deeper question involved, and that was the fallacy of regarding questions of civil law and political philosophy as branching out of political economy, which was, in fact, the science of wealth.

Lord Lyttelton would strongly advise the Council to confine themselves to the one subject of political economy. It was not an abstract science; there was no manual of any authority whatever upon it which did not abound with practical applications. By going into questions of civil law, and so on, he thought they would lead working men to spread their inquiries much too far to be of practical benefit, and would really tend to produce that state of superficial knowledge which was anything but what was desired.

Mr. Chester could not but think that there was something solid in the objections which had been brought forward. In all subjects, but particularly in such a peculiar subject, it was very desirable indeed that the examination should be confined really to the science itself. He thought they might communicate with Professor Neate, and learn his opinion on the subject.

The Chairman said the Council would adopt that suggestion.

Mr. Norris begged to suggest that they should include in the drawing examinations the subject of mechanical drawing. They had freehand and also geometrical drawing, but not mechanical drawing.

Mr. Benjamin Shaw said that the Science and Art Department were doing a great deal in the way of examinations in drawing, and he thought it was doubtful whether the Society should not rather drop that branch altogether than increase it.

Mr. Chester said that perhaps Mr. Shaw was not aware that some time after these examinations were established, the Society of Arts, at the suggestion of the Department of Science and Art, omitted the subject of Drawing, as it was thought that that Department would undertake that branch more efficiently, but after trying it two or three years the Society of Arts received applications begging them to restore the subject of drawing, as it appeared there were certain places which the Department did not reach, but which came within the operation of the Society.

Mr. Norris had one more suggestion to make with regard to the programme of next year, and that was to ask whether it would not be advisable, if possible, to get the Prince of Wales to offer a prize for females of the same character as the Prince Consort's prize for males. Of course they knew females could not compete against the males, but he thought perhaps the Prince of Wales might be induced to give a prize to that female who got the greatest number of first-class certificates during three or four years, and that in this way continuous study would be very usefully encouraged.

Mr. Mondy suggested that naval architecture should also be introduced into the programme.

The Secretary read a letter which he had received from Professor Leone Levi, who had intended to be present, saying he was desired by the Metric Committee of the British Association for the Advancement of Science, to say that they desired to give a prize of £10, to be offered to that candidate in the Society of Arts' Examination who exhibited the greatest knowledge of the principles and practice of the metric system of weights and measures. In order that no increase should be made in the number of subjects, it was suggested that the candidates' knowledge might be tested by incorporating a certain number of questions on the metric system with the arithmetic paper. If the Conference liked to recommend this matter to the consideration of the Council it would of course receive their attention.

Mr. Levy said if the suggestion were adopted it would be well not to shut out those who had already obtained a first-class certificate in arithmetic.

Professor Leone Levi (who had then entered the room) said the Conference was no doubt aware that a Bill was now before the House of Commons to render the metric system compulsory within three years; that Bill had already been read the second time by a very large majority, but it was not probable that further steps would be taken this year, as the session was so far advanced; but this declaration of opinion, that the metric system must sooner or later be introduced into this country, rendered it most necessary that steps should be taken to diffuse information on the subject. The Metric Committee of the British Association had taken the matter up seriously, and had considered that one of the best means of diffusing this information was by offering some prizes to be given to such candidates at the examinations of the Society of Arts as should exhibit the greatest knowledge of the principles and practice of the metric system. It was also proposed to give similar prizes to schools—probably the British and Foreign Schools—and other institutions, but at present they were limited to the Society of Arts. It was considered that as the Society was in correspondence with most of the educational institutions throughout the country, that would be

the best manner of introducing the subject amongst the adult portion of the population, who would be soonest brought into direct contact with the metric system. With a view to this he would propose—

"That this Conference, agreeing with the Metric Committee of the British Association for the Advancement of Science in the importance of diffusing information on the metric system of weights and measures, highly commends the proposal to institute a prize to be given to the candidate who exhibits the greatest knowledge of the principles and practice of the same, and commends the subject to the earnest attention of the Council."

Mr. Reynolds had great pleasure in seconding Professor Levi's motion, and in so doing would suggest that it would be advisable to have a separate examination in the subject, instead of including it in the arithmetic paper.

Mr. Chester was very much disposed to think it would be desirable to separate the two subjects. He quite agreed with Professor Levi as to the importance of diffusing a knowledge of the metric system, but he feared that, if it were included in the ordinary arithmetic paper, it might tend to check examinations in that important subject by giving people an idea that the two things were necessarily connected, and that the Society was taking up what some people would consider a crotchet. Any idea of this sort was much to be deprecated, and he therefore thought perhaps it would be better to have a separate paper.

Professor Levi said that the British Association also proposed to offer a further prize of £10 for the best practical elementary school-book containing all necessary information on the metric system.

The Chairman said he should now be happy to hear any suggestions on the first question,—"How can the Institutions best aid in the advancement of Technical Education?"

Mr. Norris said the Birkbeck Institution, which he represented, had done something in the way of advancing technical education, and intended to do more; and perhaps he might as well state what had been done. In the first place they had considered it advisable to have a series of lectures delivered, by eminent men, which should introduce the subject to the artisans of the district, and when by this means attention had been awakened, classes would be commenced. He hoped the Society of Arts would offer various prizes for excellence in the different subjects taught in these classes.

Mr. Levy said the scheme which had been adopted by the Council of the Birkbeck Institution, after some consideration, was the one which he had prepared, and he would therefore briefly state what his view was. He thought it was important that every institution should be careful to take up only those branches of science for which there would be a demand in their particular district. For instance, it would be absurd to teach mining in London, but in some districts it would be of the utmost importance. The institutions in London, however, had for a long time past been doing a deal of work in the way of technical education, for they taught book-keeping, arithmetic, and modern languages, which were just the branches of knowledge required by clerks and warehousemen, who formed the majority of those attending their classes. In bringing before the Council of the Birkbeck Institution, a scheme of technical education, he had endeavoured, as far as possible, to generalise, and had divided the subjects to be taught into three main classes,—architectural, mechanical, and chemical. It would be, in his opinion, absurd for any institution to attempt to teach trades to artisans. All they could do, with any advantage, would be to teach the sciences upon which the arts and manufactures were based; of course, special reference to the application of the science to various manufactures could be made by the teacher, but it would not be advisable too minutely to sub-divide the subjects. For instance, if they were to take up in detail such a subject as dyeing, they would probably attract, not men actually engaged in the business, but mere amateurs. He believed that for any beneficial purpose, the subjects taught might be divided, as he suggested, into three branches, or even two.

Mr. Lawton (Lancashire and Cheshire Union) wished, as representing a considerable district of Lancashire. to say a few words on this subject. He meant by technical education, a knowledge of the principles which lay at the root of the various arts and manufactures; he did not advocate a union of the class-room and workshop such as some contemplated. He thought the best plan was to select, as far as possible, the leading trade in a district, then call together the leading gentlemen in that district, and get them to take an interest in this important subject, and then secure effective teachers. In this way they secured a certain amount of interest in the movement on the part of the employers, and invariably where such an attempt had been made, the working classes had responded to it. The reports from Lancashire and Cheshire would show that some thousands were there under instruction; wherever they could send as teachers gentlemen who understood the working classes, the effort was always successful. During the past winter he had opened between 20 and 30 classes for technical instruction, and the average attendance had been about 20. The great difficulty he had experienced—indeed the only difficulty worth mentioning—was that of finding teachers. If it were not for this difficulty, he was certain that before long there would not be a single institution in Lancashire or Cheshire, in which there were not facilities for the members learning those scientific principles which applied to the trade of the district. During last winter there were in Lancashire and Cheshire 2,769 attending the science classes, which was an increase of nearly 700 over the preceding year. In order to bring about that result, they had 30 science teachers at work, 14 of whom were working men themselves, who by attending these classes, had qualified themselves for the position of teachers; and it was found that a working man who had thus qualified himself was the best teacher they could obtain, as he not only understood the theory but also the practice. He quite agreed with the suggestion that had been made, that classes should be first established for those subjects which bore especially on the trade of the district, and if possible at the same time that popular lectures should be delivered, but they should be given by men who understood the feelings and sympathies of the working classes, and who were willing and able to come down from the high platform which many lecturers occupied. Where this had been done the result had been very encouraging. Professor Roscoe had given a course of lectures on chemistry, at which the average attendance was about 500, and another gentleman in the neighbourhood of Macclesfield had been so successful, that the room was found too small for the audience. He would add that, out of the 14 teachers who were working men, four had attained such a position as to enable them to give up manual labour and devote themselves exclusively to the work of education.

Mr. Alexander Craig (Glasgow Institution) said the views of the directors of the institution which he represented exactly coincided with those which had been stated by Mr. Lawton.

Mr. F. Talbot (South Staffordshire Association) said that in the district which he represented, South Staffordshire, there was a great lack of teachers. there not being more than eight or ten teachers in a district numbering about half a million of people. It had occurred to him that perhaps the Science and Art Department might consent to accept a man holding a first-class certificate of the Society of Arts as equivalent to one of their certified teachers; at any rate, it would seem but fair, with such a paucity of teachers, that they should give such men a trial. As they were all aware, no results were recognised by the Science and Art Department as giving a right to payment unless the teacher were certified by that Department; he thought it would be but a fair recognition of the long and valuable services of the

Society of Arts to the cause of education, if those holding the Society's first-class certificates were recognised as properly qualified teachers, at all events for a time. If this suggestion were adopted they would at once have a large number of teachers at their disposal.

Mr. Chester said it had occurred to him that they might save time by not taking up each subject separately. They were now on the subject of technical education, and then they had to consider four other questions, all more or less bearing upon it. He could not but think that if they came at once to a resolution on the fifth question, and requested the Council to enter into communication with the Government, the universities, and such other bodies concerned in public education as it might seem expedient with a view to ascertain how far it was possible to combine the various examinations now in use, and render them more generally useful in promoting the general and technical education of the people, they would arrive better at the end in view. He was sorry that his friend Mr. Cole was not present, but he knew that he was in favour of some such step being taken. Mr. Cole had been sent down by his Department to the University of Oxford to negotiate on the subject of Mr. Whitworth's munificent donation, and he was of opinion that the time had arrived when communications might profitably be entered into, not only between the Department and the Society of Arts, but between those bodies and the universities. He (Mr. Chester) thought that, if they really wanted to advance technical education, to have proper books provided, and other educational deficiencies supplied, they should cease going on the present hap-hazard, disconnected plan, and endeavour to arrive at some uniform system, by which the whole education of the country might be pushed forward. If not out of order, he would therefore move:—

"That the Council be requested to enter into communication with the Government, with the Universities, and with such other bodies concerned in public education, as it may seem expedient, with a view to ascertain how far it is possible to combine the various examinations that are now in use, and to render them more generally useful in promoting the general and technical education of the people."

He thought that would cover the first five propositions in the list, although of course he had no desire to prevent discussion on any one of them separately. As one who had taken great interest in this matter from the very first, he had always had something of this kind in view. He considered the action of the Society of Arts was, as described by Mr. Sales, that of pioneers; that their business was to open the way, and prepare the ground for something better, and that the time was now come to establish a national system on a permanent footing.

Mr. Norris seconded the resolution.

Mr. Gibbs thought there were two sides to this question. If they considered the matter carefully, they would find grave objections to a system of centralisation such as this would seem to point to. However useful the Government Department of Science and Art might be, it must be well known that there were many places in the United Kingdom which that system did not, and probably would not reach for some time to come. It might work very well in the large centres of industry—in Lancashire, Yorkshire, or South Staffordshire—but it was entirely inoperative in such a town as that in which the institution he represented was situated, Chelmsford. He himself held a certificate from the Department as a science teacher; but he was unable to make use of it, because arrangements could not be made to examine his pupils, who were therefore thrown entirely upon the Society of Arts' examinations. In connexion with their institution there was a flourishing drawing-class, the teacher of which did not think it practicable to put his class in connexion with the Government Department. In conclusion he would say, that notwithstanding all that was done by the Government, the increasing numbers of those who presented themselves each succeeding year showed that the Society of Arts' examinations were by no means unnecessary.

Mr. Chester remarked that he had not the slightest intention that the Society should give up their examinations, and hand them all over to the Department of Science and Art.

Mr. Gibbs said the resolution seemed to point in that direction, and it was that which he wished to protest against. He believed that, notwithstanding the expense which the nation had been at in the royal establishment at Kew, the Government system of examination in botany did not extend to the gardeners employed in that establishment, and that some of them had availed themselves of the examinations of the Society of Arts. Consequently he was fully justified in saying that there was a great deal of ground which could yet be occupied with advantage by voluntary effort.

Mr. Buckmaster thought that any local committee which would answer the requirements of the Society of Arts, would be also able to put themselves in connection with the Science and Art Department.

Mr. Gibbs said that was not so, as his own experience testified. The Government required gentlemen of a certain position, magistrates or clergymen, to act as the committee, and in Chelmsford the gentlemen who occupied such positions could not be got to take enough interest in education to form a committee.

Mr. Benjamin Shaw thought probably the time might come when they would have to adopt something of this sort, but at present he believed it was premature. It was assumed that the resolution covered the first five propositions in the list, but this was not so, because the first three had nothing to do with examinations. The first was perfectly general; the second had relation to the issuing of text books; and the third again was perfectly general, and related to Mr. Whitworth's endowment. They could never expect that a Government Board would consent to merge itself in a voluntary association, and therefore it must come to this, that the voluntary association would be merged in the Government Board, and they would thus lose all the benefit of that independent action which was so valuable. This system of centralisation which was now proposed for members of Mechanics' Institutions was not adopted in other cases. There were all sorts of public and private schools in the kingdom, three universities in England, besides those of Dublin, Edinburgh, Glasgow, and Aberdeen; and nobody ever dreamed of centralising them or their examinations. There was a point, however, upon which the resolution had a bearing which might be well worth consideration, and he was much mistaken if that was not the practical difficulty which had led to the suggestion. There were a number of certificates granted, some by one body and some by another, and nobody knew exactly the value of them, nor was there any mutuality or interchange between them. He would suggest, therefore, the addition to the resolution of some such words as these:—"Or to obtain some mutual recognition of each other's certificates as far as they are passports for employment." A degree of M.A., or B.A., had a certain recognized value wherever obtained, and if something of the same sort could be obtained with reference to their certificates he believed all practical ends would be answered.

Mr. Chester did not object to the addition of the words proposed, but thought them unnecessary, inasmuch as the purport of them was already included in the resolution.

Mr. Levy suggested the word "co-operate" being used in the resolution, instead of "combine."

Mr. Reynolds remarked that the resolution did not pledge them to any immediate action, but only to ask the various bodies mentioned for information, and to that extent he was willing to vote for it. He certainly did not think it desirable to give up the Society of Arts' examinations, or hand them over to a Government board. He thought that by having two or three examining boards, so long as there was not an excessive waste of labour by unnecessary examinations, they had a better

chance of getting a more liberal education for the people than if they were reduced to one cut-and-dried system.

Mr. Chester said it was quite possible that each body might be best able to conduct the examinations in certain subjects, but what he wanted was that each should see how far it was possible to co-operate with the others.

Mr. Lawton said the subject now under consideration was one which had been very fully considered by the boards and committees in the union which he represented, and the views which he was about to state were those of the majority of those committees. In the first place the Society of Arts' examination required a previous elementary test; they were known not to admit any one to the final examination who had not already passed in reading, writing, and arithmetic, but the Science and Art Department took no notice of these elementary subjects. A candidate might get a first-class certificate, say for mechanical drawing, without being able even to write his own name. There was, therefore, this difficulty in the way of combining the two examinations, the science teachers would say they did not profess to teach reading, writing and arithmetic, they looked for their payment to the results of their own teaching, and they did not see why they should suffer because the Society of Arts required a preliminary examination; consequently he believed the whole of the science teachers would be against any such arrangement. Another difficulty was this, that the Government minute provided that the teachers should give instruction only to artisans whose parents or themselves were not in the receipt of more than £100 a-year, which definition would shut out many who belonged to the Institutions in Union. Then, again, not only the candidates themselves, but employers of labour attached great importance to the certificates of the Society, which they knew implied a knowledge not only of the special subjects, but also showed that a preliminary examination in writing and arithmetic had been passed. With the Government certificate, however, there was no such security, and the consequence was that employers preferred a certificate from the Society of Arts to one from the Department. The only thing which rendered it, in his opinion, at all desirable to consider this question was the great inconvenience which these various examinations caused to the local boards, who were beginning to complain of being overworked. This was the difficulty which was beginning to press upon them, and if they could find some way of avoiding it, he should be very glad, but he could not see his way at present.

Mr. J. W. Ryder (Devonport Mechanics' Institution) thought Mr. Lawton's concluding observations were strongly in favour of the resolution, because if the duties of the local boards were so heavy, it was advisable to see if they could not devise some means by which time could be saved. The resolution did not pledge them to anything, but merely asked the Council to communicate with the other bodies named, with a view to getting information, and endeavouring to devise a scheme for rendering these examinations more useful than at present. When the Council had obtained this information it would be time for the Conference to discuss whether it was advisable to alter the existing system.

Mr. Buckmaster said if the local boards were overworked in consequence of the number of examinations, it would seem desirable to diminish them, if this could be done without interfering with the efficiency of the scheme. The Society of Arts examined in 32 subjects, 12 of which were specially provided for by the Department, and the question, in his opinion, was whether those could not be left exclusively to the Department. It was said that the Government certificate did not require any preliminary examination, and they justified that by saying that they had nothing to do with the primary education of the people; they educated in special subjects, and they certified the results of the examination in those subjects. They thought it would be unfair to pluck a young man in mechanical drawing because was not well up in grammar or spelling, but there was no reason why the Society of Arts should not keep up their preliminary examinations. In any case where a science teacher was to be appointed, as far as possible care was taken to ascertain that his elementary knowledge was pretty good; but he very much doubted if the whole of those fourteen science teachers, whom Mr. Lawton had spoken of as doing such valuable work in Lancashire, would have passed if a preliminary examination in elementary subjects had been enforced. He thought it very desirable that some understanding should be arrived at between these different bodies, whose work was becoming each year more confused and perplexed, and as their operations extended so would the difficulties increase. Was there no plan by which they could come to some mutual understanding, without that horror of centralisation, which was, he hoped, in some degree fading away? If they gave up the subjects in which the Department examined, there would still remain many for the Society to deal with, and one or two more had just been suggested, so that they need not fear their operations becoming too restricted. For the sake of economy of working and efficiency, it was, in his opinion, very desirable to come to some sort of friendly arrangement.

The Chairman asked if the words proposed to be added by Mr. Shaw were accepted by Mr. Chester?

Mr. Chester did not object to the words, but thought they weakened the force of the resolution.

Mr. Shaw thought, perhaps it would be better to put the addition of the words he had suggested as an amendment.

The Chairman said he must support the amendment. He had rather the resolution had not been introduced at all, but he preferred it, at any rate, qualified by the amendment, simply because he thought its tendency was prejudicial to the general progress of that independent education which was so important in its effect upon the whole character of the people. He did not believe that education by government bodies would ever be so efficiently conducted as by that system which brought into active operation the energies of the whole middle class. They educated the middle-class in teaching them to educate the class below them. That was a most important element in their system—the formation of these local boards in all parts of the country. In order to be a member of one of those boards, each individual was obliged to test his own knowledge in a way which would be needless if the whole system were handed over to the Government or Universities.

Mr. Chester said he must protest against an interpretation being put upon his resolution which was not warranted by its terms. When he proposed to combine the examinations of the Society of Arts with others, and to make these examinations more useful than they were at present, it did not at all involve the idea that they were to be given up. Under these circumstances he should prefer to keep the resolution as it was, and should vote against Mr. Shaw's proposed addition.

Mr. Teulon said it appeared to him that Mr. Chester's intention went to this extent—it had been objected that there were so many examinations going on by different bodies as to occupy a large portion of time, and perhaps to weaken the effect which might be produced by a better application of that time. If he understood Mr. Chester, his object was to do away with the examinations in some subjects, in order to give place to a more perfect system. He also agreed with Mr. Shaw's amendment. He had always thought that persons holding the certificate of the Society of Arts were, as a whole, better educated than those holding certificates from the Government Department, and yet these latter were entitled to teach, and to obtain payment for results, whilst the former were not so entitled; it would, therefore, be a great point gained if their certificates were recognised by the Government, and a much larger body of teachers would be thrown into the field.

Mr. Talbot said he should support Mr. Chester's resolution. In South Staffordshire they were getting every year into greater difficulty with respect to local boards, as gentlemen objected more and more to give their services for five or six nights in succession; and during the present year, in consequence of the Government fixing upon two or three of the same nights for their examinations which had been previously arranged for the Society of Arts' preliminary examinations, they had had to provide a special examiner of their own, and choose other nights rather than give up the examination.

The Chairman then put Mr. Shaw's amendment, which was lost, and the original resolution was then carried.

Mr. Chester remarked that one means which had been suggested, by which the difficulty of two examinations in the same subjects might be got over, was, that the examiners might agree upon the same paper. That was only one of many ways in which he was convinced that much time and labour might be saved.

The Chairman said the last four questions, Nos. 6, 7, 8, and 9 appeared to form one class, and might well be considered together.

Mr. Levy suggested, as regards promoting the visits of working men to foreign countries of industry, that it might be well for the Society to offer, as a prize, an excursion ticket, and a sum of money for the expenses of the journey, to men who fulfilled certain conditions, or passed certain examinations. That was the only way he could see at present, otherwise than by sending any one specially, as had been done in the case of Mr. Coningsby, and, of course, action of that kind did not come within the cognizance of the Conference.

The Chairman said the suggestion was worth consideration, although it might be doubtful whether a young man who had just passed his examination would have sufficient practical knowledge of the world to properly discharge what was by no means an easy task. As to men taking their holidays all at once, it would be a great advantage if it could be accomplished.

Mr. Reynolds thought this must depend very much on the character of the individual employers of labour themselves. If a very popular man were to set the example in promoting this arrangement, it might in time become general, but they could not legislate on such a subject.

The Chairman said he had had a long discussion with a number of colliers on the subject, and they seemed to like the idea very much; but the difficulty on the part of the men would be the giving up the Saturday afternoons and Mondays.

Mr. Talbot said it would be a very good thing if they could find a case of an employer who had adopted the plan of giving his men a holiday of a fortnight or so in the year, paying them their wages during the time, as the Government offices did. Men who lived from hand to mouth could not afford to take a long holiday. He knew the Staffordshire men took a vast number of short holidays, but they did not know what it meant to take a long holiday.

Mr. Reynolds believed that most of the work in coal mines was piece-work, which would create a difficulty in the way of any such experiment.

The Chairman said a considerable portion was piece-work, but a great deal was not, and that would be a matter for arrangement. There was a great loss to capital by these continual short holidays; and it was a question whether it would not be better, on the whole, to pay the men's wages, for a certain fixed period, for doing nothing, if this loss could be avoided. He believed there would be a considerable saving; but he did not know whether the experiment had been tried.

Mr. Chester thought the suggestion well worth consideration, and there might be cases where it could be carried out, but generally speaking he did not think the working classes could avail themselves of such a system. If men in a higher situation in life went away for a time, their salary or profits went on just the same, and when they returned their desk or office was waiting for them, but if a man went away for a week, he would find on coming back that his place had been filled up.

The Chairman said he did not refer so much to miscellaneous employment as to the case of large mills and factories.

Mr. Buckmaster observed that there was a great deal of work done by contract, and it might be difficult to meet such cases.

Mr. Norris, in reference to the next question—"What arrangements would enable the working classes to make more extended use of public museums and galleries"—said that if these places were open on week-day evenings he thought that would be almost all that was required. There was a petition now being got up by the Working Men's Institute Union for this purpose, and if the legislature would hearken to the prayer of that memorial, they would greatly aid in the instruction of the working classes.

Mr. Levy said the Government had a considerable body of professors in connection with the South Kensington establishment, and he would suggest that some of these gentlemen might go round the museums and deliver a kind of short conversational lecture, which would be very interesting and instructive; the same might be done at the Zoological Gardens, and the Botanical Gardens at Kew. In this way amusement and instruction would be combined, and, he believed, the social effects would also be not inconsiderable. It would be a great thing to have the museums and galleries open in the evenings, but he was an advocate for opening them on Sunday afternoons also.

Mr. Buckmaster thought the plan of giving short conversational lectures would do much to increase the interest in these public collections, for the simplest things become interesting just in proportion as persons knew something about them. When the South Kensington Museum was first started, he had been requested by Dr. Lyon Playfair to give short lectures of this kind, and he accordingly prepared one, of not more than twelve minutes, on wool, another on silk, and so on, but in a short time the crowd became so great as to cause inconvenience; the people could not hear, and ultimately they had to be abandoned, for want of a room in which to deliver the lecture without interfering with the ordinary visitors to the museum. The plan was most valuable if it could be carried out.

Mr. Talbot did not think it would be necessary to have great men from South Kensington for this purpose. In South Staffordshire they had a Geological Society; and it was quite astonishing how many men there were who had made themselves so acquainted with the various points of interest in that geological field, as to be fully capable of going round, on any occasion, and describing them to a small body of visitors. In 1866, Lord Dudley kindly sent down a very beautiful collection of pictures for exhibition; and it was perfectly lamentable to go into that gallery and see people gaping at the pictures, and learning nothing whatever, while there were at least half-a-dozen gentlemen there who might have given very interesting lectures on them.

Mr. J. Pitter (Hastings Institution) thought it would be very useful if members of Institutions took upon themselves to form local museums. It was very common to go into a museum in a particular town and see a stuffed tiger or a wonderful fish from some distant part of the globe, but they did not find any objects there from the immediate locality, or, if so, they were very scanty and imperfectly arranged. Some years ago, at Hastings, they had endeavoured to form a local museum, the members of the Institution being divided into sections, each one having a particular branch of study to specially attend to, one geology, another botany, and so on, and they endeavoured, by exploring the neighbourhood, and in other ways, to put themselves in possession of all the natural productions of the locality, and some very remarkable discoveries resulted. They found in one place

a particular kind of clay which, on being treated in a a certain way, made very excellent paint; he had also reason to believe that a very useful mineral fuel was to be found in the neighbourhood, though he did not think it was quite understood at present. Then, again, a variety of grass was discovered, which was useful for weaving into baskets and other ornamental articles. If this idea were carried out generally, many useful discoveries might be made.

Mr. Chester highly approved of giving a local character to local museums, and although the same idea had before been recommended in that room, it could hardly be advocated too often. He was not, however, so hopeful about the success of itinerant lecturers. Those who had had Greenwich Hospital or Blenheim Palace explained to them in this way, would not be very strongly impressed with the value of the information thus afforded, and although the experiment had been tried in connection with the International Exhibitions and in other ways, he did not think it had ever succeeded. There was one other branch of the subject on which he might be excused for saying a word, as it really came before them in the question under discussion. Of course he did not wish, at such a meeting as that, to commit the Society of Arts to an opinion in favour of opening public institutions on the Sunday, but, as the question was before them, he could not help expressing his own personal conviction, that the interests of common-sense, religion, charity, and everything humanising and civilising, required that this step should be taken, sooner or later.

Mr. Ryder was very glad to hear the observation which had just been made. He should be very sorry to do or say anything to lead to the desecration of the Sunday, or to give offence to the reasonable scruples of others, but it was not out of place, he thought, to endeavour to remove those scruples. He had been a magistrate for some eight years, and he believed the experience of all others in the same position would bear him out in saying, that there were more cases of drunkenness brought before the bench on Mondays than on any other day in the week; and therefore it was a question whether an opportunity should not be given to persons who now spent their Sunday afternoons in a public house, to visit some place where at least they would be able to improve their minds. If they could induce them to do this, it would aid in the advancement not only of morality but of religion.

The Chairman said there would be no special recommendation on this point, except in favour of opening museums and galleries in the evenings, about which they were all agreed. There was a difference of opinion as to Sunday afternoons, upon which point his views were well known.

Mr. Shaw said the Sunday afternoon question was a perfectly fair one for discussion, and he was always glad to hear what gentlemen had to say upon it. If any attempt had been made to bind the Council to take any action in the matter, he should have claimed his say upon the other side; but, under the circumstances, he would only make one remark. This desired change used simply to be put on the ground of amusement and relaxation, but they were now seeking to obtain it as necessary to technical education; if this were so, it would soon come from visiting galleries and inspecting pictures to drawing them, and he feared the Sunday would cease to be a day of recreation altogether, and would become a day of education, if not of work. This was a view of the question which should not be overlooked.

The Chairman said they could all agree in a recommendation to open museums and public institutions on week-day evenings.

Mr. Shaw heartily concurred in that desire.

Mr. Reynolds proposed a vote of thanks to the Chairman, which was seconded by Mr. Lawton, and carried unanimously.

This brought the proceedings to a close.

HAVRE EXHIBITION.

With some few exceptions the galleries of the Exhibition are now filled and completely arranged. The marine group naturally occupies the place of honour, namely, the vestibule and the front galleries to the right, which present a very attractive appearance, most of the models and machines being well got up, and the gallery being decorated with the gay flags of the International Commercial Code of Signals; and here, at Havre, it may be stated, visitors may see the working of the new coast semaphores and telegraphs. On the summit of the horseshoe-shaped range of hills, on and between which Sainte Adresse, the pretty rural neighbour of the busy town of Havre, is almost hidden amongst magnificent trees, stand a pair of twin lighthouses, which, with two others on the jetties of Havre, guide ships into the port; close by the former stands a tall mast, with elaborate rigging, a semaphore, and a telegraphic station. A ship in distress, or the commander of which desires to communicate with any port of the Continent, opens communication, by means of the news signals, with the semaphore, and may send or receive a dispatch from Paris, Berlin, and St. Petersburg, with the aid of the electric telegraph beneath the semaphore. These stations are, however, not confined to maritime dispatches; the electric telegraph is in connection with the station at Hâvre, and messages are also received at the semaphore house itself. This station, perched upon a hill, nearly 200 feet above the level of the sea, seems to be very complete in all its arrangements, Hâvre being one of the most important towns on the French coast. We have also visited another of these stations, that which is placed on the top of the steep hill of Cette, and looks out on the waters of the blue Mediterranean, and the arrangements, although on a smaller scale, are equally complete. This system of international signals, and that of the coast semaphores, with their electric companions, certainly form together one of the most honourable achievements of the century.

The marine gallery of the Hâvre Exhibition is peculiarly remarkable in the same direction; almost every step brings to view some means of improving communication or saving human life. One of the subjects which seem to occupy much attention at the present moment in France and England is the establishment of instantaneous and certain communication between the officer in command of a ship, the steersman, and the engineer. There are six systems to be seen at work here, five of which have been employed, more or less, in the two countries and elsewhere, and one, quite new, which is a modification of a former system. We believe the first English apparatus of the kind was electric, but that this mode has been abandoned; at any rate, the three systems shown by British exhibitors are all mechanical, the communication being made either by chains, or by rods and cog-wheels, while the French apparatus are electric and pneumatic. It is not in our province to pass judgment on these various plans, but it will be interesting to many of our readers to state the effects which are common to nearly all those apparatus. The commander of the ship gives his orders by moving the pointer on a dial-plate; a bell rings, and the steersman or the engineer has the order repeated to him on a similar dial; when the order has been executed, a reply is given by the striking of a bell, or, what is better, the rudder or the engine itself records the fact on the commander's dial; and, in one case, a small dial keeps constantly before the commander's eye the direction and the speed of the engines, registered by themselves. All this may seem complicated; but the fact that the cost of one of these apparatus rarely exceeds £50 for a large vessel, dispels, to some extent, the supposition.

There are many other maritime signals, for general purposes, shown by French, English, and American inventors.

The collection of optical and other marine instruments,

chronometers, &c., is considerable, especially from French exhibitors; the English specimens, although of a very high character, are not so numerous as might fairly be expected in a town of such importance.

Amongst special instruments may be mentioned Albini's patent self-registering compass. Beneath the compass is placed a chronometer, and at the back of the latter are rollers which carry a band of paper, over which is a circular slip of carbonised paper; the under edge of the compass card is provided with brass figures representing all the degrees of the compass, and once a minute, by a simple arrangement, the card is slightly pressed down and marks its position on the paper band. The principal value of the arrangement is to show what deviations have taken place in the course of a ship during any given lapse of time, but it would also show the direction of a ship's head in the case of collision; and in that of a vessel moored by means of two anchors getting them fouled or twisted, the registering compass would show the direction of the swinging and the number of times that the cables had been crossed.

The submarine lunette is the application of a well-known principle of the examination of the hull of a ship under water; at the lower extremity of a large iron pipe is placed a large glass towards the ship's side, and behind this is a mirror, as in a camera obscura, which reflects the image to the eye of the observer at the upper end of the tube.

The collection of life-saving apparatus is large, from the simple cork jacket and life-preserver to the boats and apparatus of the French and English societies. Amongst the means of saving life are an American life-raft, like that which crossed the Atlantic, and appeared at the Paris Exhibition last year; several life-boats, and models of such boats, and a simple life-preserver, called "Podoscaphe," a flat, buoyant object, boat-shaped, with a hole large enough for a man's body near the centre, and a small staff, for a sail and signal of distress. Amongst life-saving apparatus may well be enumerated means of lowering boats in bad weather, of which there are several in the exhibition, French, English, and American, deserving attention.

There is a considerable show of ship medicine-chests, French and English, a collection which deserves attention, not so much perhaps from any essential differences, as from the fact that it is stated that other ships, on account of more strict surveillance, go to sea better provided in this respect than those which bear the British flag. We have no means of ascertaining the truth of the assertion, but we are convinced of the prevalence of the opinion; and in such a case, the more publicity is given to the charge the sooner will it be refuted, or the fault corrected. In small ships, that do not carry a medical man, the medicine-chest and its appliances are of the utmost importance; and it is exactly in their case that the regulations of the Board of Trade are said to be often disregarded.

Amongst the means of saving or protecting life, should be mentioned two electric mining lamps, one set in action by a coil, the other by a peculiar form of battery; it is also proposed to try a manganese battery, which may be almost dry. It is stated also that another lamp, which will burn under water, or elsewhere, without any connexion with the outer air, or any battery, for a considerable time, has been invented by two pupils of the Polytechnic School of Paris, but the construction is not yet made known in England. Great doubts have been thrown over the feasibility of electric lamps for mining purposes, but in France considerable trouble is being taken to carry the idea into practice.

The collection of models and plans of vessels is highly interesting. The class includes more than eighty exhibitors from all countries,—France, Holland, Belgium, Denmark, Sweden, and Norway, and the United States.

The British exhibitors, including the Channel Islands and the colonies, number more than twenty, or a quarter of the whole.

The class of sea and river fishing apparatus and tackle presents a good deal of interest, particularly with respect to the various kinds of nets and traps used in France, of which there is a great variety. England contributes half-a-dozen exhibitors; but there are not more than two or three from all the other exhibiting countries. Holland, however, shows some remarkable models of fishing-boats in another class; one in particular, which obtained a gold medal at the Hague Exhibition last year, and is sent by the Dutch Government as a present to the town of Hâvre.

In other classes will be found a considerable number of anchors, windlasses, capstans, forms of sails, systems of rigging, methods of reefing, &c., presenting many novelties.

On the whole, the first group of the exhibition, that which forms the distinguishing characteristic of a maritime exhibition, must be regarded as satisfactory. Some of the classes might have been more fully represented, but the collection is large, and, fortunately, there are few objects which do not present points of attraction.

Fine Arts.

A Rural Picture Exhibition.—There exist in the beautiful forest of Fontainebleau two or three colonies of painters, including more than one English artist, of which Barbison is the principal. Here many artists reside during the whole or greater part of the year, amidst the grand trees, the wild underwood, the ferns, and the lichen-covered rocks, which form the subjects of so many landscapes. The walls of the principal inn in this arcadia are covered with drawings, some by famous hands, or such as have since achieved fame; and here, also, is a permanent exhibition of pictures, open to all comers. The other day the Emperor and Empress paid a visit to this exhibition, where they were received by an artist and one of the founders, M. Théodore Laffitte. Their Majesties purchased several works; the Emperor selected four, and the Empress one for herself and two for the Prince Imperial.

Commerce.

Tea Cultivation in India.—The cultivation of tea on the Neilgherry hills, says the *South of India Observer*, promises to become of greater importance every year, both to the planters and to the Government. At the late local flower show specimens were exhibited from Ootacamund and Coonoor, which would bear comparison in quality with any of the finest productions of China or Assam. As regards aroma, we can safely say that no teas in the world can beat the produce of the Blue Mountains. Botanists account for this by the great elevation of the plantations, some of them being upwards of 6,000 feet above the sea level. Nearly all the seed which was purchased from Assam and the North-West turned out to be bad. Year after year, owing to the tendency of tea seed to "sweat," when packed in boxes or bags, nothing but failure awaited the Neilgherry planter. The Neilgherry climate is peculiarly trying to young plants. Owing to the rarified state of the atmosphere the radiation and evaporation at some seasons are excessive; and while the plants have to sustain great heat from an unclouded sun during the day, they are subjected to severe cold during the night. Tea planting on the Neilgherries may be said to be a study, altogether different from that in any other climate. It was not understood at the commencement. Young and tender plants were put out in the same fashion adopted in the moist, soft climate of Assam. Now, however, that the

planters have, at heavy cost to themselves, gained the fullest experience, the system in future will, doubtless, be successful.

Colonies.

Boiling Down in Victoria.—A Melbourne paper gives a description of an extensive boiling down establishment, which may not be uninteresting:—The sheep are collected in the yards, and then killed and taken into the shed attached to the dip; they are then skinned and cleaned and hung up till the vat is ready to receive them. As soon as the vat is to be filled with the sheep, a number of hands are employed in chopping them into three or four pieces and then throwing them into it. The vat is eleven feet high and tapers towards the bottom. The tapering avoids the necessity of packing the carcases, as the pressure above always causes them to be close, and as they fall to the bottom, when the steam is applied, room is left for the fat to swim on the top. Steam is conveyed from a 40-horse power engine in an adjacent shed. The vat is capable of holding 300 to 400 animals, and 1,000 of these are stewed in 48 hours. There are about thirty hands employed. When the fat has been extracted, it is allowed to flow out of the taps placed in the side of the vat so that it may pass into 500 gallon coolers. The gravy runs from a tap in the bottom of the vat into a reservoir prepared for it, and is afterwards given to pigs. All the bones and shreds of meat are carted away.

Hops in Victoria.—The *Ararat Advertiser* states that an excellent specimen of hops has been grown in that district, which promises amply to repay the grower, if he puts a larger area under cultivation next year. The quality of the hops is regarded by brewers as being infinitely superior to those imported, and a corresponding increase in price has been offered. Hops have also been exhibited at sale in Gipp's Land, grown on the banks of Lake Wellington, and, from their excellent quality, it would appear that the ground is well suited for their cultivation.

Notes.

Expedition for the August Eclipse.—The mission sent out to observe the eclipse of the sun on the 18th August, by the Minister of Public Instruction in France, who has granted £2,000 to the purpose, has just left Marseilles for the East. The Academy of Sciences of Paris has also commissioned M. Jassen, known for his spectroscopic researches, to proceed to the East, for the same purpose, and has voted £600 for expenses, to which the Minister of Public Instruction has added £480. The Governor of the French settlement of Cochin China has informed the Minister of Marine that the preliminary preparations for the observations in question are completed. The spot selected is on the coast of the peninsula of Malacca, and it is said that the King of Siam has expressed his desire to be present at the observations. A similar expedition has been organised by the Prussian Government, at the instance of the Berlin Astronomical Society. As each nation selects a spot distant from that to which the English expedition has proceeded, there is every hope that in one place, if not more, the weather will be favourable for observation.

A New Trade, says the *Stationer*, has recently become popular in the marketing streets of the metropolis. A class of individuals have sprung up as it were by magic; these take their stand opposite the drapers in common neighbourhoods, and offer for sale the patterns of various descriptions of ladies' and children's clothing cut out in tissue paper. The business appears a thriving one, and it is, moreover, an occupation that seems to offer a boon to the humbler classes, many of whom have been compelled to put out their work in consequence of being ignorant how to cut out their materials.

Correspondence.

Dried Meat.—Sir,—I find, from Dr. Hassall, that, on comparison, the desiccated meat from Brisbane, exhibited by Messrs. Orr and Honeyman, at a recent meeting of the Food Committee, differs materially from Dr. Hassall's "flour of meat;" and I am authorised by the doctor to intimate that he does not consider the importation and sale of that article, in its present form, an infringement of his patent. I shall be obliged by your inserting this letter in your next number, as I consider it due to Messrs. Orr and Honeyman, after my letter, published in your *Journal* of the 22nd of May.—I am, &c., H. Sibley.

3, Lincoln's-inn-fields, 30th June, 1868.

The Postal Telegraph Bill.—Sir,—The public generally, the chambers of commerce, and the provincial press especially, who have actively supported the Bill for the system of postal telegraphs, may be congratulated that it has been so far supported, against opposition in the House of Commons, as to be read a second time, and referred to a select committee. The chief pretexts for opposition to the Bill, by representatives of some commercial constituencies, are, the want of information, and doubts as to the principles of the measure by themselves. On my own experience of preparations for legislation, I aver, that seldom has preparation been more complete, and exposition more full, clear, and conclusive than that to be found in the papers on this Bill, prepared by Mr. Scudamore, and submitted to the House of Commons. If the question were one of authority, those commercial members may be publicly challenged for presumption, in setting up their mere dicta against the preparer and worker of the great and successful measure of the postal savings banks. Indeed it speaks little for the state of elementary economic knowledge on the part of commercial representatives, that there can be any doubt or hesitation as to the comparative eligibility of one establishment already paid for, as against two or three establishments of lines from the same places to the same places to be paid for, or of five stations already paid for, as against five to be paid for, *i.e.*, of twelve thousand postal stations, and a service of upwards of twenty thousand collectors and distributors already paid for—except as to a minor extent of additional and collateral service—as against the like amount of service to be provided and separately paid for by the private trading companies. I might undertake that if the alternative economic propositions were put to the lower-class boys taught political economy in the Birkbeck schools, they could have no hesitation upon them, and would laugh at the bewilderment upon them of some of the old big boys of the House of Commons, and would declare that they really must be shamming for some purpose or another. It is inconceivable that, with the progress of elementary economical knowledge, and in the face of continental example, the present state of things can be allowed to continue. All delay of reform and of success in opposition, must be at grievous public expense. At the time, as I now learn, when the proposition was first made to the Treasury by Mr. Bain, with the approbation of Sir Rowland Hill, for the purchase of the private companies' lines, and the establishment of a postal telegraph, the market value of their shares was eight hundred thousand pounds. It is now upwards of three millions. Upwards of two millions of money for wasteful duplicate and triplicate separate unnecessary private establishments created since then may be set down as the penalty which the public will have to pay for the ignorance of direct economic and legislative principle of their representatives in Parliament. And the

greater the delay to act upon those principles, the greater will be the penalty that will be inflicted on the public. The cost of the success of the opposition in creating delay for this session will be at the least half a million more money in the continued waste from separate establishments, and in money not earned, besides higher demands of compensations for increased separate outlays, and claims for separate augmenting profits. Instead of opposing, the shareholder may, in his point of view, urge a purchase, in language to this effect. "You, the public, or you, Mr. Statesman, may, by taking our properties and consolidating them, make, commercially, a good thing of them, and out of what by consolidation you may get from them, you can afford to pay us liberally for the outlays you have, by your sanction, led us to make." To avoid further debates and wasteful delays, the Government has advanced beyond the first offers of compensation, and made others which are deemed satisfactory, so that the opposition of the chief telegraphic companies is withdrawn. To the International Company, the terms are twenty years' purchase of the net profits. Even Mr. Grimston, the chairman, has, I am informed, declared, that he cannot advise his shareholders to refuse them. The remaining opposition is with the railway directorates. To the railway companies Mr. Scudamore's plan gives for the lines of small traffic, where it may not be worth while to have separate wires for postal purposes, the first use and entire control to the companies; but for all lines of greater traffic it provides for the companies' separate wires for their exclusive use. What do they want more, or better? In the discussion at the Institution of Civil Engineers, on the Means of Preventing Railway Accidents, it was shown that the less proportion of accidents, and the far greater safety of railway travelling in Germany, was due to the better use of the electric telegraph as a means of working the lines. The provision of distinct wires for the purpose will be a valuable means of improvement. The opposition of the railway directorates, therefore, if it were successful in creating delay, in which only for a time it could succeed, would only incur larger bills to the shareholders, continued inferior security in railway travelling, and an aggravated expense to the public.—I am, &c., Edwin Chadwick.

MEETINGS FOR THE ENSUING WEEK.

Mon......Entomological, 7.
Asiatic, 3.
Wed ...R Literary Fund, 3.
Sat ......R. Botanic, 3¾.

Patents.

From Commissioners of Patents' Journal, June 26.

Grants of Provisional Protection.

Aerial navigation—1881—R. B. Boyman.
Agricultural machinery, transverse reciprocating motion for—1690 - C. J. Foster.
Anchors—1928—W. R. Lake.
Artesian tube well—1872—G. Watson and W. J. and S. T. Baker.
Ash-pits, &c.—1903 - H. Turner.
Boots and shoes, composition for soles of—1852—J. Wadsworth.
Boxes and parcels, marking or directing—1588—W. R. Lake.
Brick-making—1907—A. M. Clark.
Buoys, &c.—1916—T. Morris.
Cartridges, central-fire—1870—F. Waenzel.
Cartridges, closing the ends of—1865—H. Riviere and F. T. Baker.
Carts—1850—W. J. Addis.
Cement—1912—W. E. Newton.
Cranes or lifts—1867—T. A. Weston.
Driving-bands—1906—J. Rodgers.
Fermentable liquids, heating—1897—E. P. J. L. Terrell.
Fire-arms, breech-loading—1894—C. E. Brooman.
Fire-arms, double-barrel breech-loading—1873—S. Willetts.
Fire-escapes—1856—J. Gerard.
Fuel, combustion of—1914—A. E. G. Thenard.
Furnaces—1851—O. T. and G. A. Newton.
Furnaces—1904—S. Barlow, T. Edmeston, and T. Beeley.
Furnaces, smelting or blast—1888—W. Ferrie.
Gas-holders, purifiers, &c.—1902—W. H. Westwood.
Glass, manufacture of—1854—R. Elsdon and A. Stein.
Harmoniums—1887—Peter Fraye.
Hydrocarbons, treating—1868—J. Young.
Inkstands—1877—F. F. Benvenuti.
Joints, material for making steam, water, and gas-tight—1930—C. Rostaing and E. Vivet.
Kitchen-ranges—1869—W. Broughton.
Kitchen ranges—1899—W. Barton.
Levelling and measuring apparatus—1859—H. A. Bonneville.
Liquids, cooling—1926—G. W. Cutmore.
Locks—1874—D. Coffey.
Looms—1866—T. Metcalf and T. Longfellow.
Lounging chairs—1886—G. Davis.
Match-boxes—1900—C. R. E. Grubb.
Mills, rotatory—1879—J. S. Wilson.
Moulds for casting metallic articles—1880—T. D. Clare.
Oleaginous acid waste, utilising—1909—E. R. Southby.
Ores and crude metals, refining—1922—J. Gray and R. Weir.
Ornamental fabrics, weaving—1846—A. B. Sawers.
Oxide of iron, utilising in blast furnaces—1885—J. H. Johnson.
Pipes for smoking—1895—A. M. Clark.
Parquet flooring—1882—G. Howard.
Petroleum, &c , storing and measuring—1862—A. V. Newton.
Plant labels—1861—G. Maw.
Portable commode seat—1891—J. Carter.
Printing and numbering machinery—1730—J. R. Williams.
Pump buckets and pistons—1848—F. Reddicliffe.
Quartz, &c., obtaining hydrate of silica from—1920—A. L. Henry.
Reaping and mowing machines—1893—J. and E. Firth.
Salt-pans, furnaces of—1890—W. Hamer and J. Davies.
Screw propellers—1726—J. A. Joyner and J. H. Jenkins.
Sewing machines—1911—J. S. Cockings and A. Umbach.
Sewing machines, bobbin holders for—1822—G. W. Reynolds.
Sewing machines, embroidery apparatus for—1898—W. F. Proctor.
Shears for shearing horses, &c.—1772—H. Griffiths and W. A. Wishart.
Shutters, revolving—1676—J. Revill.
Silk-waste, preparing for dressing—1857—A. Kerney.
Steam-boilers—1875—W. Langan.
Steam-engines—1918—D. F. Chase.
Steam generators—1765—T. Shore, J. Eastwood, and W. W. Brealey.
Steel, cast, manufacture of—1892—C. W. Siemens.
Stone-cutting tools—1884—A. Munro and W. B. Adamson.
Straw elevators—1883—J., J. W., and D. S. Stafford.
Tin-plates—1901—T. E. Williams.
Valves—1908—S. J. Paris, D Drummond, and D. Hamer.
Vegetable substances, preserving—1860—J. Dewar.
Ventilating apparatus—1855—A. Stephen.
Watches—1794—S. Walker.
Wood-working machinery—1889—J. T. Ladyman.
Woven fabrics, finishing—1910—W. Henderson.

Inventions with Complete Specifications Filed.

Rails for common roads—2026—W. Sowerby.

Patents Sealed.

3674. E. J. Hughes.	113. G. Ireland.
3676. J. Cockshoot and H. Weatherill.	118. W. Firth.
3682. J. W. Lewis.	146. C. E. Brooman.
3699. T. and J. Robertshaw and J. Greenwood.	295. T. Corbett.
3701. G. Glover.	334. C. H. Adams.
3704. A. M. Clark.	422. W. R. Lake.
3713. V. L. Daguzan.	519. A. H. Brandon.
3723. J. G. Crompton.	536. W. E. Newton.
34. A. Albini.	887. H. A. Bonneville.
102. A. Budenberg.	1337. J. Casson.
	1364. C. Drake.

From Commissioners of Patents' Journal, June 30.

Patents Sealed.

4. G. A. D. Goodyar.	140. W. Wilkins and W. G. Pollard.
5. W. Stroudley.	165. J. Crossley.
11. J. Imray.	185. W. E. Newton.
20. E. Izod.	191. J. Davies.
25. J. and B. Dellagana.	214. J. H. Johnson.
27. M. J. Frisbie.	231. T. Goune.
30. W. J. Blinkorn.	320. B. Dobson, W. Slater, and R. Halliwell.
48. C. D. Abel.	364. J. H. Johnson.
63. G. E. Donisthorpe.	371. J. H. Johnson.
72. C. Pontifex.	483. S. Seville.
99. H. Cochrane.	946. J. G. Tatters, W. Keeble, and B. Newbery.
112. T. Whitwell.	1475. W. E. Newton.
127. A. B. Boyer.	
131. G. Nimmo.	
148. J. Wood.	

Patents on which the Stamp Duty of £50 has been paid.

1672. S. Godfrey.	2221. W. P. Gregg.
1686. E. Finch.	1707. W. E. Newton.
1694. F. G. David.	1696. C. R. Bamber.
1843. J. Saunders and J. Piper.	1727. W. Botham.

Patents on which the Stamp Duty of £100 has been Paid.

1674. L. H. Spence.	1628. J. Fowler.

Journal of the Society of Arts.

FRIDAY, JULY 10, 1868.

Announcements by the Council.

EXAMINATIONS, 1868.

The following candidates having each obtained the same number of First-class certificates, in the present and three preceding years, as the Prince Consort's prizeman, the Council have this year voted the sum of fifty guineas to be divided amongst them. It will be understood that these candidates are not thus disqualified from competing for the Prince Consort's Prize in future years:—

1104—Hugh Morgan, 21, City of London College, clerk.
1641—Edward Turner Sims, jun., 21, Southampton Athenæum, clerk.
417—Henry George White, 26, Devonport Mechanics' Institute, shipwright.
1131—William John Wilson, 25, Royal Polytechnic Classes, engineer's clerk.

WORKMEN'S HOLIDAYS.

A discussion having taken place on this subject at the Conference of Representatives (see page 598,) the Council would be much obliged to any manufacturer or other employer of labour who, having tried the plan of allowing his workmen to take their holidays at once, rather than piecemeal, would kindly communicate his experience to the Secretary of the Society of Arts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

EAST LANCASHIRE UNION OF INSTITUTIONS.—The annual summer examinations of the above Union was held in the large assembly-room of the Mechanics' Institution, Burnley, on the 13th of May, when 159 candidates presented themselves for examination from the various institutions in East Lancashire. The examination was conducted by U. J. Kay-Shuttleworth Esq., Mr. Alderman Wilkinson, Mr. L. Clement, Mr. T. W. Shore (organizing master), and other gentlemen connected with the Union. The number of candidates shows an increase of 31 on the number present last year, and from the reports sent in by the examiners, the Council of the Union have been gratified to find a marked improvement in proficiency. The results were published in the local papers, and the Council have awarded £28 13s. 6d. in prizes to the candidates. The total number of failures was 20; 13 males and 7 females, so that 139 candidates will obtain either a prize or a certificate. At the spring examination, held on March 28th, 59 candidates also were examined, and 50 succeeded in obtaining prizes or certificates. The examinations of the Union therefore have been attended this year by 218 candidates, 172 males and 46 females. The Council have issued the following statement:—"In publishing the results of the examination held in Burnley, we have pleasure in congratulating the candidates on their success in earning an amount of prizes considerably in excess of the amount given in former years. At the annual distribution of prizes each successful candidate will receive either a book or books of the value stated, or a certificate of competency or of merit. The hope that the number of candidates in the first and second classes will be steadily increased in future years, is encouraged by the very decided improvement in the proficiency shown by this year's male candidates in the first section of the third class, and by many of those in the second section. Perseverance and industry in the evening classes will enable each of these candidates to win, in every successive year, a higher position and a more valuable prize, and eventually to qualify themselves for the highest prize (books to the value of £3) in the first class. With reference to the examination of the female candidates, the merit they have shown in their written papers, their samples of sewing, and their reading aloud, entitle them to commendation; an increased activity in establishing evening classes for young women, and preparing them to compete at the examinations of the Union in March and June is, however, needed in order to render this important part of the examination scheme more generally useful to the district."

YORKSHIRE UNION OF MECHANICS' INSTITUTES (ECCLESHILL).—The village of Eccleshill, little over two miles distant from Bradford, has progressed with the rapidity that has characterised all the villages bordering on the town. Located on a lofty eminence, originally moorland, the salubrity of the air and the extensive prospects of the surrounding country have tempted wealthy people to erect mansions in the most beautiful situations, which are gradually imparting a new and pleasing feature to the district. The inhabitants are alive to the religious and educational wants of the neighbourhood. Aids to the development of both of these higher requirements of the community are not scarce, and a Mechanics' Institute has afforded the means of education to the young people. The institute, which has 100 members, is held in rooms in Belle Vue-buildings, Town-street, but for a long time past the accommodation has been unequal to meet the demands upon it. An effort to secure a commodious and permanent home for the members has met with ready and substantial support, and the objects of the promoters are in a fair way of realization. On Saturday afternoon, June 20, the corner-stone of a new building for the purposes of the institute was laid, amid much rejoicing, by Mr. Alderman Brown, of Bradford. The site is on an elevated position, commanding wide and extensive views of the picturesque district bounding this portion of Airedale. The proposed institute, of the Doric order, will be erected at a cost of £1,200, of which nearly £700 has been subscribed. The area to be covered by the building is 64 feet by 40 feet, and will consist of two stories. A reading-room, 20 feet by 18 feet, four class-rooms, a library, and a cooking-room, each 15 feet by 12 feet, will form the lower storey, while in the upper story will be a commodious lecture-hall, capable of accommodating between 600 and 700 persons, and suitable for lectures, concerts, public meetings, &c. The event of laying the corner-stone was one of great satisfaction to the inhabitants, who displayed numerous flags from the mills and housetops. A procession, including the principal and most active friends of the institution, many local gentlemen of influence and position, and several friendly societies, was marshalled in the Cricket-field, and marched, headed by the Eccleshill brass band,

through the principal streets of the village, to the site of the institute. Here a large concourse had gathered to witness the ceremony. Amongst the gentlemen present were Mr. Ald. Brown and Mr. Councillor Briggs (Bradford), Mr. Ald. Yewdall (Leeds), Rev. J. Aston, Rev. S. Beavan, Rev. J. H. Penrith, Mr. Wm. Milnes, Mr. Henry H. Sales (Yorkshire Union of Institutes), Mr. James Hanson, Mr. Wm. Smith (president of the institute), Mr. John Hutton, Mr. Samuel Smith, Mr. Wm. Hutton, Mr. Wm. Womersley, Mr. Isaac Bakes, Mr. J. Boyd, Mr. J. Hargreaves, and Mr. David Smith. The hymn, "Before Jehovah's awful throne," was first sung. A bottle, containing the local papers, and a variety of documents, and some current coins, was then deposited in a cavity beneath the stone. Mr. Ald. Brown spread the mortar, the stone was lowered into its place, and he applied the usual tests to secure its being properly and safely laid. He then declared the stone well and duly laid, and prayed that God might so bless the work that it might be brought to a happy conclusion, and that it might be for the good of the township of Eccleshill for many generations. The Rev. J. Aston next offered up prayer. Mr. J. Hutton stated that Mr. Brown had promised to give £20, and a member of the committee had promised to double his subscription, making £50, in the hope that others would follow his example. The Doxology was sung, and the assembly separated. In the evening a meeting was held in the United Free Methodist Schoolroom, a large party having previously partaken of tea in the Wesleyan Schoolroom. The chair was taken by the Mayor of Bradford, and the claims of the enterprise were warmly advocated by many of the gentlemen who had been present at the afternoon ceremony.

DESCRIPTION OF THE SOCIETY'S PICTURES PAINTED BY JAMES BARRY.

The following description, written towards the latter part of the last century, has been reprinted in consequence of the wish expressed by the members at the last Annual General Meeting:—

The late James Barry, the artist to whose exertions the world is indebted for this valuable effort, has had, in the execution of it, the patriotic intention of offering to the public a practical illustration of the arguments he had occasion to adduce against opinions generally received and highly derogatory to the honour and genius of the British nation.

The opinions of such men as the Abbé du Bois, the President Montesquieu, and the Abbé Winckelman, could not fail to make a deep impression upon the public mind, and it unfortunately happened that these philosophical investigators of the human capacity, the art, and its history have followed each other in assigning limits to our national genius; they ascribe to it a certain character of heaviness and sterility of fancy, and affect to deduce them from physical causes; but they have wilfully taken advantage, or have been ignorant of, and deceived by, certain impediments which have happened casually to retard or prevent us from keeping pace with other nations in the acquisition of some of the fine arts, and have laid it down as a position from the same mode of reasoning, that the thing is impossible, from the supposition that we are naturally incapacitated by the cloudiness of our atmosphere, our soil, our food, and the very frame of our nerves. They assert that we have no imagination, no taste, no sensibility; that we are cold and unfeeling to the powers of music;* that we succeed in nothing in which genius is requisite;† and that if we ever merit admiration, it is for the hand and execution of the workman, not for the design of the artist; that we‡ partake so much of the distempers of our climate, as to disrelish everything, even life itself; that our poets are devoid of true taste and true imagery; that they make a great noise, but present nothing to the mind; and that our natural capacity for fine arts amounts to very little, or nothing at all.* Such is the unjust and illiberal picture of British genius, with respect to the fine arts, as drawn by the mistaken, though respectable authors above mentioned; to refute which, Mr. Barry published his "Inquiry into the real and imaginary Obstruction to the Acquisition of the Fine Arts in England;"† and in the performance of the magnificent work now before us, it appears, as well from his own "Account of the Pictures‡ as from his "Letter to the Dilettanti Society,"§ that it was his intention to effect that great *desideratum* of art, viz., the union or association of the Grecian style and character of design, with all those lesser accomplishments which the moderns have so happily achieved. Such an undertaking, so bold, so singular, and so unprecedented, reflects the highest honour on this eminent artist, who died on the 26th of February, 1806, in the fifty-sixth year of his age; and whose corpse was deposited in St. Paul's Cathedral on the 8th of May following, between the remains of Sir Christoper Wren and Sir Joshua Reynolds. These paintings will remain a monument to perpetuate his memory, honourable to himself and valuable to the Society.

The series consists of six pictures, on dignified and important subjects, so connected as to illustrate this great maxim of moral truth, "That the attainment of happiness, individual as well as public, depends on the development, proper cultivation, and perfection, of the human faculties, physical and moral, which are so well calculated to lead human nature to its true rank, and the glorious designation assigned for it by Providence." To illustrate this doctrine, the first picture exhibits mankind in a savage state, exposed to all the inconvenience and misery of neglected culture; the second represents a harvest-home, or thanksgiving to Ceres and Bacchus; the third, the victors at Olympia; the fourth, navigation, or the triumph of the Thames; the fifth, the distribution of rewards of the Society; and the sixth, Elysium, or the state of final retribution. Three of these subjects are truly poetical; the others historical.

The pictures are all of the same height, viz. eleven feet ten inches; and the first, second, fourth, and fifth, are fifteen feet two inches long; the third, and sixth, which occupy the whole breadth of the room, at the north and south ends, are each forty two feet long. The pictures were completed and publicly exhibited in 1783, and were presented to the Society in 1784.

First Picture.—"Orpheus."

The scenery of this picture exhibits a view of the mountainous and desert country of Thrace; near the centre of the piece, is Orpheus, in an action of great energy, enthusiastically singing his divine poems, his right-hand rapturously stretched towards Heaven; and for the harmonious accompaniment of his instructive song, the several fingers of his left hand are employed upon the various strings of the lyre suspended from his shoulder, representing him, according to his own assumption, as the inspired messenger and founder of the Grecian theology.

The story of Orpheus has exercised the pencils of many painters, who by realizing the poetical metaphor, have overlooked everything valuable in it; but Mr. Barry, instead of surrounding him with such auditors as trees, birds, and wild beasts, has united in his character the legislator, the divine, and the philosopher, as well as the musician, and has placed him in a wild and savage country, surrounded by people as uncultivated as the land they inhabit, depending upon the chase for

* L'Esprit des Lois, ch. ii., vi., xiv.
† Du Bois, Part 11, ch. xii.
‡ L'Esprit des Lois, ch. ii., vi., xiv.

* Hist. de l'Art, par l'Abbé Winckleman, p. 48.
† Printed by T. Becket, 1775.
‡ Published in 1798.
§ Published by J. Walker, 1779. See pp. 64, 132, 152.

their subsistence; whilst he, as a messenger from the gods, to whose mansions he seems pointing, is pouring forth songs of instruction, which he accompanies with the music of his lyre.

By the action of Orpheus, the song appears the principal, and the music an accessory part; as it should always be where utility and instruction are intended. His hearers, who are represented in what is called a state of nature, are most of them armed with clubs, and clad in the spoils of wild beasts; in allusion to their being possessed of courage and strength to subdue lions and tigers, but wanting wisdom and skill to prevent retaliation on themselves or their feeble offspring. This latter circumstance is finely illustrated, by a woman at some distance on the other side of the river, milking a goat, her two children sitting near her, at the entrance of the habitation, a cave, where they are ill-secured against a lion, who discovers them as he is prowling about for prey: still further in the distance are seen two horses, one of which is run down by a tiger; by this incident it is clearly pointed out that the want of human culture is an evil which extends beyond our own species, to all animals intended for domestication, and which have no other defence than the wisdom and industry of man.

It is a circumstance often observed by travellers, that the value and estimation of women increase according to the growth and cultivation of society, and that among savage nations their merits are disregarded, and they are in a condition little better than beasts of burden; all offices of fatigue and labour, war and hunting excepted, being reserved for them. It is to prove the truth of this observation, that a woman is leaning on her male companion, and carrying a dead fawn upon her shoulder. As Orpheus is said to have taught the use of letters, the theogony or generation of the gods, and the worship due to them, there is placed near him, on his right-hand, a scroll of mythological matters respecting the cosmogony and the mundane egg, &c., which is respectfully inspected by two admiring savages behind; and in the advanced part of the fore-ground are, a lamb bound, a fire kindled, and other preparations for sacrifice. The countenances and actions of the several hearers are happily contrasted, and well exhibit the effects of those lessons on the various dispositions in the sensibility and pious resignation so peculiarly characteristic of female nature, as well as in the various impressions of contemplation and reflection in the other sex, one of whom, contemplating his hands, and the various uses to which they are convertible, appears as if, for the first time, struck with the grand idea, that knowledge is power. About the fore-ground are scattered fragments of the Chaonian mast, or acorns, the miserable subsistence derived from spontaneous uncultivated nature. The whole of this picture shows with peculiar energy the effect of those benefits which accrue to mankind from religion and philosophy, and the absolute necessity of substituting the love and pursuit of truth, justice, order, and social virtue, in lieu of the fraud, violence, and disorder, of the savage state.

Second Picture.—"A Grecian Harvest Home."

The warm glow of colouring spread over this picture, and the elegance of the figures in the more conspicuous parts of it, form a striking and beautiful contrast to the picture already described. The season is, as the title expresses, that of harvest; and as most of the persons represented are employed in rural sports, the evening is chosen, as the most proper time for such relaxation from the labours of the field.

In the fore-ground is a double terminal figure of Sylvanus and Pan, with their proper attributes; round which, young men and women, in beautiful forms and lightly habited, are dancing to the music of a rural pipe and tabor, and seem, in the language of the poet, to

> "———— trip it as they go
> "on the light fantastic toe."

Behind them are oxen with a load of corn, and other characteristic marks of the season of the year. On one side of this happy group, appears the father, with a fillet round his head, and in his hand a staff, his aged wife along with him, beholding and partaking of the festivity of the scene.

In the opposite corner of the picture are some rustics sitting, in drunken disorder, with the fruits of the earth and implements of husbandry near them: these might serve as a foil, if any foil were necessary, to the beautiful dancing figures already described.

The distant parts of this pleasing picture exhibit a view of a fertile cultivated country, with a farm-house, near which are men wrestling, and engaged in other manly exercises which strengthen the body and elevate the mind to heroic actions; aged men are sitting and lying along, discoursing, and enjoying a view of those athletic sports, in which they can no longer engage. Here are also seen the various employments of a country life, as binding corn, tending bees, courtship, and everywhere a number of children. A marriage procession is advancing from a distant temple; and the joy of the accompanying figures expresses the happiness arising on such occasions, the labourers even suspending their work to hail the happy pair; in short, whatever can best point out a state of happiness, simplicity, and fecundity, in which, though not attended with much *éclat*, the duty we owe to God, our neighbour and ourselves, is perhaps better attended to than in any other state of life. Still further to embellish this picture, the artist has introduced, sitting on a pent-house, a peacock in fine plumage; and at the top of the picture, Ceres, Bacchus, Pan, &c., are looking down on the innocent festivity of their happy votaries: behind them is a limb of the Zodiac, with the signs Leo, Virgo, and Libra, which mark the season of the year.

Third Picture.—"The Victors at Olympia."

In this superb picture, the artist has happily chosen that point of time when the victors in the several games are passing in procession before the hellanodics, or judges, where they are crowned with olive in the presence of all the Grecians. At the right-hand corner of the piece, the three judges are seated on a throne, ornamented with medallions of Solon, Lycurgus, and other legislators, and with trophies of the victories of Salamis, Marathon, and Thermopylæ. Near the foot of the throne is a table, at which the scribe appears writing in the Olympic records of noble deeds, the name, family, and country of the conqueror; near this table, a victor in the foot-race, having already received a branch of palm, which he holds in his hand, is crowned by an inferior hellanodic; next him is a foot-racer, who ran armed with a helmet, spear, and shield. Close following is seen a manly group, formed of two athletic figures bearing on their shoulders their aged father; one of these represents a pancratiast, the other the victor at the cestus. The old man is Diagoras, of Rhodes, who, having in his youth been celebrated for his victories in the games, has, in his advanced age, the additional felicity of enjoying the fruits of the virtuous education he had given his sons, amidst the acclamations of the people of Greece, some of whom are strewing flowers around the old man's head, while one of his friends is grasping his right-hand, and supposed to be making the celebrated speech recorded on this occasion, "Now, Diagoras, die, for thou canst not be made a god." The climax of this domestic felicity is well pointed out by a child holding the arm of one of the victors, and looking up with joy in his countenance at the honours conferred on his grandfather. Near this beautiful group are seen a number of persons, the chief of whom represents Pericles speaking to Cymon. Socrates, Euripides, and Sophocles, are earnestly attending to what is said by Pericles, whilst the malignant buffoon Aristophanes is ridiculously laughing, and pointing to the deformity of the cranium of the speaker, which was unusually long. The painter has, in the

person of Pericles, introduced the likeness of the late Earl of Chatham. Next appears, in the front of the picture, a horse-racer; and close to him, a chariot drawn by four horses, on which is represented, in basso-relievo, the triumph of Minerva over Neptune, emblematical of the advantages of peace. In the chariot is Hiero, of Syracuse; and round the chariot are several persons with musical instruments, accompanied by many youths, forming a chorus, which is led by Pindar singing one of his odes, which he accompanies with his lyre.

As at one end of the picture there is represented a statue of Minerva, so at the other is that of Hercules trampling on Envy, which are comprehensive exemplars of that strength of body and strength of mind, which were the great objects of Grecian education. Sitting on the base of the statue of Hercules, the artist has introduced his own portrait, in the character of Timanthes, holding in his hand a picture of the Cyclops and Satyrs, as related by ancient writers.

Behind the stadium, at a distance, is a view of the beautiful Grecian temple of Jupiter Olympus, in the Atlis, the town of Elis, and the river Alpheus, as truly characteristic of the spot on which the ceremony that forms the subject of the picture may be supposed to have been performed.

The procession approaching the distant temple with a sacrifice, leads the mind to contemplate the numberless blessings which society derives, and can only derive, from the exercise of religious worship, and the happy opportunity it affords on such solemn occasions, of pacifying the minds of a belligerent people so composed as were the different states of Greece.

Fourth Picture.—The Thames.

The practice of personifying rivers, and representing them by a genius adapted to their peculiar circumstances, is as ancient as the arts of painting and sculpture; and in conformity to this practice the ingenious artist has in this picture represented the Thames of a venerable, majestic, and gracious aspect, sitting on the waters in a triumphant car, steering himself with one hand, and holding in the other the mariner's compass, by the use of which modern navigation connects places the most remote, and has arrived at a certainty, importance, and magnitude, unknown to the ancient world. The car is borne along by our great navigators, Sir Francis Drake, Sir Walter Raleigh, Sebastian Cabot, and the late Captain Cook; in the front of the car, and apparently in the action of meeting it, are four figures, representing Europe, Asia, Africa, and America, ready to lay their several productions in the lap of the Thames.

Sir John Denham, in his celebrated eulogium on this river, has expressed this circumstance very happily:—

> "Nor are his blessings to his banks confin'd,
> But free and common, as the sea or wind,
> When he, to boast, or to disperse his stores,
> Full of the tribute of his grateful shores,
> Visits the world, and, in his flying tow'rs,
> Brings home to us, and makes both Indies ours;
> Finds wealth where 'tis, bestows it where it wants;
> Cities in deserts, woods in cities plants,
> So that to us no thing, no place is strange,
> While his fair bosom is the world's exchange."

The supplicating action of the poor negro slave, or, more properly, of enslaved Africa, the cord round his neck, the tear on his cheek, the iron manacles, and attached heavy chains on his wrists, with his hands clasped and stretched out for mercy, denote the agony of his soul, and the feelings of the artist thus expressed before the abolition of slavery became an object of public investigation.

Over head is Mercury, the emblem of Commerce, summoning the nations together; and following the car are Nereids carrying several articles of the principal manufactures of Great Britain. The sportive appearance of some of these Nereids, gives a variety to the picture, and is intended to show that an extensive commerce is sometimes found subversive of the foundation of virtue.

In this scene of triumph and joy, the artist has introduced music, and, for this reason, has placed among the sea-nymphs his friend Dr. Burney, whose abilities in that line are universally acknowledged.

In the distance is a view of the chalky cliffs on the English coast, with ships sailing, highly characteristic of the commerce of this country, which the picture is intended to record. In the end of this picture, next the chimney, there is a naval pillar, mausoleum, observatory, and lighthouse, all of which are comprehended in the same structure, and which, by a flight of imagination no less classically happy than singularly original, the Tritons or sea-gods themselves appear to have erected as a compliment to the first naval power. In this important object, so ingeniously produced by the sea-gods, we have obtained the happy concurrence and union of so many important desiderata in that opportunity of convenient inspection of all the sculptured commemorations, the want of which has been so deeply regretted by all who have seen the Trajan and Antonine columns, and other celebrated remains of antiquity.

Fifth Picture.—The Society.

This picture represents the distribution of the rewards in the Society founded for the noble purpose of introducing and perfecting the useful arts in this country, for which we were formerly obliged to have recourse to other nations. Not far advanced from the left side of the picture stands the late Lord Romney, then President of the Society, habited, as all the other noblemen are, in the robes of his dignity; near the President stands his Royal Highness the Prince of Wales; and sitting in the corner of the picture, holding in his hand the instrument of the institution, is Mr. William Shipley, "whose public spirit gave rise to this Society."* One of the farmers, who are producing specimens of grain to the President, is Arthur Young, Esq.; near him is Mr. More, the late Secretary, distinguishable by the pen he holds. On the right-hand of the first Lord Romney stands the late Lord Romney, V.P., and on the left, the late Owen Salusbury Brereton, Esq., V.P. Towards the centre of the picture is seen that distinguished example of female excellence, Mrs. Montague, who long honoured the Society with her name and subscription. Her example has been imitated by the late Duchess of Northumberland, and other ladies, and probably will be followed by greater numbers, when it is more generally known that the fair sex may become members of this institution, and that many of its objects are peculiarly adapted to female accomplishments. Mrs. Montague appears here recommending the ingenuity and industry of a young female, whose work she is producing. Near her are placed the late Duchess of Northumberland, the present Duke of Northumberland, V.P., the late Joshua Steel, Esq., V.P., the late Sir George Savile, Bart., V.P., Dr. Hurd, Bishop of Worcester, Soame Jenyns, and James Harris, Esqrs., and the two Duchesses of Rutland and Devonshire; between these ladies the late Dr. Samuel Johnson seems pointing out this example of Mrs. Montague to their graces' attention and imitation.

Further advanced is his grace the late Duke of Richmond, V.P., and near him the late Edmund Burke, Esq.; still nearer the right-hand side of the picture is the late Edward Hooper, Esq., V.P., and the late Keane Fitzgerald, Esq., V.P. His grace the late Duke of Northumberland, V.P., the Earl of Radnor, V.P., William Locke, Esq., and Dr. Hunter, are examining some drawings by a youth, to whom a premium has been adjudged; behind him is another youth, in whose countenance the dejection he feels at being disappointed in his expectation of a reward, is finely expressed. Near the right-side of the piece are seen the late Lord Viscount Folkestone, first President of the Society, his son, the late Earl Radnor, V.P., and Dr. Stephen Hales, V.P. In the back-ground appear part of the water-front of Somerset-house, St.

* These words are engraved on the gold medal voted to Mr. Shipley in the year 1758.

Paul's, and other objects in the vicinity and view of this Society as instituted at London. And as a very large part of the rewards bestowed by the Society have been distributed to promote the polite arts of painting and sculpture, the artist has also most judiciously introduced a picture and statue; the subject of the picture is the Fall of Lucifer, designed by Mr. Barry when the Royal Academy had selected six of the members to paint pictures for St. Paul's Cathedral; the statue is that of the Grecian Mother Dying, and in those moments attentive only to the safety of her child. In the corners of the picture are represented many articles which have been invented or improved by the encouragement of this Society. In the lower corner of this picture, next the chimney, are introduced two large models intended by Mr. Barry as improvements of medals and coins.

Sixth Picture.—"Elysium, or the State of Final Retribution."

In this sublime picture, which occupies the whole length of the room, the artist has, with wonderful sagacity, and without any of those anachronisms which tarnish the lustre of other very celebrated performances, brought together those great and good men of all ages and nations, who have acted as cultivators and benefactors of mankind. This picture is separated from that of the Society distributing its rewards, by palm trees, near which, on a pedestal, sits a pelican feeding its young with its own blood; a happy type of those personages represented in the picture, who had worn themselves out in the service of mankind. Behind the palms, near the top of the picture, are indistinctly seen, as immersed and lost in the great blaze of light, cherubim veiled with their wings, in the act of adoration, and offering incense to that invisible and incomprehensible power, which is above them and out of the picture, from whence the light and glory proceed, which are diffused over the whole piece. By thus introducing the idea of the Divine Essence, by effect, rather than by form, the absurdity committed by many painters is happily avoided, and the mind of every intelligent spectator is filled with awe and reverence. The groups of female figures, which appear at a further distance absorbed in glory, are those characters of female excellence whose social conduct, benevolence, affectionate friendship, and regular discharge of domestic duties, soften the cares of human life, and diffuse happiness around them. In the more advanced part, just bordering on this blaze of light (where the female figures are almost absorbed), is introduced a group of poor native West Indian females in the act of adoration, preceded by angels burning incense, and followed by their good bishop; his face, partly concealed by that energetic hand which holds his crozier or pastoral staff, may, notwithstanding, by the word "Chiapa" inscribed on the front of his mitre, be identified with the glorious Friar Bartholomeo de las Casas, bishop of that place. This matter of friendly intercourse, continued beyond life, is pushed still further in the more advanced part of the same group by the male adoring Americans, and some Dominican friars, where the very graceful incident occurs of one of these Dominicians directing the attention of an astonished Carib to some circumstances of that beatitude, the enjoyment of which he had promised to his Carib friend. The first group below on the left-hand, in this picture, consists of Roger Bacon, Archimedes, Descartes, and Thales; behind them stands Sir Francis Bacon, Copernicus, Galileo, and Sir Isaac Newton, regarding with awe and admiration a Solar System, which two angels are unveiling and explaining to them; near the inferior angel, who is holding the veil, is Columbus, with a chart of his voyage; and close to him, Epaminondas with his shield, Socrates, Cato the younger, the elder Brutus, and Sir Thomas More; a Sextumvirate, to which, Swift says, all ages have not been able to add a seventh. Behind Marcus Brutus is William Molyneux, holding his book of the Case of Ireland; near Columbus are Lord Shaftesbury, John Locke, Zeno, Aristotle, and Plato; and in the opening between this group and the next are Dr. William Harvey, the discoverer of the circulation of the blood, and the Honourable Robert Boyle. The next group are legislators, where King Alfred the Great is leaning on the shoulder of William Penn, who is showing his tolerant, pacific code of equal laws to Lycurgus; standing round them are Minos, Trajan, Antoninus, Peter the Great of Russia, Edward the Black Prince, Henry the Fourth of France, and Andrea Doria of Genoa. Here, too, are introduced those patrons of genius, Lorenzo de Medici, Louis the Fourteenth, Alexander the Great, Charles the First, Colbert, Leo the Tenth, Francis the First, the Earl of Arundel, and the illustrious Monk Cassiodorus, no less admirable and exemplary as the Secretary of State than as the friar in his convent at Viviers, the plan of which he holds in his hand. Just before this group, on the rocks which separate Elysium from the Infernal Regions are placed the angelic guards (see Milton, book iv., ver. 549); and in the most advanced part an archangel, weighing attentively the virtues and vices of mankind, whose raised hand and expressive countenance denote great concern at the preponderancy of evil; behind this figure is another angel, explaining to Pascal and Bishop Butler the analogy between natural and revealed religion. The figure behind Pascal and Butler, with his arm stretched out and advancing with so much energy, is that ornament of our latter ages, the graceful, the sublime Bossuet, Bishop of Meaux; the uniting tendency of the paper he holds in that hand, resting on the shoulder of Origen, would well comport with those pacific views of the amiable Grotius for healing those discordant evils which are sapping the foundation of Christianity amongst the nations of Europe, where in other respects it would be, and even is, so happily and so well established. See page 61 of Mr. Barry's printed letter to the Society for the Encouragement of Arts, &c., dated Feb. 1793.

Behind Francis the First and Lord Arundel, are Hugo Grotius, Father Paul, and Pope Adrian.

Towards the top of the picture, and near the centre, sits Homer; on his right-hand Milton; next him, Shakespeare, Spenser, Chaucer, and Sappho. Behind Sappho sits Alcæus, who is talking with Ossian; near him are Menander, Molière, Congreve, Brahma, Confucius, Mango Capac, &c. Next Homer, on the other side, is the Archbishop of Cambray, with Virgil leaning on his shoulder; and near them Tasso, Ariosto, and Dante. Behind Dante, Petrarch, Laura, Giovanni, and Bocaccio. In the second range of figures, over Edward the Black Prince and Peter the Great, are Swift, Erasmus, Cervantes; near them Pope, Dryden, Addison, Richardson, Mendelssohn, and Hogarth. Behind Dryden and Pope, are Sterne, Gray, Goldsmith, Thomson, and Fielding; and near Richardson, Inigo Jones, Sir Christopher Wren, Sir Joshua Reynolds, and Vandyke. Next Vandyke is Rubens, with his hand on the shoulder of Le Sueur; and behind him is Le Brun: next to these are Giulio Romano, Dominichino, and Annibal Carracci, who are in conversation with Phidias, behind whom is Giles Hussey. Nicholas Poussin and the Sicyonian maid are near them, with Callimachus and Pamphilus; near Apelles is Correggio; behind Raphael stand Michael Angelo, and Leonardo da Vinci; and behind them, Ghiberti, Donatello, Massaccio, Brunaleschi, Albert Durer, Giotto, and Cimabue.

In the top of this part of the picture, the painter has happily glanced at what is called by astronomers the system of systems, where the fixed stars, considered as so many suns, each with his several planets, are revolving round the Great Cause of all things; and representing everything as effected by intelligence, has shown each system carried along in its revolution by an angel. Though only a small portion of this circle can be seen, yet enough is shown to manifest the sublimity of the idea.

In the other corner of the picture the artist has repre-

sented Tartarus, where, among cataracts of fire and clouds of smoke, two large hands are seen; one of them holding a fire-fork, the other pulling down a number of figures bound together by serpents, representing War, Gluttony, Extravagance, Detraction, Parsimony, and Ambition; and floating down the fiery gulph, are Tyranny, Hypocrisy, and Cruelty, with their proper attributes; the whole of this excellent picture proving in the most forcible manner, the truth of that great maxim, which has been already quoted, but cannot be too often inculcated:—"That the attainment of man's true rank in the creation, and his present and future happiness, individual as well as public, depend on the cultivation and proper direction of the human faculties."

In addition to the pictures described above, there are two other pictures in the Great Room; one by Mr. Horsley, R.A., representing Her Majesty surrounded by the Royal Family at Windsor Castle; the other by Mr. Cope, R.A., representing His Royal Highness the Prince Consort with his hand upon the charter of the Great Exhibition of 1851. It will be in the recollection of members, that these pictures (with a bust of the Prince Consort now in the Vestibule) were presented to the Society by subscription amongst its members, as a memorial of His Royal Highness, who was for eighteen years President of the Society.

When the subject of this memorial was under discussion, it was suggested that the completion of the decoration of the Society's Great Room, as designed by Barry, would (in addition to the bust above referred to), be a suitable form for the memorial.

In Barry's original design the spaces at the end of the room, where the portraits of Lords Romney and Folkestone were formerly placed, were to have been filled—one with a portrait of George the Third, and the other with a group representing Queen Charlotte superintending the education of her family at Windsor Castle. Barry did not live to complete these pictures, but his intentions were accurately recorded in his own etchings. The spaces intended to have been thus occupied have now been filled with the two pictures just described.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The thirty-eighth meeting will commence in Norwich on Wednesday, the 19th of August next, under the presidency of Joseph Dalton Hooker, Esq., F.R.S., D.C.L., &c., Curator of the Royal Gardens at Kew.

The fact that Norwich has never before been visited by the British Association, the character of its manufactures, the highly interesting geological features and archæological remains in the surrounding district, with a hearty desire worthily to receive the Association, will combine, it is hoped, to make the meeting thoroughly interesting and succesful.

Through the liberality of various public bodies and private individuals, the Committee have obtained excellent accommodation for the various meetings of the Association; a subscription has been raised to defray local expenses; the offers of private hospitality have been numerous; special invitations have been given to the corresponding members and a large number of distinguished foreigners; and every effort will be made to receive and heartily entertain visitors to the meeting.

Those who propose to be present at the meeting should communicate with Messrs. Donald Dalrymple, Hinds Howell, and Joseph Crompton, Honorary Local Secretaries, in order that they may be supplied with a railway pass ticket; and also that accommodation may be obtained for them.

The Reception-room, at Masonic Hall, Theatre-street, Norwich, will be open on Monday, August 17, at 12 o'clock, for the sale of tickets, and for supplying information.

Communications intended for presentation to the sections should be forwarded in letters, before August 15th, addressed either to G. Griffith, Esq., Assistant General Secretary, 1, Woodside, Harrow, or to one of the local secretaries at Norwich, and should be accompanied by a statement whether the author will be present, and on what day, so that the business of the Association may be satisfactorily arranged.

The opening address will be delivered in the Drill-hall, on Wednesday evening, the 19th of August, at 8 o'clock, by Joseph Hooker, Esq., F.R.S., D.C.L., &c., President Elect.

Soirées will be held in St. Andrew's Hall on the evenings of Thursday, the 20th, and Tuesday, the 25th of August.

Evening lectures will be delivered in the Drill-hall on Friday, the 21st, and Monday, the 24th of August, at half-past eight o'clock.

Various excursions (geological, archæological, and ethnological) have been arranged to take place on Thursday, the 27th of August, to Cromer and its district, to Hunstanton, to Holkham, Castle Acre, Diss, Hoxne, Thetford, &c., full details of which, with times of trains, will be published in due course. Minor excursions, within a short distance of Norwich, are in course of arrangement.

AGRICULTURAL EDUCATION IN FRANCE.

Considerable attention has been given of late in France to the education of the rural population, and the Minister of Public Instruction has recently taken a step of some importance in the same direction as regards girls; he has commissioned Madame la Baronne Hérald de Pages, a lady who has given great attention to agricultural and philanthropic instruction, to inspect all the girls' schools in France in which agriculture is added to the ordinary studies of primary schools. Madame de Pages will commence her inspection with Bordeaux, and afterwards continue her labours throughout the South of France, the Vosges, and Alsace. Reports have shown how terribly wanting in the principles and practice of household economy are the women and girls of the agricultural districts of England, and there is little doubt that their sisters of France are in a condition very little (if any) superior, and the visits of a well-informed lady cannot fail to produce a good effect.

In the same spirit M. Malgras, academical inspector of Epinal, has issued a circular to the schoolmasters of the Vosges, containing practical hints for the guidance of the latter. The Inspector recognizes the facts of the introduction of agricultural lessons in many of the schools, and adds that the method should be systematised, account being always taken of the special agricultural character of each locality. He impresses upon the teachers of the schools that lessons are not alone sufficient; that the pupils should be taken to see the best-kept farms in the district; be made to study the various kinds of soil and their products, and visit the stables, cattle-houses, fields, and vineyards of those who have received medals for their good farming or management. The schoolmasters are especially enjoined to make their own gardens practical schools of instruction. The Inspector requires, moreover, that on or before a given day each schoolmaster shall make a return of the means which are at his disposal, or of which he proposes to avail himself, for giving instruction in agriculture and horticulture. The schoolmasters are instructed to make (or cause their pupils to make) a plan of the garden or land placed at their disposal, on a scale of 1 in 100 or 1 in 200, according to the extent of the plot, indicating the boundaries, walks, beds, trees, and other objects, such plans to be on paper of a given size, and to bear the name of the commune, the name and age of the draughtsman, and an explanatory inscription. These plans are to be sent in by a given date, in order to be exhibited at the Scholastic Show of the Department.

The Prefect of the Department is instructed to confer with agricultural, horticultural, and other societies, in order that well-drawn plans may be rewarded with prizes.

Fine Arts.

Statue to the late Painter, Ingres.—A competitive exhibition of models for a statue of the late painter, Ingres, is about to take place at the Institut of France. More than thirty models have arrived, some from Rome and other parts of Italy, and some from Athens, but the majority from the ateliers of Parisian sculptors. M. Ingres was not a favourable subject for sculpture, but the estimation in which he was held will probably have induced some clever sculptors to compete for the execution of the statue to be raised to his memory.

Discovery of Ancient Painting at Milan.—A fine fresco has just been discovered in the church of Santa Maria del Giardino, which is now being demolished. This fresco, which is in a good state of preservation, represents St. Antonio of Padua, and is attributed to the painter Suardi.

Excavations at Pompeii.—The excavations, which are being carried on with great activity just now at Pompeii, have brought to light two very interesting specimens of ancient art, namely, two fresco portraits, situated under a portico of the Via Stabiana. They are believed to be the master and mistress of the house. The man wears the toga of magistrate, and the woman is represented in the attitude of a person reflecting about what she is to write, for she has a style in her right hand and is about to carry it to her lips, while in her left she holds the writing tablets. Both the portraits are well executed.

New Royal Academician.—At the meeting of members and associates of the Royal Academy, on Tuesday, the 30th ult., for the election of a member in the place of Baron Marochetti, deceased, Mr. F. Leighton was chosen by a large majority. Mr. Leighton was elected A.R.A. in July, 1864.

Collection of Engraved Portraits.—The authorities of the South Kensington Museum are forming a collection of engraved portraits, and a considerable number of those which have already been obtained are now on view on the upper floor of the national portrait exhibition at Kensington.

Manufactures.

Production of Silk in Syria.—According to the report of the Italian Consul at Beyrout, the total production of silk in Syria, including the province of Aleppo and the adjacent island of Cyprus, amounted, in 1867, to 1,744,000 kilos. of cocoons. The highest price paid was 6 fr. 65 c. per kilo., and the lowest 4 fr. 20 c. The quantity of silk obtained from the cocoons is also very variable, depending almost entirely on the mode of winding. Treating the cocoons in the native manner, only about a kilogramme of silk is obtained from 8 kilos. of cocoons, whilst, on the other hand, 2 kilos. of silk are obtained from 10 to 12 kilos. of cocoons when the operation is conducted in the European manner. The total production of silk may be estimated at 149,881 kilos., of the value of 14,086,035 francs. The greatest part, viz., 125,000 kilos., was exported to France. The report observes that the grains (eggs) of Candia and Egypt succeed best in the plains, whilst the Chinese and Japanese grains gave the best results in the hills.

Glass Cutting.—The *Athenæum* says that a new method of cutting, or rather dividing, glass has been recently invented in France, and is practised in the large establishment of the Glass Company of Baccarat. A jet of highly heated air is directed from a tube on the vase or other object to be cut, which, while made to revolve on its axis, is brought close to the nozzle of the tube. The object being then cooled suddenly, the glass divides at the place operated on with extreme accuracy.

Flour Mills in Italy.—The flour mills in Italy are chiefly driven by water-power. According to the latest statistics the total number of these mills is 52,846, containing 78,813 pairs of stones. Taking the total population of Italy at 24,255,488 persons, there is one mill to every 461 inhabitants, or a pair of stones to every 307 persons. In Northern Italy, that is to say, Piedmont, Lombardy, and the Venetian provinces, composed of 5,277 communes, with 9,717,113 inhabitants, there are 29,308 mills and 43,350 pairs of stones. In Central Italy, which comprises Everilda, Umbria, the Marches and Tuscany, the number of mills is 8,373, with 17,689 pairs of stones to 1,071 communes and 6,368,993 inhabitants. In the Neapolitan provinces and Sicily, with 2,214 communes and 9,179,322 inhabitants, there are 14,687 mills and 17,774 pairs of stones. Of the 68 provinces in Italy, that which contains the greatest number is Cagliari, 10,016; next comes the province of Sassari, with 3,647 mills; then Lecce, with 1866; Genoa, 1721; Turin, 1588; Rovigo, 1,348; Novara, 1,329; Florence, 1,309; Potenza, 1,241. The provinces which contain the fewest number of mills are Ravenna, with 95, and Livorno, 75. As regards the number of pairs of stones, in the province of Cagliari there is the greatest number, 10,422; then Sassari, 3,760; Turin, 3,267; Florence, 3,012; Genoa, 2,940; Novara, 2,237. The least number are in the province of Porto Maurizio, 288; Ascoli Piceno, 284; Ravenna, 251; Caltanisetta, 235; Mantua, 232; and Livorno, 99. Of late years several mills driven by steam power have been built. At Venice there is one of these establishments which produces about 255 hectolitres per day. In Calabria there are two mills driven by steam-power. At Bari one, producing 200 hectolitres per day. At Ferrara there is another. In Tuscany there are several mills driven by steam, one at Leghorn, another at Pontedera, and three at Calci, near Pisa, with 17 pairs of millstones. The number of mills on the American plan is very limited in Italy. In the province of Verona there are 8 mills on this plan, of which 4 have 22 horse-power, and grind about 25,000 hectolitres of grain a year. At Ancona there is also a mill on this plan. In Piedmont the same system is used on a large scale at Collegno, near Turin, with 24 pairs of stones, and grind daily 500 hectolitres of grain. These mills produce daily 300 quintals of flour. Another establishment, near Settimo Torinese, with 6 pairs of stones, grinds upwards of 250 quintals of corn per day. Another mill, at Sampierdarena, driven by water-power, produces 20,000 quintals of flour yearly. The production of wheat in Italy amounts to 34,397,168 hectolitres; oats, maize, &c., to 19,152,092 hectolitres. Taking the imports at 4,150,000 hectolitres, the total amount of corn ground averages yearly 57,700,000 hectolitres. Besides the flour which is produced in Italy about 79,000 quintals of foreign flour is imported. The exports do not amount to more than half the imports. The following are the exports and imports from 1861 to 1865:—

	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Quintals.	Francs.	Quintals.	Francs.
1861....	49,707	1,889,000	42,253	1,606,000
1862....	79,747	3,030,000	28,305	1,077,000
1863....	90,287	4,431,000	55,045	2,167,000
1864....	84,603	3,235,000	41,907	1,593,000
1865....	89,982	3,416,000	48,325	1,836,000
Average	78,845	3,200,000	43,147	1,656,000

The principal exports of flour from Italy are to England, France, and Switzerland.

Commerce.

OCEAN TELEGRAPHY.—A meeting was held at the City Terminus Hotel, on the 3rd inst., of gentlemen interested in ocean telegraphy, to hear Capt. Rowett describe his patent for hempen cables, and his progress in connection with them. Capt. Rowett received a concession from the Emperor of the French for an Atlantic cable. He claims under his patent the modifications adopted by the Atlantic Telegraph Company. He now proposes to adopt the simple sheathing of hemp, manilla, or coir, relying on the durability of hemp as tested in the case of the Atlantic cable, and simplifying the manufacture and laying, resulting consequently in a very large reduction of expense. He suppresses all wires or metallic armour in the sheathing, considering the hemp sufficiently durable for protection, this becoming hard and heavy when wetted. He avoids the complications and expense of the present paying-out machinery. Under such circumstances he assumes a very large reduction and consequent economy in laying cables to India, Java, China, Australia, America, &c.

SEA FISHERIES. — The Dieppe fishermen have just completed their mackerel fishing for the season, which has proved more than usually successful, the fish being remarkably plentiful, especially during the last week or two of the season; eight Dieppe boats, making a total of twenty-one voyages, brought in more that four hundred thousand fish, all of which were salted on board, the trade for salt mackerel being apparently on the increase. The following is a return of the produce of the boats of other ports:—Boulogne, eight boats, in eleven trips, obtained three hundred thousand fish; and two boats belonging to Courseulles, making only three voyages, 56,846. The take of the fishermen of these three ports has, therefore, amounted to nearly eight hundred thousand fish of one kind only.

PRODUCTION OF SHIPS' BISCUITS IN ITALY. — The production of ships' biscuits in Liguria and at Leghorn forms now an important branch of trade. Formerly this article was imported from other countries, but of late years this industry has so increased that the exports exceed the imports by upwards of 600,000 frs. (£24,000). The Russian and Greek shipping are those which principally use the Italian biscuits. The following are the exports and imports of this article from 1862 to 1865:—

	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	quintals.	frs.	quintals.	frs.
1862....	396	24,000	4,172	250,000
1863....	216	13,000	21,547	1,293,000
1864....	209	13,000	11,295	677,000
1865....	311	19,000	4,881	293,000
Average	283	17,000	10,474	628,000

COMMERCE OF VENICE.—The following is the value of the merchandise imported and exported from Venice during the last five years:—

Imports.

	Francs.
1863	123,285,012
1864	117,431,239
1865	110,796,341
1866	98,739,457
1867	128,668,460

Exports.

	Francs.
1863	74,257,147
1864	77,049,854
1865	71,009,059
1866	68,321,674
1867	101,565,424

From this it will be seen that, although great outcries are being made as to the stagnation of trade at Venice, there is no reason to complain, and that it has increased considerably since its annexation to the kingdom of Italy.

A SULTAN'S ORDER.—The Sultan has given a splendid commission to the famous house of Froment-Meurice and Marnyac, of Paris, consisting of a series of massive pieces of plate for a dinner table. The centre piece will stand more than six feet high, and will represent a Moorish palace, in the style of the Alhambra; on each side of this central ornament are to stand two large fountains; two triumphal arches occupy positions at some distance, and several smaller pieces, *bouts de table*, as they are called, to hold flowers or fruit, or both, complete the series, or *surtout de table*. The whole are to be of massive silver, and, of course, all in the same style. The Sultan has at the same time ordered the table on which the grand specimen of the silversmiths' art is to stand, together with complete services of china, glass, and cutlery; the table, it is said, is to measure more than 140 feet in length, and sixteen feet in breadth. The price of the silver plate ordered of MM. Froment-Meurice and Marnyac is reported to be four millions of francs, or £160,000.

IMPORTATIONS OF WHEAT.—The *Produce Markets' Review* says:—From official returns it appears that our total importations of wheat during the first quarter of the present year were 8,465,521 cwts., an increase of 40 per cent. over those of the same quarter of 1866. The chief supply continues to be derived from Russia, although that country has not maintained its relative positions in our market; since in the first quarter of last year we derived from her about 44 per cent. of our entire importations, while on the present occasion her proportion has only been 27 per cent. From Prussia, likewise, the quantity has been only about two-thirds that of last year. The great increase has been in the instances of Egypt and the United States. Egypt, which last year sent us only 10,954 cwts., has this year contributed 1,241,382 cwts., or about 15 per cent. of our entire supply; while the United States have more than trebled their consignments, the total arrivals thence having been 1,868,119 cwts., or about 22 per cent. of our entire supply. Of grain other than wheat, our importations have in every case, with the important exception of Indian corn, been less than in the first quarter of last year, the diminution having been 40 per cent. in barley, 23 per cent. in oats, 30 per cent. in peas, and 7 per cent. in beans. Of Indian corn, the arrivals have been 2,302,287 cwts., an excess of 71 per cent.

Colonies.

PROGRESS IN AUCKLAND, NEW ZEALAND. — The census returns show an increase in the population of the province of 6,189 since December, 1864, the total number being now 48,321. The population of the city of Auckland is now 17,606, against 17,145 in 1864. The number in the city would have shown a greater increase but for the recent rush to the Thames gold fields. Since 1864, 78,846 acres of land have been fenced in, and 42,481 brought into cultivation, the Government returns now showing that 207,994 acres have been fenced in, and that there are now 130,037 acres of land under crop. There is also a marked increase in the stock of the colony, especially in the number of sheep, which in three years have more than doubled, there having been in 1867 172,030 head of sheep, against 73,151 in 1864.

COAL IN NELSON, NEW ZEALAND. — The coal seams at the Grey River were discovered about twenty-two years ago, but beyond the fact of their existence nothing was really known about them for thirteen years afterwards. In the year 1860 surveyors were appointed by the Government to examine and report upon the coal-beds in the south-west districts, and then was the colony

first made acquainted with its great mineral wealth. No attempt, however, was made to work the coal at the Grey River until gold was discovered near the river, when, about three years ago, a party of six working men, by permission of the Government, opened the mine, and with very inadequate means supplied with coal the steamers visiting the Grey River. Subsequently an offer was made to the Government by parties who stated they had capital to work the coal, and place it within the reach of shipping, at the lowest possible cost; they were, after due inquiry, accepted as lessees, but the working of the mine has, so far, been a disappointment to all who desire to see New Zealand supply itself with coal. The only means of cheapening the cost of transporting the coal from the Grey River to the port of Nelson is by the construction of a railway, which, it is hoped, will shortly be commenced. It is calculated that by means of a railway the coal could be delivered at the port at about 9s. per ton, whilst at present, owing to the difficulties attendant on its transport, the price varies from 25s. to 30s. per ton. There seems no doubt that a large demand for the coal would spring up at Melbourne and other Australian ports.

Silver in Victoria.—A discovery of silver ore on the surface has been made in the neighbourhood of Smythsdale; and a license or lease for an extensive area of land, to be used for mining purposes, has been applied for. A fine sample of mixed metal—gold and silver—from the St. Armand Mine, now known as the Pioneer, has been shown in Melbourne.

Immigration in South Australia.—A South Australian paper says:—"The number of immigrants introduced at the public expense during the ten years preceding 1867 has been 23,795, whilst the nett increase of population from foreign sources, in other words, the excess of the total immigration over the total emigration in that period, was 21,970, showing a loss of 1,825 immigrants; and as the actual cost of every immigrant landed at Port Adelaide has been £17 each, the money-loss to the colony is fully £31,000. The total outlay of the Immigration Department of the Government between 1857 and 1867 was £398,106."

Labour in Queensland.—It is now being discovered that many of the anticipations which were indulged in as to the benefits to be derived from the importation of labourers from the South Sea Islands were without foundation. The men are neither so industrious nor tractable as represented, their most distinguished characteristics being to have an unlimited capacity for eating and sleeping, and an inclination either to obtain raised wages or to run away. It is more than probable that in the southern part of the colony the employment of these men will be confined to a few plantations, where they can be worked in gangs.

Cloth Manufacture in Victoria.—In connection with the manufactures of Victoria, it is satisfactory to report that the first cloth factory established in Victoria is now in full operation near Geelong, and is capable of turning out about 1,500 yards of cloth per week, the manufacture of which will consume about 1,820 lbs. of washed, or 2,880 lbs. of greasy wool. Between forty and fifty persons are employed, chiefly women and girls, the former earning 20s., and the latter about 7s. a-week.

Notes.

Mont Cenis Railway.—The Fell Railway over the Mont Cenis appears to be working admirably, and to give the utmost satisfaction to those who travel by it, both as regards the saving in time and expense. The prices charged are little more than half those formerly paid by diligence, being 25frs. 1st class, instead of 40frs., the charge for a place in the coupé in the diligence. The 2nd class fare is 22frs., and the 3rd class 18frs., instead of 35frs., which was paid for places in the interior or banquette of the diligence. The charge for goods has also been reduced from 100frs. to 77frs. per ton of 1,000 kils. by "grande vitesse," and from 60frs. to 40frs. by "petite vitesse." The postal service between Paris and Florence has been acccelerated by the opening of this line. Formerly a letter leaving Paris at eight o'clock in the evening arrived at Florence two days afterwards, but so late at night that it was not delivered till the next morning. Thus, letters which left Paris on Monday evening were distributed in Florence on Thursday morning. They now will arrive on Wednesday morning, and be at once delivered, and a gain of a day is effected. It is much to be regretted that other towns in Northern Italy do not enjoy a like advantage, the Alta Italia Railway Company not having thought fit to make any alteration on their line from Turin to Milan and Venice, and letters which arrive in Turin in the evening are not forwarded to Milan and Venice until the next morning, and arrive too late for delivery at Venice that day. Letters from London might equally share the advantages of the new system if the Post-office authorities in Paris did not detain them for twelve hours, and a night service were organised over Mont Cenis.

Water Velocipede.—*Galignani* says:—An ingenious application of the principle of the velocipede to water-locomotion may now be seen on the Lake of Enguien, near Paris. The form of this new species of naval construction is that of the twin ship tried some years back on the Thames, the motive power being placed in the middle instead of on each side as in ordinary paddle steamers. A pair of hollow water-tight pontoons, about 12 feet long, 10 inches wide in the thickest part, and tapered to a point at each end, are fastened together about twenty inches apart by transverse bars near the extremities. In the centre is placed the seat, rising about two feet above the water, and supported by iron rods. In the front is the paddlewheel, about three feet in diameter and eight inches broad, provided with sixteen floats, the axle turning on stout iron uprights, and the rotary motion being obtained from cranks worked by the feet. This little vessel is steered by rudders at each of the sterns, and moved by lines. The pontoons being made of thin mahogany planks, the whole construction is very light, and glides along with astonishing rapidity. This water velocipede, having been built as a first experiment, is no doubt susceptible of improvement in some of its details, but the principle may be already pronounced a complete success. The inventor is M. Thierry, an architect, of Paris.

The Mont Cenis Tunnel.—During the present year to 30th April, the total advancement made at the Mont Cenis Tunnel has been 421·35 metres, of which 199·50 was at the Italian side, at Bardonnèche, and 221·85 metres at Modane on the French. During the month of April, the total progress made was 109·35 metres, of which 46·40 metres were driven at the Bardonnèche end, and 62·45 metres at Modane. The position of the tunnel up to the 30th April was as follows:—

	Metres.
South end, Bardonnèche	4,924
North end, Modane	3,344
Total length of tunnelling	8,268
Remaining to be driven	3,952
Total length of tunnel	12,220

The Brindisi and Alexandria Routes.—According to the report just published by the Southern Railway Company of Italy, the total number of passengers who passed over this line *en route* for the East during the last ten months of 1867 was 673. Previously to this date there were no returns, as the through service from Paris to Alexandria at reduced rates was not established.

Telegraphic Improvements in France.—The Corps Legislatif has just adapted a bill modifying the charges for telegraphic dispatches in France. From the pro-

mulgation of the new law, the cost of a message of not more than twenty words between any two offices in the same department of France is to be only fifty centimes, (5d.) From the 1st of November, 1869, the price of a single telegram between any two departments in France is to be one franc, and this rate may be forestalled by imperial decree. In either case the fees to increase 50 per cent. for every ten words, in addition to the original twenty. The bill also authorizes the authorities to arrange a system of payments through the medium of the telegraphic service in addition to that of post-office orders. The new scale of prices will doubtless create a large increase in the number of messages, and therefore it is found necessary to lay down several new lines, open extra offices, and make various improvements in the material of the service ; the cost of these operations is estimated at 4,021,500 francs (nearly £161,000.) The following are the details of the estimate :—

	Francs.
New lines from Paris to Marseilles and Nice	1,096,500
Line from Paris to Clermont-Ferrand and Nimes	90,000
Line from Paris to Limoges, Toulouse, and Montpellier	409,000
Line from Paris to Bordeaux and the Spanish frontier	276,000
Line from Lyons to Toulouse and Bordeaux	102,500
Lines in Brittany	127,500
Lines in Normandy	163,750
Lines in the North	161,250
Lines in the East	345,000
Establishment of underground lines within and around the most important towns	300,000
Establishment of atmospheric tubes for the distribution of dispatches in Paris	500,000
Purchase and fitting up of improved apparatus	200,000
Sundries	250,000
Total	4,021,500

American Association for the Advancement of Science.—It appears by a circular of the committee that the objects of this Association for the Advancement of Science are very similar to those of the British Association ; they are, by periodical and migratory meetings, to promote intercourse between those who are cultivating science in different parts of North America ; to give a stronger and more general impulse, and a more systematic direction to scientific research in that country, and to procure for the labours of scientific men increased facilities and a wider usefulness. The seventeenth meeting of the association will be held at Chicago, during the week commencing on Wednesday, August 5th, 1868, at ten o'clock, a.m. It will be the aim of the Local Committee to make the sojourn of the members of the association in Chicago pleasant, as well as profitable in a scientific point of view. The usual local courtesies will be extended to them, both by private citizens and public bodies. Resolutions of invitation, and offers of the use of rooms, libraries, collections, &c., have already been passed by the Academy of Sciences, the Historical Society, the Young Men's Association, the University of Chicago, the Board of Trade, and other bodies. Communications should be addressed to the Local Secretary, at the Academy of Sciences, No. 263, Wabash Avenue, or Post-office Box, 1,430, Chicago, Ill.

The Inventor of Envelopes.—The *Stationer* states that about forty years ago there lived at Brighton a bookseller and stationer of the name of S. K. Brewer, and he used to place in his shop window piles of paper, beginning at the largest up to the then smallest size, 16mo. ; but to finish off the pile he cut cards so as to bring them up to a point. Ladies used to go in and ask for that "dear little paper," which induced him to cut paper in small sizes. Then came the difficulty of the place for address, and the result was he invented the envelope, and had metal plates made for cutting them to shape and sizes. This just pleased the ladies, and orders came to him for the little paper and envelopes from all parts. This at length became such a demand upon his time, that he got Dobbs and Co., of London, to make them for him. Such was the beginning of the envelope trade.

Healing of Wounds by Lead.—The *Journal des Connaissances Medicales* contains a paper by Dr. Burggræve, member of the Academy of Medicine of Belgium, on the new way of dressing wounds by means of a lamina of lead, of the thickness of about half a millimetre, and which, therefore, can be easily bent by the fingers, and thus, by pressure, made to assume the form of the injured part. Once applied, it is fixed by means of strips of adhesive plaster, and once or twice a day irrigations are effected on the limb. The author of the paper states that 165 patients out of 179 treated at the civil hospital at Ghent for workshop or railway accidents, most of which were very serious, were cured without undergoing any operation, the only course followed being the treatment by lead above described. The average duration of the cure was 31 days and a fraction. Only 14, or eight per cent., died, including those who expired a few hours after the accident, and who may consequently be considered as having been mortally wounded. For the last five years not a single operation has taken place by the knife at the Ghent Hospital in the cases alluded to. Nature alone performs the cure ; all the surgeon has to do being merely to second her, and avoid the application of irritating substances. Wounds by laceration or crushing are less dangerous in their consequences than those by the knife, the vessels in the former case being contracted, and offering less chance of purulent absorption. About 50 per cent. of operations by the knife end in death, owing to the general weakness induced by loss of blood and by a strict diet. By the lead treatment the patient is not deprived of his limb, and can use it, though in a mutilated state. The lead remains in its place for ten or twelve days, without any other trouble than that of making a current of fresh water pass between the lamina and the flesh, and keeping the limb in a bath. Any person, without being a surgeon, can learn to apply the lead ; and this system, therefore, promises to be extremely useful on the field of battle.

Hospitals and Asylums in France.—The number of hospitals in France is said to be 337, and of *hospices*, including asylums for the aged, infirm, incurable, orphans, and foundlings, 199, besides 734 establishments which are at once hospitals and asylums, making a total of 1,270, whereas, in 1805, the number was 1,920 ; this diminution being the result of improved organisation. The average income of these establishments amounted to about 20,000,000frs. at the end of the past century, but at present it is nearly triple that sum. The budget of Paris includes 44,000,000frs. for charitable purposes, of which 9,000,000frs. are devoted to the hospitals, and the remainder to the relief of the indigent ; of this latter about one-third is collected by charitable societies, which number more than a hundred. In 1789 the number of persons in asylums was stated at 40,000, but they contain double that number at present, while the sick in the hospitals has risen since the same date from an average of 25,000 to 90,000.

Mineral Oil as a Destroyer of Insects, &c.—Petroleum oil, especially in the crude state, is found in France to be of great value in destroying insects—slugs, ants, caterpillars, and other mischievous creatures. The petroleum is mixed with water, in the proportion of from an ounce to half an ounce to a pint of water in ordinary cases, but when applied to fruit trees or delicate plants the quantity of the oil is still further diminished. A very weak solution, applied to cherry trees with a watering pot, is said to be completely efficacious against the *ver blanc* or larvæ of the cockchafer. A strong

solution, poured into the holes and down walls infested by insects, is said to kill them rapidly. Another application of the solution is to rid dogs and other animals of parasites, but the parts must be rubbed with soap a few minutes after the solution has been applied. An agriculturist in the Aube says that the rats and mice with which his cellar had been infested, all quitted it when some petroleum was stored there, and that his garden was cleared of slugs by watering with the rinsings of petroleum casks.

Correspondence.

THE ELECTRIC TELEGRAPH BILL.—SIR,—I may state, for the information of those particularly interested in the subject of this Bill, that now the chief railway companies have withdrawn their opposition to the Bill, having expressed themselves satisfied with the provisions proposed in their behalf by the Post-office, and that the chief remaining opposition anticipated to it is political. It is yet objected to on the ground of the political patronage which it is supposed it may give to the present Government. As respects new appointments, I have already stated that the effectual preventive is the application of the great principle of open competitive examinations for them. As respects the apprehended exercise of any political influence over the present *employés* of the private companies at the coming elections, I may state that, if the Bill be passed immediately it will not be practicable to bring it into operation, so as to give any possible exercise of such influence—assuming it to be possible at any time—within the next nine months. But of the private companies' *employés*, the greater proportion are boys, women, and young persons, and the office-keepers or persons who might have votes are so few, scattered all over the country in twos and threes, and in numbers so insignificant amidst urban constituencies of many thousands, as to make it not worth the trouble of any party political manager to look after them. A leading electoral agent treats the opposition on this head as absurd. There is other opposition, as might be expected, on the part of directors of railways, and of various private companies concerned in intercommunication, who object to the principle of the measure as affording a precedent for other applications of it. I hope their apprehensions are well founded, and that they may see an early application of it to the Irish railways; and this is an additional public ground for not delaying the passing of the postal measure. The directorates are on the alert, and the public and shareholders should be on the alert too upon the principle. The leading opponent of the measure, Mr. Leeman, the member for York, the deputy chairman of the North Eastern Railway Company, and a director in two others, in his speech in the House of Commons in opposition to the bill, is reported to have stated, that it was based on the principles I had proposed for the the reform of our railway system, but which a royal commission had declared to be inapplicable. He should have added the commissioners' qualification, "at present,"—the then present being before the demonstrations in favour of the principle had been afforded by the large railway smashes, which have checked the progress of the country and shaken its manufacturing and commercial prosperity to its foundation. Mr. Leeman, however, did me too much honour in leading the House to suppose that the principle of administrative reform in question rested solely upon my testimony. He should have mentioned that, in the commission, it had the support of a clear and able paper by Sir Rowland Hill, and also of one by Mr. Monsell, in relation to the railways in Ireland, and that both Lord Stanley and Mr. Roebuck declined to vote with Mr. Lowe and the majority of the commissioners. Besides Mr. Galt in England, the principle has the great authority of the leading Belgian statesman, Charles Rogier, as well as the authority of Moritz Mohl and other leading German statesmen, and has had, beyond any personal authority, the triumphant demonstration of completely successful practice in their respective states, for the contemplation of the English public, and of English shareholders.—I am, &c., EDWIN CHADWICK.

BEWICK'S WORKS. — SIR, — The *Penny Magazine* for July 3, 1841, contained a pretty oval cut, of "The Huntsman and Old Hound," by Bewick, and which was printed originally in an edition of "Gay's Fables," published by T. Saint, of Newcastle, in 1779. For the engraving, Bewick, in 1775, received a premium from the "Society for the Encouragement of Arts and Manufactures." It represents a man on horseback, in the act of whipping the hound, with water in the foreground, and at the edge a large old oak-tree. Several hounds are working, and three horsemen are visible in the background, representing, probably, the master of the hounds and the two whippers-in. The four corners of this woodcut are ornamented with leaves, giving it the appearance of an oblong, 3½ inches long by 2½ inches wide. This cut is interesting as an early specimen of this artist's works. One of his fellow-workmen stated:—"The art of engraving on wood was nearly coeval with that on copper; and for some time after it was invented was practised by several of the most eminent painters as an easy and expeditious method of multiplying copies of their works. Most of the earlier writers of natural history embellished their works with figures, from wood, of plants and animals. Some of these did honour to the artist, but the greatest part of them were rude and inexpressive, and could boast of very little merit. The superior beauty and splendour of copper-plate engravings gradually obtained a decided preference. During the greater part of the 17th and 18th centuries, wooden cuts were of little use but to embellish halfpenny ballads and school-books. It was reserved for Bewick to revive and restore this nearly-forgotten art from the neglected state in which it had been so long suffered to continue. His particular turn of mind led him to observe and to delineate the form and manners of the animal creation. He soon found that the yielding consistence of wood is better fitted to express the ease, freedom, and spirit which ought to characterise portraits of animated beings, than the stubborn surface of a metallic substance. He engraved wooden blocks of all the domestic, and most of the wild British quadrupeds, &c., and these show the hand of a master,—boldness of outline, exactness of attitude, and discrimination of general character, which convey a just and lively idea of each animal. The landscapes, as a background and relief to his figures, and his numerous vignettes, have a similar excellence, a truth and nature which will be admired in proportion as they are more attentively observed and better understood. His embellishment of the poems of Parnel, Goldsmith, and Somerville, form the most extraordinary efforts of the art of engraving upon wood ever produced in any age or country. The accuracy of his drawings and the life and spirit which he imparts to his figures, are of unrivalled excellence." These observations seem to deserve a place in your *Journal*.—I am, &c., CHR. COOKE, Member of the Society of Arts.

London, 4th July.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 19th June, 1868.*

173. Bill—Court of Session (Scotland) (amended).
175. ,, Local Government Supplemental (No. 6).
176. ,, Lands Clauses Consolidation Act (1845) Amendment.
177. ,, Railway Companies (Ireland) Advances.
326. Queen Anne's Bounty (1866)—Return.

Delivered on 20th June, 1868.

179. Bill—Representation of the People (Ireland) (amended).
252. Harbours of Refuge—Quarterly Reports.
271. East India (Home Accounts).

277. Shannon River—Report and Evidence.
326. (I.) Queen Anne's Bounty (1867 and 1868)—Account.
333. House of Lords (Causes)—Return.
Judicial Reforms in Egypt—Papers.
Public Petitions—Twenty-seventh Report.

Session 1867.

557. East India (Military and Budget Estimates)—Return.

Delivered on 22nd June, 1868.

304. Chain Cables and Anchors—Return.
330. Metropolis Gas—Return.
331. Small Livings—Additional Papers.

Delivered on 23rd June, 1868.

178. Bill—Bank of Bombay.

Delivered on 24th June, 1868.

170. Bill—Sea Fisheries—Lords Amendments (corrected copy).
181. ,, Sale of Poisons and Pharmacy Act Amendment.
182. ,, Renewable Leasehold Conversion (Ireland) Act Extension (amended).
183. ,, Poor Law and Medical Inspectors (Ireland).
Victoria—Further Correspondence.

Delivered on 25th June, 1868.

180. Bill—Bank Holidays and Bills of Exchange (as amended by the Select Committee).
185. ,, New Zealand (Legislative Council).
282. Naval Reserve—Report.
343. East India (Persian Telegraph)—Return.

Session 1867.

559. Navy (Iron Ballast)—Return.

Delivered on 26th June, 1868.

184. Bill—Lunatic Asylums (Ireland) Accounts Audit.
187. ,, University Elections (Voting Papers).
188. ,, Consular Marriages.
189. ,, Municipal Elections (Scotland).
314. Dockyards and Factories—Return.
320. Army Reserve—Regulations.
321. Militia Reserve—Regulations.
339. New Courts of Justice—Treasury Minute.
348. Ecclesiastical Titles in Great Britain and Ireland—Lords' Report.
354. Bank Holidays—Report.
355. Mr. Eyre (Jamaica)—Letter.

Delivered on 30th June, 1868.

199. Bill—Libel (Ireland).
345. Income and Property Tax—Return.
347. Law Costs (Ireland)—Return.

Delivered on 1st July, 1868.

164. Bill—Investment of Trust Funds Supplemental.
194. ,, Clerks of the Peace, &c. (Ireland.)
200. ,, Turnpike Trusts Arrangements.
201. ,, Portpatrick and Belfast and County Down Railway Companies.
202. ,, Colonial Governors Pensions Act Amendment.
119. (IV.) Trade and Navigation Accounts (31st May, 1868).
307. Lee River Conservancy Bill—Minutes of Evidence.

Delivered on 2nd July, 1868.

150. Bill—Ecclesiastical Buildings and Glebes (Scotland) (amended).
203. ,, Assignees of Marine Policies (amended).
204. ,, Burials (Ireland) (amended).
205. ,, Fairs (Metropolis).
337. Abyssinian Expedition — Two Despatches from Sir Robert Napier.
341. East India (Progress and Condition)—Statement.
344. (A.) Poor Rates and Pauperism—Return (A).
353. Navy (Beef)—Returns.
356. Portpatrick and Donaghadee Harbours—Minutes and Correspondence.
358. Royal Hibernian Military School—Return.
369. Army Services—Further Correspondence.
374. Writs of Error—Memorials, &c.

Patents.

From Commissioners of Patents' Journal, July 3.

Grants of Provisional Protection.

Aërial navigation—1815—A. Crestadoro.
Aërial navigation—1987—W. E. Newton.
Baking powder—1970—J. C. Walker.
Beer, &c., cooling—1937—W. Müller and G. Englert.
Beer, &c., cooling—1965—G. B. Turrell.
Boilers—1936—M. and J. Mackie.
Boring bits and augers—1935—C. Whitehouse.
Carriages, &c., apparatus for weighing—1966—W. Betts.
Chemical product applicable to the electrical pile, &c.—1258—W. E. Gedge.
Chimney cowls—1704—C. Windhausen and H. Büssing.
Cloth, figured—1964—D. Mitchell.
Cop bottoms, machinery for preparing, &c.—1923—J. Anderson.
Cotton, &c., preparing—1913—J. Lord.
Door knobs, &c., enamelled cast-iron for—1534—A. D. E. Boucher.
Drinks, tonic effervescing—1944—E. Fisher.
Feeding bottles—1917—A. S. Stocker.
Fire-arms, breech-loading—1950—J. S. Benson and J. Von der Poppenburg.
Fire-arms, &c., breech-loading—1931—W. Richards.
Fishing apparatus—1806—L. G. Mure.
Flax, &c., hackling—1957—W. Rowan.
Furnaces for metallic operations—1939—W. Yates.
Gas, &c.—1444—W. R. Lake.
Gloves, &c., compound for cleaning—1940—K. Malster.
Gold and silver ores, treating—1921—A. L. Fleury.
Grain, &c., apparatus for shovelling, &c.—1941—J. T. Parlour.
Hay rakes—1975—A. Ridgway.
Healds for weaving—1956—W. and O. Brooke.
Hemp and flax, preparing—1778—P. Buchan.
Hinges—1969—W. Carr.
Hurdles, &c., wrought-iron—2003—W. Bayliss.
Iron, enamelling—1804—J. Oakden and J. Pickin.
Lace, &c., cutting off the superfluous portions of threads from sprigs or other devices made on—1946—J. Ball, jun.
Lathes—1933—J. Toft.
Looms—1995—G. Richardson.
Miners' safety cages, &c.—1919—J. H. Johnson.
Miners' safety lamps—1991—T. Heppell.
Moulds for casting—1977—C. Attwood.
Mowing or reaping grass or grain crops—1963—J. P. and T. F. Wills and E. H. Cardell.
Needle-cases, dial or indicating—1962—M. Demmer.
Oils, hydrocarbon, burning—1927—N. D. Spartali.
Omnibuses, &c., registering the number of passengers travelling by—1958—R. Wappenstein and R. Ray.
Paper, waterproofing—1953—C. Humfrey and W. S. Webster.
Pots, urns, &c., for containing hot beverages—1997—H. W. Hart.
Poultry houses, &c.—1929—S. S. Bent.
Railway brakes—1905—W. Unsworth.
Railway brakes and signals—1967—T. Comfield, jun.
Railway chairs and rails—1955—L. B. Prindle.
Railway chairs and rails—1973—W. Thomson and J. Crossley, jun.
Safes, strong rooms, &c.—1971—W. and J. Rhodes.
Sewage, &c., deodorizing—1954—W. C. and R. G. Sillar and G. W. Wigner.
Ships, propelling—1999—W. L. G. Wright.
Shirt studs, &c.—1925—L. and A. Pyke.
Steam engines—1934—C. H. Mitchell.
Steam engines, &c.—1938—J. Howden.
Steam engines, &c., governors for—1680—W. E. Newton.
Stone, dressing—1961—J., J., and J. Booth.
Stoves or furnaces for heating air—574—W. R. Lake.
Tuyeres—1949—F. Worcester.
Vessels containing liquids, closing and securing—1788—M. Chavagnat.
Watches, lever escapements for—1808—W. E. Newton.
Water, obtaining—1915—F. Warner.
Water, purifying—1408—F. Wise and E. Field.
Waterclosets—1981—W. S. Carr.
Waterproofing compounds—1932—C. Humfrey.
Wool, &c., combing—1960—T. Whitehead.
Yarns, dyeing—1968—J. McLeod.

Patents Sealed.

39. E. R. Southby.	61. J. L. Norton.
43. J. Combe.	62. G. Warsop.
51. H. McEvoy.	64. P. Spence.
52. J. Maury.	75. R. Girdwood.
53. W. T. Tongue.	81. J. Petrie, jun.
56. J. B. Dunn.	116. P. Pittar.
60. G. Warsop.	157. J. Batchelor and J. Smith.

From Commissioners of Patents' Journal, July 7.

Patents Sealed.

87. S. G. Archibald.	232. C. S. Barker.
92. J. Lewtas.	237. W. Oram.
93. J. H. Glew.	347. A. M. Clark.
103. J. Pilling and R. Scaife.	377. R. Morton.
155. F. Postill.	429. J. Nixon.
178. H. Kershaw.	467. W. E. Newton.
199. A. M. Clark.	885. W. and W. Arthur.
229. E. Tomlinson.	

Patents on which the Stamp Duty of £50 has been paid.

1754. C. de Bergue.	1840. A. Denayrouze.
1764. W. Clapperton & A. Lyle.	1766. J. and R. S. Dale.
1784. W. Thomson & C. F. Varley.	1775. J. and A. Longbottom.
1806. W. Goulding.	1799. H. D. P. Cunningham.

Patents on which the Stamp Duty of £100 has been Paid.

1701. W. H. Ludford.	1695. P. Spence.

Registered Designs.

4952—June 2nd—A traveller's wrapper—The North British Rubber Company, Castle Mills, Edinburgh.
4953—June 18th—Indexed key cabinet—John Raphael Isaac, Liverpool.
4954—June 20th—Metallic door mat or scraper—William Prockton, Launceston, Cornwall.
4955—June 20th—Sack truck—Warren Sharman, Melton Mowbray.
4956—June 29th—Knife and railway key—Unwin and Rogers, Sheffield.

Journal of the Society of Arts.

FRIDAY, JULY 17, 1868.

Announcements by the Council.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, will shortly be published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

In addition to the Essay to which the above prize was awarded, the Judges desire specially to commend the Essay by Mr. Gilbert Murray, Elvaston Castle, Derby.

The Judges also commend the Essays by Messrs. George Strickland, Low Abbey, Kirkley, Thore, Penrith; David Robinson, Burntshields, Kilbarchan, Paisley; William Churchman, Lydling Farm, Godalming; E. J. Cumming, Linscott, Moreton Hampstead, Devon; and Thomas Ferguson, Kinochtry, Cupar Angus, N.B.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

"On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture I., delivered Monday, January 27.

Varieties of Food—their Chemical Composition and Nutritive Value.

The economy of food, in its fullest signification, is a matter of national importance; for the political influence of a nation is as much dependent upon the muscular strength of the people as upon their intelligence and commercial industry; and this strength is wholly referable to a right use and proper distribution of food.

We perceive this not merely in the calamities of actual want, as in the fevers of famine, but also in the less prominent, but equally significant decline of health in times of partial distress, when the vigor and energy of the poorer part of the population are so reduced as to lay them open to disease. In fact, the experience of our public hospitals too often elicits the fact that the wasted power of the patient has been the advent of incurable disease. Nor is this all; for, as Mr. Simon observes—"Long before insufficiency of diet is a matter of hygienic concern; long before the physiologist would think of counting the grains of nitrogen and carbon which intervene between life and starvation, the household will have been utterly destitute of material comfort; clothing and fuel will have been scantier than food; against inclemencies of weather there will have been no adequate protection; dwelling-space will have been stinted to the degree in which over-crowding produces or increases disease; the home will be where shelter can be cheapest bought, where sanitary appliances are least considered, and where cleanliness is almost impossible." And all this distress falls heaviest upon those who are least able to bear it—the mother and her children; for the father, to be able to work, even lightly, must eat, and thus the others are the largest sufferers. Bad, however, as the immediate consequences are, they are nothing in comparison to the remote—the sickly race that comes of want.

In examining, therefore, this question of the economy of food, we must not only look at the nutritive value of different articles of diet, but we must also consider how food can be best distributed and utilized.

To-day we will investigate the principal varieties of food, and ascertain their peculiar qualities and dietetical values. For this purpose it will be necessary to have some standard for comparison, but this is avowedly a difficult matter; for if we compare foods according to the proportions of their principal constituents—viz., albuminous matters, starchy, saccharine, and saline—we shall find that the relative quantities vary to such a degree as to make the comparison almost useless; and if we fix our attention on one of these constituents—the nitrogenous, for example—and make it the exponent of nutritive value, we get into the difficulty of either overloading the equivalent with a large amount of carbonaceous material, or of having it deficient therein. If, for instance, we desire to know the quantities of different foods which would furnish the 1,200 grains of nitrogenous matter required by a man in his daily diet, we should find that the following are the proportions:—

Table I.

Proportions of Different Foods Required to Yield 1,200 Grains of Nitrogenous Matter.

	Grains.	Pounds.
Skim-cheese	2,681	0·4
Lean meat	6,217	0·9
White fish	6,630	1·0
Fat meat	9,231	1·3
Fat bacon	13,636	2·0
Bread	14,815	2·1
Rice	19,048	2·7
New-milk	29,268	4·2
Potatoes	57,143	8·2
Parsnips or turnips	100,000	14·3
Beer or porter	1,200,000	171·4

In this manner tables have been constructed of the nutritive values of food, and I show you one of them.

Table II.

Nutritive equivalents—calculated according to the amounts of Nitrogen in the Dry Substances; Human Milk being 100:—

VEGETABLE.

Rice	81	Oats	138
Potatoes	84	White bread	142
Maize	100	Black bread	166
Rye	106	Peas	239
Radish	106	Lentils	276
Wheat	119	Haricots	283
Barley	125	Beans	320

ANIMAL.

Human milk	100	Lamb	833
Cow's milk	237	White of egg	845
Yoke of egg	305	Lobster	859
Oysters	305	Skate	859
Cheese	331	Veal	873
Eel	434	Beef	880
Mussel	528	Pork	893
Ox-liver	570	Turbot	898
Pigeon	756	Ham	910
Mutton	773	Herring	914
Salmon	776		

I hardly need say that comparisons of this description are of little practical value, for they furnish no indication of the digestive labour required to utilize the products; besides which we are far from being assured, at the present time, that the nitrogenous elements of our foods are the most important.

In framing, therefore, a table of alimentary equivalents, regard must be paid to all the constituents. This I have endeavoured to express in Table No. 3, wherein I have shown the per cent. of nitrogenous and carbonaceous matter, and the proportions of the latter to one of the former; but here again the actual value of the several carbonaceous compounds is very different; for, although the fattening and respiratory powers of starch, gum, sugar, and pectin, may be nearly the same, yet the power of fat is about 2·5 times as great as that of sugar; and this must be considered, irrespective of other functions of fat, in estimating the value of carbonaceous food.

TABLE III.—NUTRITIVE VALUES OF FOOD.

	Water.	Albumen, &c.	Starch, &c.	Sugar.	Fat.	Salts.	Total Per Cent. Nitrogenous.	Total Per Cent. Carbonaceous.	Carbonaceous to one Nitrogenous.
Bread	37	8·1	47·4	3·6	1·6	2·3	8·1	52·6	6·5
Wheat flour	15	10·8	66·3	4·2	2·0	1·7	10·8	72·5	6·7
Barley meal	15	6·3	69·4	4·9	2·4	2·0	6·3	76·7	12·2
Oatmeal	15	12·6	58·4	5·4	5·6	3·0	12·6	69·4	5·5
Rye meal	15	8·0	69·5	3·7	2·0	1·8	8·0	75·2	9·4
Indian meal	14	11·1	64·7	0·4	8·1	1·7	11·1	73·2	6·6
Rice	13	6·3	79·1	0·4	0·7	0·5	6·3	80·2	12·7
Peas	15	23·0	55·4	2·0	2·1	2·5	23·0	59·0	2·5
Arrowroot	18	..	82·0	..	..	..	..	82·0	..
Potatoes	75	2·1	18·8	3·2	0·2	0·7	2·1	22·2	10·6
Carrots	83	1·3	8·4	6·1	0·2	1·0	1·3	14·7	11·3
Parsnips	82	1·1	9·6	5·8	0·5	1·0	1·1	15·9	14·5
Turnips	91	1·2	5·1	2·1	..	0·6	1·2	7·2	6·0
Sugar	5	..	..	95·0	..	..	..	95·0	..
Treacle	23	..	..	77·0	..	..	..	77·0	..
New milk	86	4·1	..	5·2	3·9	0·8	4·1	9·1	2·2
Cream	66	2·7	..	2·8	26·7	1·8	2·7	29·5	10·9
Skim milk	88	4·0	..	5·4	1·8	0·8	4·0	7·2	1·8
Buttermilk	88	4·1	..	6·4	0·7	0·8	4·1	7·1	1·7
Chedder cheese	36	28·4	..	..	31·1	4·5	28·4	31·1	1·1
Skim do.	44	44·8	..	..	6·3	4·9	44·8	6·3	0·1
Lean beef	72	19·3	..	..	3·6	5·1	19·3	3·6	0·2
Fat do.	51	14·8	..	..	29·8	4·4	14·8	29·8	2·0
Lean mutton	72	18·3	..	..	4·9	4·8	18·3	4·9	0·3
Fat do.	53	12·4	..	..	31·1	3·5	12·4	31·1	2·5
Veal	63	16·5	..	..	15·8	4·7	16·5	15·8	1·0
Fat Pork	39	9·8	..	..	48·9	2·3	9·8	48·9	5·0
Green bacon	24	7·1	..	..	66·8	2·2	7·1	66·8	9·4
Dried do.	15	8·8	..	..	73·3	2·9	8·8	73·3	8·3
Ox liver	74	18·9	..	..	4·1	3·0	18·9	4·1	0·2
Tripe	68	13·2	..	..	16·4	2·4	13·2	16·4	1·3
Poultry	74	21·0	..	..	3·8	1·2	21·0	3·8	0·2
White fish	78	18·1	..	..	2·9	1·0	18·1	2·9	0·2
Eels	75	9·9	..	..	13·8	1·3	9·9	13·8	1·4
Salmon	77	16·1	..	..	5·5	1·4	16·1	5·5	0·3
Entire egg	74	14·0	..	..	10·5	1·5	14·0	10·5	0·7
White of do.	78	20·4	..	..	..	1·6	20·4	..	..
Yolk of ditto.	52	16·0	..	..	30·7	1·3	16·0	30·7	1·9
Butter and fats	15	..	..	..	83·0	2·0	..	83·0	..
Beer and porter	91	0·1	..	8·7	..	0·2	0·1	8·7	87·0

Another method of determining the values of food, is by estimating the proportions of nitrogen and carbon in them, and comparing them with the proportions required in a standard diet.

Judging from the minimum quantities of food which an ordinary individual is capable of existing on, without suffering in health, it would seem that about 4,100 grains of carbon, and 190 grains of nitrogen are required in his daily diet. These proportions have been determined from a large number of observations, as by those of Dr. Lyon Playfair, in his inquiries into the dietaries of hospitals, prisons, and workhouses, and by those of Dr. Edward Smith, in his examination of the amounts of food which the Lancashire operatives were capable of living on during the cotton famine, and also by his inquiries into the dietaries of in-door labourers. The proportions which Dr. Smith gives as a famine or barely sustaining diet, are the following:—

	Carbon (grains).		Nitrogen (grains).
Adult woman	3,900	..	180
Adult man	4,300	..	200
Average adult	4,100	..	190

These proportions are contained in 2lbs., and in 2lbs., 3oz. of bread; and they closely accord with another set of facts, derived from an examination of the amounts of carbon and nitrogen exhaled and secreted from the body during health and idleness.

Taking these numbers, therefore, as the exponents of the nutritive values of food, we are able to construct the following table:—

TABLE IV.—NUTRITIVE VALUES OF FOOD.

	Grains per Pound.		Value per Pound	Grains for One Penny.		Weekly Cost of Famine Diet for	
	Carbon.	Nitrogen.		Carbon.	Nitrogen.	Carbon.	Nitrogen.
			d.			d.	d.
Split peas	2730	255	1	2730	255	10·5	5·2
Indian meal	2800	123	1	2800	123	10·2	10·8
Barley meal	2730	70	1	2730	70	10·5	19·0
Rye meal	2660	88	1¼	2128	70	13·5	19·0
Seconds flour	2660	120	1½	1773	80	16·2	16·6
Oatmeal	2800	140	2	1400	70	20·4	19·0
Bakers' bread	1995	90	1½	1330	60	21·6	22·1
Pearl barley	2660	91	2	1330	45	21·6	29·5
Rice	2730	70	2	1365	35	20·5	38·0
Potatoes	770	24	0½	1540	48	18·6	27·7
Turnips	238	13	0½	476	26	60·3	51·1
Green vegetables	420	14	0½	840	24	34·1	55·4
Carrots	385	14	1	385	14	74·8	95·0
Parsnips	421	12	1	421	12	66·4	110·8
Sugar	2800	..	5	560	..	51·2	..
Treacle	2200	..	1	2200	..	13·0	..
Buttermilk	335	35	0½	670	70	42·8	19·0
Whey	154	13	0¼	626	52	45·8	25·6
Skimmed milk	350	34	1	350	34	82·2	39·1
New milk	378	35	2	189	18	154·0	73·9
Skim cheese	2348	364	3	783	121	36·6	11·0
Cheddar do.	2520	315	8	315	39	91·1	34·1
Bullocks' liver	1226	210	3	408	70	70·3	19·0
Mutton	2902	140	5	580	28	49·5	47·5
Beef	2301	175	8	288	22	99·6	60·5
Fresh pork	2950	108	7	421	15	68·1	88·7
Dry bacon	4270	98	9	474	11	60·5	120·9
Green do.	3990	79	8	492	10	58·3	133·0
White fish	900	130	2	450	65	63·8	20·4
Red herrings	1435	217	4	359	54	80·0	24·6
Dripping	5320	..	6	887	..	32·3	..
Suet	4710	..	7	673	..	42·6	..
Lard	4819	..	9	535	..	53·6	..
Salt butter	4585	..	12	382	..	75·1	..
Fresh do.	4712	..	16	294	..	97·6	..
Cocoa	3934	140	4	983	35	29·2	38·0
Beer and porter	315	1	1	315	1	91·1	1330·0

And now we may proceed to examine in detail the general properties, and the nutritive qualities of different foods.

Primarily all our foods are derived from the vegetable kingdom, for no animal has the physiological power of associating mineral elements, and forming them into food. What we may yet do by means of chemical agencies in the laboratory is another question; but within our own bodies there is no faculty for such conversion. As I shall hereafter explain to you, our functions are of an opposite kind. We are destructive creatures, not constructive. It is our province to pull down what the vegetable has built up; to let loose the affinities which the plant has brought into bondage, and to restore to inanimate nature the matter and cosmical force which the growing plant had taken from her.

Foremost, therefore, of our foods are those which come at once from the vegetable kingdom; and of these the *cereals* are the most important, as wheat, barley, oats, rye, maize, or Indian corn, rice, millet or durra, and Guinea corn.

Wheat.—Different species of this grain are cultivated, but the most common in this country is *Triticum vulgare*, of which there is a summer and winter variety.

The grain varies a good deal in composition according to season, climate, and soil; but, as a rule, the wheat of southern climates, and warm seasons, is richer in gluten, and of harder texture than that of colder times. They are then called stronger grains, although the latter, from their being softer and kinder, give a larger proportion of flour. Some of the hardest varieties of wheat, as *rivets*, are used to strengthen the flour of new grain, which is always unmanageable, and to improve that of bad seasons and of damaged quality.

The structure of the grain is like that of all the cereals; there is an outer siliceous and woody covering, which is altogether valueless as food; then there is a layer of rich nitrogenous matter, containing a digestive body called *cerealine*, and within that is the flour, which forms the great bulk of the seed.

When ground whole, it forms *brown meal*, which is rarely used in England at the present time, although it was the common food of our forefathers, and even now is much employed in Westphalia, to make the dark-coloured bread called *pumper-nickel*. It contains from 5 to 12 per cent. of indigestible matter, in the form of bran, the removal of which, according to Liebig, is only a refinement of luxury.

The practice at the present time is to bolt or sift the ground meal through sieves, or silks, of different degrees of fineness, and thus to remove the coarser bran. The products have different names in different places, and have also different values; but generally a hundred pounds of wheat will yield from 78 to 80 parts of good serviceable flour. The other products are about 2 parts of *specks*, or *tails*, or *tippings*; from 2 to 3 parts of *sharps*; about 3 of *fine pollard*; from 3·5 to 6 of *coarse pollard*; and from 4 to 10 of *bran*. The relative wholesale values of these are about as follows:—

Vegetable Foods.	lbs. per bushel.	Price per bushel.	Price per 20 lbs.
		s. d.	s. d.
Fine flour	56	10 0	3 7
Seconds ditto	56	7 9	2 9
Sharps	26	2 0	1 6
Fine pollards	18	1 0	1 1
Coarse ditto	14	0 10	1 2
Bran	12	0 9	1 3

Seconds flour is practically the best for domestic use; and of this there should be at least 80 per cent. obtained from the grain. Attempts have often been made to increase the produce; for as the bran contains a good deal of nitrogenous matter, and is, moreover, rich in fat and saline substances, it has been thought wasteful to remove it; but the experimental researches of Poggiale, the learned professor at Val-de-Grace, have shown that at least 50 per cent. of the bran is perfectly indigestible, and may be passed successively through the bodies of four or five animals without undergoing change. It, moreover, acts as an irritant; and, by hurrying the food through the alimentary canal, is very likely to cause waste. Those who labour hard, as railway navigators, invariably choose the whitest bread for food, believing that it is not only more digestible, but it is stronger, and will enable them to do more work. Without doubt, however, there is room for improvement in the treatment of flour, and in the complete utilization of its several constituents. M. Mège Mouries has invented a process whereby the outer skin only of the wheat may be removed, and from 86 to 88 per cent. of flour realised. The process was examined in 1857, and reported very favourably of by Dumas, Pelouze, Payen, Peligot, and Chevreul, but I am not aware that it has come into use.

M. Mège Mouries also directed attention to the fact that the bran contains a portion of very soluble nitrogenous matter, *cerealine*, which is of the nature of diastase, and has the property of dissolving starch. This, no doubt, might be utilized by treating bran with warm water, and then using the water in the manufacture of bread.

The nutritive value of wheat is shown in Tables No. 3 and No. 4; and although the average amount of gluten is there set down at about 11 per cent., it ranges from 8 to 15 per cent.—the largest quantity being found in the wheaten flour of India, Egypt, South America, and the South of Europe.

It appears, too, that the quantity of gluten, as represented by nitrogen, increases with the coarseness of the flour, and so, also, does the amount of mineral matter.

Table V.

Percentage amounts of Nitrogen and Mineral Matter in the different Products of the Mill:—

	Nitrogen.		Mineral matter.
Fine flour	1·70	..	0·71
Tails	1·86	..	0·99
Fine sharps	2·21	..	1·89
Coarse sharps	2·58	..	3·80
Fine pollard	2·44	..	5·50
Coarse pollard	2·42	..	6·50
Bran........................	2·39	..	7·00
Average in whole grain	1·82	..	1·62

The starch and sugar amount to about 70·5 per cent. and the fat to 1·7; so that the carbonaceous is to the nitrogenous as 6·7 to 1, which is a good proportion. Other facts relating to its nutritive value are shown in Table No. 4.

The tests for a good flour are its sweetness and freedom from acidity or musty flavour; and its nutritive value, as far as gluten is concerned, is estimated by the process of Beccaria, who discovered gluten in wheat more than a century ago. A given weight of flour (say 500 grains) is made into a stiff dough, and is carefully washed by tender manipulation under a small stream of water. The gluten remains, and when baked it expands into a clean-looking ball, which should weigh, when thoroughly dried, about 54 grains.

Of all the preparations of flour, *bread* is the most important. I shall hereafter describe the process of making it, but I may here remark that it should not contain more than from 36 to 38 per cent. of water, and the other constituents, excepting salt, should be the same as of good flour.

In practice, 100 lbs. of flour will make from 133 to 137 lbs. of bread, a good average being 134; so that a sack of flour of 286 lbs. should yield 95 four-pound loaves. The art of the baker, however, is to increase this quantity, and he does it by hardening the gluten through the agency of a little alum, or by means of a gummy mess of boiled rice, three or four pounds of which will, when boiled for two or three hours in as many gallons of water, make a sack of flour yield 100 four-pound loaves. But the bread is dropsical, and gets soft and sodden at the base where it stands. A good loaf should have the following characters:—

Kindness of structure—that is, not chaffy, or flaky, or crummy, or sodden; and
Sweetness to the palate and to the smell.

Wheaten bread is best eaten on the day after it is baked, for new bread is difficult of mastication, and still more difficult of digestion, because of its gummy nature. When it becomes stale it does not really get much dryer, but it undergoes a molecular change, which may be restored by heating the bread in a closed vessel to a temperature of 212°.

Wheaten bread is preferred to all other varieties of bread, because of its sweetness, and because it may be eaten alone. The nutritive constituents of it are in the same proportion as in wheat—namely, as 1 to 6·5, and a little more than two pounds of bread will supply the requirements of the system; although, as I shall hereafter explain, it cannot be used alone without loss of health and strength.

Barley-meal is the chief food of a large number of people in the North of Europe and in the South of England, where the labourer is partly paid his wages in meal or grain. It is also used in Wales and Scotland, especially in winter time, when wheaten bread is dear; and to some extent in Ireland. It is employed by about ninety per cent. of the outdoor labouring population of England. At the time of Charles I. (in 1626), according to M'Culloch, it was the usual food of the ordinary sort of people; and as late as the middle of the last century hardly any wheat was used in the northern counties of England. In Cumberland the principal families used only a small quantity about Christmas-time; and the crust of the everlasting goose-pie, which adorned the table of every country family, was invariably made of barley-meal.

The grain is almost always ground whole, and the farina has much resemblance to wheaten flour; but the amount of gluten is very different, in fact, the nitrogenous matter, which amounts to about six per cent., is chiefly in the form of albumen, hence, the bread is heavy and compact, for albumen will not vesiculate or sponge like gluten. The common way of making it into bread, is by mixing it with an equal proportion of wheaten flour; and sometimes it is mixed with oatmeal and rye-meal, and baked into cakes. But the best way of using it is in the form of thick gruel or stirabout, which is made by stirring the meal into boiling water.

Pearl Barley and Scotch Barley are the grain deprived of its husk, and rounded by attrition. The former is more carefully prepared than the latter, but both are used to give consistence to broth.

The nutritive value of barley meal is somewhat inferior to that of wheaten flour, but as the meal is cheaper than flour, it is more economical to use it: in fact, it is almost

the cheapest article of diet, as may be seen by reference to Table No. 4.

Oatmeal and rye-bread were once the chief diet of the servants of the wealthy, and even now the former is used by 90 per cent. of the agricultural labourers of England, and by a still larger proportion of the Scotch. The grain is very rich in gluten and fat, and it contains a good quantity of sugar and starch, the microscopic form of which is remarkable. The Scotch meal is always preferable to the English, on account of its higher nutritive power. It is prepared by grinding the kiln-dried grains, previously deprived of their skins. The Scotch grind it rather coarsely as compared with the practice in England.

Oatmeal is not nearly so white as wheaten flour, and its taste is peculiar, being at first sweet, then rough and bitter. Like barley-meal, it cannot be vesiculated into bread, but it makes good cakes, and these may be either leavened, as is the custom in Yorkshire, or unleavened, as in Scotland.

The common method of cooking it, however, is by stirring it into boiling water until it has the consistence of hasty pudding, and in this manner *porridge* is made; but if it be afterwards boiled for a short time it makes Scotch *brose*. In Ireland it is mixed with Indian meal, and then stirred into boiling water, thus making the mixture called *stirabout*.

The decorticated grain constitutes *grits* or *groats*, and when these are crushed or bruised they go by the name of *Emden groats*. The sole use of them is for making gruel, a drink that seems to have been a favourite with our forefathers; for in the *London Gazette*, for Friday, August 13, 1695, there is an advertisement to the effect that water-gruel was always ready at the Marine Coffee-house, in Birchin-lane, Cornhill, every morning from six to eleven o'clock; and, it added, that as much as from four to five gallons of it were consumed there daily.

The husks of the grains are sold in Scotland under the name of *seeds*, and these, when steeped in water for a few days, until they become a little sour, like stale brewers' grains, and then squeezed out, produce a liquid which, when boiled down to the consistence of gruel, makes the food called *flummery* or *sowans* in Scotland, and *sucan* in South Wales. If it be boiled still more, until it becomes as thick as jelly, it forms *budrum*, or *brwchan*, as it is named in Wales. Oatmeal is, no doubt, rather hard of digestion, and causes irritation of the bowels. There is a notion also that it produces heat and irritation of the skin; and formerly, when sufficient care was not taken to remove the husk from the grain before it was ground, it was not an uncommon occurrence to find calculi or concretions of phosphate of lime, mixed with the silky bristles of the grain, in the alimentary canal. Somewhat similar concretions are found at the present time in the bowels of horses that feed too freely on bran or grains. The nutritive value of oatmeal is shown in Tables No. 3 and No. 4, and it will be noticed that although it is, weight for weight, more nutritive than wheaten flour, yet, considering its price, it is not so economical.

Rye meal is the chief food of northern nations, and was once a common article of diet with ourselves. It forms the dark-coloured and sour-tasting bread of the North of Europe. In this country it is rarely eaten alone, but is mixed with about twice its bulk of wheaten flour, forming what in many places is called *maslin*, and is then made into bread. The nutritive power of rye-meal is a little less than that of flour, and the proportion of the nitrogenous to the carbonaceous constituents is as 1 to 9·4.

(*To be continued.*)

MEMORIAL TABLETS OF GREAT MEN AND EVENTS.

In order to show how rich the metropolis is in the memory of important personages and events, which it would be desirable to mark by means of tablets on houses, the Council have caused an alphabetical list to be prepared, the last part of which is now inserted. The Council request the assistance of members of the Society in completing and correcting this list, especially with reference to dates and the insertion of other names.

Whilst the Council intend proceeding with this work, they desire also to see it carried on by others—either by corporate bodies or individuals—and the Council will be happy to be instrumental in procuring suitable tablets from the manufacturers.

Talleyrand, Charles M. (b. 1754—d. 1838), Prince of Benevento; French diplomatist. Lived at Manchester-house, north side of Manchester-square, and often frequented the Travellers' Club, in Pall-mall.

Tarlton, Richard (d. 1588), actor and jester. Lived at (No.—?) Gracechurch-street. He kept an ordinary, called "The Castle," in Paternoster-row, near where Dolly's chop-house now stands. He lies buried at St. Leonard's, Shoreditch.

Taylor, John (b. 1580—d. 1654), poet; usually called the "Water Poet." He was a licensed sculler or waterman on the Thames. He lived and kept a tavern in Phœnix-alley, Long-acre.

Taylor, Joseph; one of the original performers in Shakespeare's plays. Lived, from 1634 to 1651, at (No. — ?) Russell-street, Covent-garden.

Telford, Thomas (b. 1757—d. 1834); was the engineer of the Menai Bridge; also of St. Katherine's-docks. He lived and died at No. 24, Abingdon-street, Westminster. A portrait of him hangs at the Institution of Civil Engineers, of which society he was president for fourteen years.

Tempest, Pierce (d. 1717); artist and engraver of the "Cries of London." Lived over against Somerset-house, Strand. He lies buried at St. Paul's, Covent-garden.

Temple, Sir W. (b. 1628—d. 1698); statesman, political and miscellaneous writer. He lived on the south side of Pall-mall. He lies buried, and a monument is erected to his memory and that of his wife, in Westminster Abbey.

Tenison, Thomas (b. 1636 — d. 1715); Archbishop of Canterbury; theological writer. He was the first rector of St. James's Church, Piccadilly. He much enlarged the Lambeth Library, and founded the library which bears his name in Castle-street, St. Martin's-lane. Lived in 1683 on the west side of St. Martin's-lane, and lies buried in St. Mary's, Lambeth.

Tenterden, C. Abbott, Lord (b. 1760—d. 1832); Lord Chief Justice. He lived at No. 28, Russell-square, where he died; and lies buried in the chapel of the Foundling Hospital.

Thackeray, W. M. (d. 1863), novelist, &c., was educated at the Charterhouse; lived at No. 36, Onslow-square; also in the red-brick house on the south end of the west side of Palace-gardens, which he built.

Theobald, Lewis (b. 1690—d. 1744); dramatic poet, critic, and editor of Shakespeare; the hero of the early editions of the "Dunciad." Lived in Wyan's-court, Great Russell-street, Bloomsbury. Buried in St. Pancras-in-the-Fields.

Thomas, Elizabeth (d. 1730), poetess, and known as "Corinna." She had much to do with the publication of Pope's private correspondence. She lived at (No.—?) Dyot-street, St. Giles's; also within the rules of the Fleet Prison. She lies buried in the Fleet-market ground, St. Bride's.

Thomson, James (b. 1700—d. 1748), Pastoral and dramatic poet, author of "The Seasons." He composed his poem of "Summer" at (No. —?), Little Tower-street. A monument is placed to his memory in Westminster Abbey.

Thoresby, Ralph (b. 1659—d.1725), biographer and antiquary; he lived at an oil-shop, near Old Parr's Head, in Little Knightrider-street.

Thornhill, Sir James (b. 1676 — d. 1734), historical painter; he lived at 75, Dean-street, Soho, where there is still a staircase painted by him; also on the east side of James-street, Covent-garden; also in St. Martin's-lane, in a house behind No. 104, this staircase was also decorated by him; and in 1733, in the Piazza, Covent-garden, in the second house eastward from James-street. His daughter Jane was married to Hogarth, in the parish church of Paddington.

Thornton, Bonnell (b. 1734—d. 1771), poet and miscellaneous writer, and editor of the *Connoisseur;* was born and lived at (No. — ?), Maiden-lane, Covent-garden, where his father had an apothecary's shop. In a large room at the upper end of Bow-street, nearly opposite a narrow court, once called Playhouse-passage, he opened an exhibition of sign-paintings, a piece of inoffensive drollery, from the annual Exhibition of Pictures by the Society of Artists, previous to the institution of the Royal Academy. A monument is erected to him in Westminster Abbey.

Thurloe, John (b. 1615—d. 1667-8; when Cromwell's secretary, lived (from 1645 to 1659) in No. 24, Lincoln's-inn, and here the "Thurloe Papers" were discovered. He lies buried in Lincoln's-inn Chapel.

Thurlow, Edward Lord (b. 1736—d. 1806), Lord Chancellor; lived, in 1784, at No. 45, Great Ormond-street, and from him the Great Seal of England was stolen on the 24th March; he also lived, in 1800, at No. 15, St. James's-square, and at No. 15, Great George-street, Westminster. He frequented Vando's coffee-house, east corner of Inner Temple-lane, Fleet-street.

Tompion, Thomas (d. 1713), a celebrated watch-maker, had a shop at the corner of Water-lane, Fleet-street, where he died.

Townley, Charles (b. 1737—d. 1805), collector of the Townley marbles, now in the British Museum. He lived at No. 7, Park-street, Westminster, where he died. A bust of him is in the British Museum.

Tradescant, John (temp. Charles I.), the collector of curiosities, &c., which he bequeathed to Ashmole. He lived in what was afterwards Turret House, Lambeth. A monument to his memory stands at St. Mary's, Lambeth.

Turner, J. M. W., R.A. (b. 1775—d. 1851), painter; was the son of a hairdresser, living at No. 26, on the north-side corner of Hand-court, Maiden-lane, Covent-garden; he also lived at No. 7, Queen Anne-street West.

Turner, Sharon (b. 1768—d. 1847), the historian; lived for many years at (No. —?) Red Lion-square.

Turner, William (temp. Queen Elizabeth), herbalist, and author of the first English Herbal; lived in Crutched-friars. A tablet is placed to his memory in St. Olave's Church, Hart-street.

Tyrwhitt, Thomas (b. 1730—d. 1786), critic and antiquary, presented his collection of books to the British Museum. He lived at (No. — ?) Welbeck-street, Cavendish-square.

Underhill, Cave, actor; lived at (No. — ?) Salisbury-court, Fleet-street.

Vanbrugh, Sir John (b. 1666—d. 1726), dramatic writer and architect. He built the first Opera House in the Haymarket. He lived in Scotland-yard, Whitehall, and lies buried in St. Stephen's, Walbrook.

Vandyck, Sir Anthony (b. 1598—d. 1641), painter; he lived and died in a house in St. Anne's, Blackfriars, and was buried in Old St. Paul's.

Vane, Sir Harry, the Elder (b. 1585—d. 1654), statesman; lived in the Strand, next door to Northumberland-house.

Vane, Sir Harry, the Younger (b. 1612 — d. 1662), statesman; educated at Westminster School; he lived in the Strand, next to Northumberland-house, also in a house standing on the site of Evans's Hotel, the Piazza, Covent-garden. Imprisoned in the Tower, and beheaded on Tower-hill.

Van Limput, Remigius (d. circ. 1660), painter; lived for many years on the east side of Bedford-street, Strand.

Vere, Aubry de, twentieth and last Earl of Oxford; lived at (No. — ?) Church-street, St. James's-square, in the east corner of St. James's-square; also, from 1663 to 1676, in the north-east angle of the Piazza, Covent-garden, and finally in Downing-street, Whitehall, where he died.

Verelst (d. 1710), painter, particularly of flower and fruit subjects; lived, in 1663, at (No. — ?) Jermyn-street, St. James's, three doors from the Duchess of Richmond.

Verrio, Antonio (b. 1634—d. 1707), painter; lived, in 1675, in Piccadilly, close to St. James's Church.

Verstegan, Richard (d. 1650), writer on English antiquities, and etymologist; was born within the precincts of St. Katharine's, in the Tower.

Vertue, George (b. 1684—d. 1756), engraver and antiquary; lived in (No. — ?) Queen-square, Bloomsbury. A monument is erected to his memory in Westminster Abbey; a portrait of him hangs in the British Museum.

Villiers, George, Duke of Buckingham (b. 1592 — d. 1628), statesman; lived at Beaufort-house, Chelsea; also in a house which stood on the site of the present Durham-street, Strand; also in Wallingford-house, which stood on the site of the present Admiralty; also in York-house, Strand. He was buried in Westminster Abbey.

Villiers, George, Duke of Buckingham (b. 1627—d.1688), was born in Wallingford-house, Strand; lived in Buckingham-house, College-hill; at the Cockpit, Whitehall. He lies buried in Westminster Abbey.

Vivares, Francis (d. 1780), landscape engraver; lived at No. 12, Newport-street, Long-acre. He lies buried in the churchyard at Paddington.

Voltaire, Marie François Arouet de (b. 1694—d. 1778); lodged at the White Peruke, Maiden-lane, Covent-garden.

Wade, George, Field Marshal (b. 1673—d. 1748); lived at (No. — ?) Cork-street, Burlington-gardens. He lies buried, and a monument is erected to his memory, in Westminster Abbey.

Walker, John, lexicographer, lies buried in the churchyard of St. Pancras-in-the-Fields.

Waller, Edmund (b. 1605—d. 1687), poet, statesman, and writer; lived, from 1654 to 1656, on the east side of Bow-street, Covent-garden; and from 1660 till his death, on the west side of St. James's-street. He was married at St. Margaret's, Westminster.

Walpole, Sir Robert, first Earl of Orford (b. 1676—d. 1745-6), statesman and political writer; lived, in 1716, at (No. — ?) Arlington-street, Piccadilly; also, about 1722, in Chelsea, in a house "next the College," adjoining Gough-house; also at (No. — ?) St. James's-square, from which he removed, in 1735, to Downing-street, Whitehall, when First Lord of the Treasury; and he it was who got this house annexed to this post for ever. In 1742, when he went out of office, he purchased No. 5, east side of Arlington-street, where he died. He was imprisoned in the Tower.

Walpole, Horace, Earl of Orford (b. 1717—d. 1797), statesman and writer. Born at (No. — ?) Arlington-street. He lived at No. 5, east side of Arlington-street, until 1779, when he removed to No. 11, Berkeley-square, in which house he died.

Walsingham, Sir Francis (b. 1500—d. 1590), statesman, and author of "The Complete Ambassador." He lived

and died at (No. — ?) Seething-lane, Great Tower-st. A tablet to his memory was placed in Old St. Paul's.

Walton, Brian (b. 1600—d. 1661), Bishop of Chester, and editor of the "Polyglot Bible." He lived and died at (No. — ?) Aldersgate-street.

Walton, Izaak (b. 1593—d. 1683), author of "The Complete Angler," and other works. He lived, from 1627 to 1644, in Chancery-lane, in what was then the seventh house on the left-hand as you walk from Fleet-street into Holborn.

Warburton, William (b. 1698—d. 1779), Bishop of Gloucester, theological writer and critic, lived at (No. — ?) Bedford-row, Bloomsbury; also in Grosvenor-square. His friendship with Pope first commenced in a bookseller's shop in Fleet-street, on the west side of the gateway leading down the Inner Temple-lane.

Ward, Edward, commonly called "Ned," a burlesque writer, and author of "The London Spy." He lived and died at a punch-house which he kept in Fullwood's-rents, Holborn. He lies buried in St. Pancras-in-the-Fields.

Warton, Joseph, Dr. (b. 1722—d. 1800), poet and miscellaneous writer; lodged, in 1792, at (No. — ?) Sackville-street, Piccadilly.

Warwick, Sir Philip (d. 1682), author, and devoted Royalist in the Civil Wars. Lived, in 1661, in Outer Spring-gardens; and at (No. — ?) Warwick-street, Cockspur-street.

Watson, James, engraver, chiefly after Sir Joshua Reynolds, lived at No. 45, Little Queen-street, Portland Chapel.

Watts, Dr. Isaac (b. 1674—d. 1748), divine and poet; lived at Abney-park, Stoke Newington, in a house on the site of the present cemetery. He lies buried in Bunhill-fields, and a monument is erected to his memory in Westminster Abbey.

Weber, Carl Maria Von (b. 1786—d. 1826), musical composer; died at No. 91, Great Portland-street, Oxford-street.

Wedgwood, Josiah (b. 1730—d. 1795), the potter, and maker of the Wedgwood ware; lived in the house lately occupied by the Erectheum Club, St. James's-square, corner of York-street.

Wellesley, Marquis, soldier and statesman, lived and died in Listowel-house, Kensington, which stood on the site of the present Ennismore-gardens.

Wellington, Arthur, Duke of (b. 1769—d. 1851), lived at Apsley-house, Hyde-park-corner, and died at Walmer Castle. He lies buried in St. Paul's Cathedral. He met Nelson but once, and then at the Colonial-office, 14, Downing-st., Whitehall, in a small waiting-room, on the right hand as you enter. In Battersea-fields he fought a duel with Lord Winchelsea in 1829. When in town he regularly attended St. James's Chapel, St. James's Palace. Was Constable of the Tower of London, and Master of the Trinity House.

Wesley, John (b. 1703—d. 1792), divine, and originator of the sect called "Methodists; was educated at the Charterhouse. His chapel is in the City-road, close to the entrance of the Bunhill-fields burial-ground, where he lies.

West, Benjamin (b. 1738—d. 1820), President of the Royal Academy: lived in (No. — ?) Castle-street, Leicester-square; also at No. 14, Newman-street, Oxford-street, from 1777 till his death. He lies buried in St. Paul's Cathedral.

West, James (d. 1772), President of the Royal Society, and collector of books, &c.; lived in the house now called "Evans' Hotel, Covent-garden.

Westmacott, Sir Richard, R.A., sculptor; lived at 14, South Audley-street, Grosvenor-square.

Wharncliffe, James A. S. Wortley, Lord (b. 1776—d. 1845); great grandson and editor of the works of Lady Mary Wortley Montague; lived in Curzon-street, Mayfair, in the retiring house, over against the chapel.

Whiston, William (b. 1667—d. 1752), divine and mathematician; he regularly attended St. Andrew's, Holborn, until excommunicated by Sacheverel. He lived in Cross-street, Hatton-garden.

White, Robert (d. 1704), the engraver; lived in Bloomsbury-market.

White, Dr. Thomas (d. 1623), the founder of Zion College; was Vicar of St. Dunstan's-in-the-West, Fleet-street.

Whitehead, Paul (b. 1710—d. 1774), poet; he lived and died in (No. — ?) Henrietta-street, Covent-garden.

Whitelocke, Bulstrode (b. 1605—d. 1675), statesman under Cromwell, and author of the "Memorials of English Affairs from Charles I. to the Restoration of Charles II.;" baptised in St. Dunstan's-in-the-West; educated at the Merchant Taylors' School. Was a Templar.

Wilkes, John (b. 1727—d. 1797), politician; he lived and died at No. 30, Grosvenor-square, and lies buried in Grosvenor Chapel. An obelisk stands to his memory in Fleet-street. He was an alderman of the ward of Farringdon Without.

Wilkie, Sir David, R.A. (b. 1785—d. 1841), painter; lived at Sol's-row, Hampstead-road; also at 11, Norton-street, Portland-road, Kensington; and 24, Lower Phillimore-place, Kensington; his last residence was Vicarage-place, Kensington. He frequented Slaughter's Coffee-house, St. Martin's-lane. A statue to his memory stands at the National Gallery.

Wilks, Robert (b. 1666—d. 1731-2), actor, called "Gentleman Wilks;" lived at Bow-street, Covent-garden, in the sixth house on the west side as you walk to Long-acre. He lies buried in St. Paul's, Covent-garden.

Williamson, Sir Joseph, Secretary of State, and the second President of the Royal Society, lived in St. James's-square.

Willis, Dr. Thomas (b. 1622—d. 1675), the physician; lived at (No. — ?) St. Martin's-lane.

Wilson, Richard, R.A. (b. 1714—d. 1782); lived, in 1777-8 at No. 24, Norton-street, Portland-row; also in the house now Tavistock-hotel, the Piazza, Covent-garden; also at No. 85, Great Titchfield-street, in 1779; and in 1780 in Tottenham-street, Tottenham-court-road.

Winchelsea, George, Earl of (b. 1791). Was living in No. 7, Suffolk-street, Haymarket, when challenged by the Duke of Wellington, in 1829.

Wolcot, John (b. 1738—d. 1819), known as "Peter Pindar," satirist and poet; lived, in 1800, at No. 1, Chapel-street, Portland-place; also lodged on the first-floor of (No. — ?) Pratt-place, Camden-town; and at No. 13, Tavistock-row, Covent-garden. He died in a house which stood on the site of Euston-square, and lies buried in St. Paul's Covent-garden.

Wollaston, Dr. William Hyde (b. 1766—d. 1828), chemist and philosopher. He lived, in 1800, in No. 18, Cecil-street, Strand. A portrait of him hangs at the Royal Society.

Woollett, William (b. 1735—d. 1785), engraver; lived in Long's-court, Leicester-fields; and from here he moved to No. 11, Green-street, Leicester-fields. He lies buried in the churchyard of St. Pancras-in-the-fields.

Worde, Wynkyn de, the celebrated printer, lived at (No. — ?) Fleet-street, at the "Sign of the Sonne;" lies buried in St. Bride's, Fleet-street.

Wren, Sir Christopher (b. 1635—d. 1723), architect; was educated at Westminster School. He lived in Dulwich, in a large red house, on the right-hand side of the road from the "Elephant and Castle," over Camberwell-green; also in Scotland-yard, Whitehall; and in No. 5, Walbrook. He was married a second time in St. James's Chapel, and lies buried in St. Paul's Cathedral. A portrait of him hangs at the Royal Society, of which he was a Fellow. He designed the following

churches in London:—St. Alban's Church, Wood-street.; Allhallows-the-Great, Upper Thames-street; St. Andrew's, Holborn; St. Anne's-within-Aldersgate; St. Anthony's, in Budge-row; St. Augustine's, Watling-street; St. Bennet-Fink; St. Bride's, Fleet-street; St. Clement's Danes, Strand; St. Clement's, Eastcheap; St. Dionis Backchurch, Fenchurch-street; parts of St. Dunstan's-in-the-East; St. George's, Botolph-lane, Billingsgate; St. James's, Piccadilly; St. James's, Garlickhithe; St. Lawrence, Jewry; St. Magnus, London-bridge; St. Margaret's, Lothbury; St. Margaret Pattens; St. Martin's Ludgate; St. Mary Abchurch; St. Mary, Aldermary; St. Mary-le-Bow, or Bow Church, Cheapside; St. Mary Magdalen, Old Fish-street; St. Mary Somerset, Thames-street; St. Michael's, Crooked-lane; St. Michael's, Wood-street; St. Nicholas, Old Fish-street; St. Paul's Cathedral; St. Peter's, Cornhill; St. Stephen's, Coleman-street; and St. Swithin's, by London Stone. He also designed Temple-bar; the College of Physicians, Warwick-lane, Newgate-street; and the Monument.

Wycherley, William (b. 1640—d. 1715), comic poet; was a Templar, and lived on the west side of Bow-street, Covent-garden, and lies buried in St. Paul's, Covent-garden.

York, Philip, Lord Hardwicke (b. 1690—d. 1764), celebrated lawyer and Lord Chancellor; was articled to an attorney in Brook-street, Holborn; he lived for twenty years in the second Powis-house, Great Ormond-street.

Young, Edward (b. 1681—d. 1765), poet, author of "Night Thoughts," was married at Mary-at-Hill Church, Bishopsgate.

Zoffany, John, R.A. (b. 1735—d. 1810), theatrical portrait painter; lived in the Piazza, Covent-garden (the north-east wing); also at No. 9, Denmark-street, St. Giles's.

Proceedings of Institutions.

EXAMINATION PAPERS, 1868.

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

ARITHMETIC.

THREE HOURS ALLOWED.

1. The fore-wheel of a coach is $8\frac{1}{4}$ feet round; the hind wheel $12\frac{1}{2}$ feet round. How many more revolutions will the former make than the latter in the course of a mile and a quarter?

2. How many English ells of cloth, at 19s. $9\frac{1}{2}$d. per ell, should be given in exchange for 47 yards 2 qrs., at 17s. 5d. per yard?

3. If £7 14s. 7d. pay the wages of 10 men and 3 boys, how many persons will £12 19s. 7d. pay, a man earning 5 times as much as a boy?

4. If 2 engines of 12 horse-power raise 3,200 gallons of water from a depth of 75 fathoms in 45 minutes, in what time would the same engines raise 4,000 gallons from a depth of 50 fathoms?

5. Find by Practice the value of $267\frac{5}{6}$ cwts. of sugar at £2 14s. 6d. per cwt.

6. Calculate the value of 215 acres, 1 rood, 20 poles, at £2 10s. 6d. per acre.

7. How many articles, bought at 1s. $4\frac{1}{2}$d. each, must I sell at 1s. 9d. to make a profit of £2 14s.?

8. What will be the carriage of $\frac{18}{25}$ cwt. for 80 miles at the rate of a farthing a lb. per mile?

9. In what time will £161 5s. at 5 per cent. per annum. gain the same interest as £75 12s. 6d. gains in $18\frac{1}{4}$ years at $4\frac{1}{2}$ per cent. per annum?

10. A and B work together for a fortnight; A works 9 hours a day throughout; B works ten hours a day the first week, but only 7 hours a day the second. They earn £11 1s. 8d. How much ought each to receive?

11. Exchange into decimal coinage 1,000 francs 50 centimes, the rate of exchange being 25 francs 17 centimes per £.

12. An income of £150 10s. is liable to a tax of £4 7s. 6d. What is the tax on £361 4s.? Work by decimal currency, a £ being the unit.

13. Change £32 into French money at the rate of 25 francs 80 cents per £.

14. Subtract 3 roods, 39 poles, 30 square yards, 2 square feet, 35 square inches, from 1 acre.

15. What is the difference between the simple and the compound interest of £350 for 3 years, at 5 per cent. per annum?

16. If a ship be insured for $91\frac{2}{3}$ per cent. of its value, the whole value being £6,968, what would a person lose who owned $\frac{2}{5}$ of it in the event of its being lost?

17. By selling sugar at 6d. per lb. a grocer clears $\frac{1}{8}$ of his outlay. He lowers the price to $5\frac{1}{2}$d. What does he now clear per cent.?

18. If goods worth £1,200 are to be insured at $1\frac{1}{2}$ per cent, to what amount must they be insured so that in case of loss the person insuring them may recover the value of both the goods and the premium?

19. During the first six months of the year the income tax is 7d. per £; but during the last six months it is 5d. per £: what is the gross annual income of a gentleman who receives £819 after deducting income tax for the year?

20. Bought wheat at 61s. a quarter, payable in 4 months: how must I sell it the same day so as to make my immediate gain $5\frac{5}{19}$ per cent., giving 7 months' credit?

21. A can do $\frac{1}{2}$ of a work in 4 hours; B can do $\frac{3}{4}$ of the remainder in 2 hours; and C can then finish it in 20 minutes. In what time could the three together perform the work?

BOOK-KEEPING BY DOUBLE ENTRY.

THREE HOURS ALLOWED.

1. Journalise and post, in proper technical form and language, the following imaginary transactions, and make out from the ledger a trial balance, a profit and loss account, and a balance-sheet.

On 1st January, 1868, D. Scott has assets and liabilities as follows:—

Assets.

	£	s.	d.
Business premises, valued at	500	0	0
Wine	2,000	0	0
Due by J. Wall	205	0	0
Bills receivable	352	0	0
Cash	605	12	4

Liabilities.

	£	s.	d.
Bills payable	557	0	0
Due to W. Brown	44	0	0

On 1st January, 1868, T. Jones is taken into partnership. T. Jones's capital is composed of brandy valued at £2,000 and £1,000 in cash.

N.B.—The capital and drawings of the partners are subject to interest at 5 per cent. per annum, and the net balance of profit and loss is divisible equally between them.

1868.			£	s.	d.
Jan.	1	Advanced for petty cash	10	0	0
,,	,,	Paid cash for purchase of additional business premises	200	0	0
,,	3	Discounted S. Nokes's acceptance for £200, and received in cash £197 10s., and allowed for discount £2 10s.	200	0	0
,,	6	Brought wine for cash	342	10	0
,,	,,	Sold brandy for cash	845	0	0
,,	,,	Paid cash for our acceptance to J. Wilson due this day	257	0	0

Jan.	9	Bought brandy of F. Black	400	0	0
„	10	Cash drawn out by D. Scott	200	0	0
„	13	Sold G. Green wine	500	0	0
„	„	Received from G. Green (and cancelled) our acceptance to him..	300	0	0
„	„	Received G. Green's acceptance to us at two months..........	200	0	0
„	14	Received amount due by J. Wall —viz., £200 in cash, and allowed for discount £5	205	0	0
„	16	Paid amount due to W. Brown— viz., £42 in cash, and received for discount £2	44	0	0
„	20	Sold J. Wilson brandy	240	0	0
„	„	Sold, ditto, wine	800	0	0
„	„	Received J. Wilson's acceptance at twenty-one days	1,040	0	0
„	25	Received consignment of cigars from J. Thompson, invoiced at	100	0	0
„	30	Bought of J. Wall, the schooner *Dolphin*	2,000	0	0
„	„	Paid J. Wall, cash	1,000	0	0
„	„	Accepted J. Wall's draft at two months	1,000	0	0
„	31	Paid salaries of clerks	30	0	0
„	„	Received Johnson and Son's account for carriage of wine during the month of January	4	3	0
„	„	Trade charges paid out of petty cash to this date	8	9	0
		Interest on amount of capital drawn out by D. Scott........		11	6
		Interest on D. Scott's capital....	12	15	2
		„ T. Jones's „	12	10	0
		Estimated wear and tear of business premises................	10	0	0
		Stock of wine on hand	1,250	0	0
		Stock of brandy on hand	1,310	0	0

2. What is the use of a trial balance?
3. How is the profit-and-loss account affected?

(1.) If expenditure which ought to have been charged to it is charged to capital?

(2.) If receipts are credited to it which ought to have been credited to capital?

4. If, on examining the books, it be found that the following entry:—"Interest on T. Jones's capital £12 10s.," has been journalised and posted as if it had been "interest on amount of capital drawn out by T. Jones, £12 10s.," what journal entry or entries would be necessary to correct the error?

ALGEBRA.

THREE HOURS ALLOWED.

1. Explain the ordinary system of arithmetical notation.

Show that, if a number of six figures be formed by the repetition of any three figures in the same order, the resulting number will be divisible by 7, 11, and 13.

2. If $ax^2 + bx + c$, and $ax^2 + mbx + m^2c$ have a common measure, then $(m+1)^2ac = mb^2$.

3. Simplify the expressions,

$$\left(\sqrt{\frac{a+x}{x}} - \sqrt{\frac{x}{a+x}}\right)^2 - \left(\sqrt{\frac{x}{a}} - \sqrt{\frac{a}{x}}\right)^2$$

$$1 + \frac{x}{a} + \frac{a}{x} + \frac{x^2}{a^2} + \frac{a^2}{x^2} + \left(\frac{x^3}{a^2} - \frac{a^3}{x^2}\right)\frac{1}{x-a}$$

4. A man having a capital of £P spends it all in the purchase of certain shares, each of which pays a dividend of £d; and he buys at such a rate that, when the shares have risen £r each, he gains £q by selling out. When the shares have fallen to their original price he again invests all his money in them. Find the alteration in his income, supposing a brokerage of £b a share is paid for purchasing.

5. Solve the equation $ax^2 + bx + c = 0$

If α β be its roots, prove that
$ax^2 + bx + c = a(x-\alpha)(x-\beta)$

6. Determine the number of permutations which can be formed out of n things taken r at a time.

7. State and prove the algebraical theorem upon which the arithmetical "Double Rule of Three" depends; and make and work out an example in illustration of it.

8. The arithmetic mean between two numbers exceeds the harmonic by 1, and twice the square of the arithmetic mean exceeds the sum of the squares of the geometric and harmonic means by 11; find the numbers.

9. Write down the r^{th} term of $(a - x)^n$.

If a_0, a_1, a_2, &c., be the co-efficients of the 1st, 2nd, 3rd, &c., . . . terms respectively, of the expansion of $(1 + x)^n$, find the value of $a_0 a_1 + a_1 a_2 + a_2 a_3 +$ &c., . . . $+ a_{n-1} a_n$.

10. Prove that the difference between the interest and discount upon any sum is the interest upon the discount.

If this difference for £420 for one year be £1, find the rate per cent.

11. A man throws with three dice on the condition that, if he throws 10 exactly he shall receive a sovereign; find the value of his expectation.

12. Sum the series $1 - 3 + 5 - 7 +$ &c. to n terms.

(*To be continued.*)

Fine Arts.

Works of Art Executed or placed in Public Buildings in France.—The catalogue of the annual exhibition of works of art in Paris contains a very interesting addendum, namely, the list of paintings and sculpture executed during the past year, by order of the Government, or purchased for the decoration of public buildings, and other monuments. The list for 1867-68 is as follows:—

Painting.

Balze, Paul—Three paintings in *faïence*, for the vestibule of the new church of La Trinité, Paris.

Brisset, P. N.—Two paintings in the Chapel of the Virgin, in the new church of St. Augustin, Paris.

Brunner-Lacoste, Henri—Ceiling and decorative paintings in the hôtel of the Sous-prefecture of Sceaux.

Cazes, Romain—Mural paintings in the churches of Nôtre Dâme de Clignancourt, and du Jesu.

Delaunay—Two paintings in the Chapel of the Virgin in the church of La Trinité.

Denuelle—Restoration of a gallery in the palace of Fontainebleau; decorations in the reception-rooms at Versailles; church of La Trinité; the Préfecture of Grenoble; and the Pavillon Denon of the New Louvre.

Desgoffes, Alexander—Paintings in the new reading-room of the Bibliothèque Impériale.

Doze, J. M. M.—Paintings in the churches of St. Gervasy, Gard, and Sainte Perpétué, at Nismes.

Dupuy-Delaroche—Painting in the sanctuary of the church of La Feuille.

Gonézou, Joseph—Death of St. Louis, in the church of Nôtre Dame de Bon Port, Nantes.

Guiaud, Jacques—Six compositions in the palace of Fontainebleau.

Hesse, J. B. A.—Three paintings in the churches of St. Gervais and St. Protais, Paris.

Lamothe, Louis—Decorations in the churches of the Jesuits, Paris, and St. Iréné, at Lyons.

Le Henaff, A. F.—Two paintings in the chapel of St. Hilaire, and church of St. Etienne du Mont, Paris.

Lenepveu, J. E.—Eight paintings in the chapel of the Hospice of St. Marie, at Angers; four in the Prefecture

of Grenoble; and two in the church of St. Clotilde, Paris.

Magaud, D. A.—Ceiling and four panels at the Prefecture of Marseilles.

Ulmann, Benjamin—Three compositions in the Court of Cassation, Paris.

Vibert, Jules—Painting in the chapel of La Miséricorde, at Bayeux.

Sculpture.

Auvray, Louis—Monumental bust of Condillac, for the Prefecture of Grenoble.

Bertaux, Madame Léon—Two figures of saints in stone, for the church of St. Laurent, Paris.

Caillé, J. M.—Two caryatides, for the Place de la Trinité, Nantes.

Chambart, Louis L.—Statues of Mercury, in the court of the Tuileries, and of Jupiter, for St. Cloud.

Chatrousse, Emile—Statue for the church of St. Ambroise, Paris.

Courtet, Augustin—Two statues for the façade of the church of St. Laurent, Paris.

Dantan, J. P., jun.—A statue for the church of La Trinité, Paris.

Dumont, A. A.—Marble bust of Alexander Lenoir, founder of the Musée des Monuments Français, for the Ecole des Beaux Arts.

Etex, Antoine—Tomb of Louis Martinet, in the cemetery of Père La Chaise.

Girard, Noel Jules—"Comedy and Drama," façade of the new Opera-house, Paris.

Gruyère, T. C.—Bas-relief for the church of St. Thomas D'Aquain, Paris; and for the façade of the Opera-house.

Hébert, Emile—Groups, "Comedy" and "Drama," façade of the new Vaudeville Theatre.

Iguel, Charles—Composition for the *fronton* of the hospital of Roubaix; and bust of Sebastian Bach, for the Conservatoire of Paris.

Jouandot, Amédée—Decorations in bronze for the Fountain of the Three Graces, at Bordeaux.

Lavigne, Hubert—Bas-relief, for the façade of the Chapelle of Chantemerle.

Le Hárivel-Durocher, Victor—Four statues in stone.

Maniglier, H. C.—Bas-relief, "Science and Art," for the new Opera-house.

Mathieu-Meusnier, Rolland—Statue, "The Goldsmith," court of the Louvre.

Meunier, Louis—Group, in copper *repoussé*, of the Archangel overthrowing Satan, for the roof of the chapel of the Château of Pierrepont.

Michel-Pascal, François—Sculptures for the churches of Sainte-Croix and St. Ferdinand, Bordeaux, and for the Sous-prefecture of Mirande.

Petit, Jean—Statues of Castor and Pollux, for the façade of the Tuileries; and bas-relief, "The Muses of Architecture and Industry," for the façade of the Opera.

Pètre, Charles—Marble group for the church of Drancy.

Poitevins, Philippe—Fronton for school-house at Chambéry.

Robert, L. V. E.—Two caryatides, for the façade of the Opera; statues of "Agriculture" and "Industry," for the Orleans Railway-station.

Rouillard, Pierre Louis—Eight eagles, for the new Opera-house; and lions, for the piers of the bridge of Arles.

Salmson, Jean Jules—Caryatides, "Folly," "Comedy," "Satire," and "Music," for the new Vaudeville Theatre.

Sobre, Hyacinthe—Fronton, "Work and Pleasure," for the Opera.

Truphême, François—Fronton, "The Evening Hours," for the Opera-house.

It is worthy of remark that, in the majority of cases, commissions for the provinces are given to artists residing in, or natives of, the same town or department; and of the fifty artists whose names appear in the above list, less than half are natives of Paris.

Commerce.

The Production of Wax and Honey in Italy.—The Italian peasantry, as a rule, take but little care of their bees, the hives are generally of wood, and the bees are destroyed in order to get the honey. The following is the production of honey in Italy:—

	Quantity Kils.		Amount Francs.
Piedmont and Liguria....	380 000	..	300,000
Lombardy	179,880	..	170,000
Venetia	174,160	..	165,000
Emilia, Umbria, and the Marches.............	189,840	..	190,000
Other Provinces	600,000	..	560,000
Total	1,523,880	..	1,385,000

The best honey is that of Bormio, in Lombardy, that of Empoli in Tuscany, and that of Otranto. The exports of honey from Italy are very small. The production of wax is as follows:—

	Quantity. Kils.		Amount. Francs.
Piedmont and Liguria	75,000	..	350,000
Lombardy	72,000	..	340,000
Venetia	59,920	..	250,000
Emilia, Umbria, and the Marches.............	33,900	..	150,000
Other provinces..........	140,000	..	500,000
Total	380,820		1,590,000

About two-thirds of this quantity are used for making wax-candles, and the rest is bleached and moulded into cakes for sale. As the production of wax in Italy is not in proportion to the consumption, a great deal of raw wax is imported, the best quality being supplied from Moldavia, Wallachia, Bosnia, and the Archipelago; the second quality from Poland, Hungary, Transylvania, Africa, and America; the third quality from the islands of Cuba and St. Domingo. The following are the imports of this substance from 1863 to 1865:—

	Quantity. Quintals.		Amount. Francs.
1863	9,517	....	3,996,000
1864	8,436	....	3,532,000
1865	8,517	....	3,591,000
Average	8,823		3,706,000

Receipts of the Italian Railways.—In 1867, the total length of the railways opened to public traffic was 4,805 kils., of which 151 kils. were opened during the year. The total receipts were 76,254,815frs. The total number of passengers amounted to 14,433,430. The goods per "grand vitesse" amounted to 94,606,206 kils., of which 4,284,691 kils. cocoons; 15,626,588 kils. articles of food; and 72,920,062 kils. parcels. These do not include the transport of carriages, horses, &c. The goods carried per "petite vitesse" amounted in all to 28,888,345 kils., the principal items being grain, wine, and spirits, coal, timber, and marbles.

Commerce of Algeria.—The general commerce of the colony of Algeria, in 1867, including both exports and imports, amounted to 284,838,990 francs, showing an increase on that of 1866 of 12,941,156 francs. The exports amounted to 97,161,983 francs, an increase of 4,429,076 on those of the previous year, and the imports to 187,677,007 frs., principally in wheat and flour, drawn from France and other foreign countries, in consequence of the failure of the harvest. The value of the produce of the soil and manufactures from France was 143,871,466 francs; next to France comes Turkey, the states of Barbary, Spain, and Russia, and then England, for a sum of 4,879,563 frs. only, including articles of consumption, iron, coal, and woollen goods. A curious circumstance is, that in the above total, the port of Oran takes

the greatest share, namely, 69,284,707 frs., or 36·93 per cent., and Algiers, only 66,758,241, or 35·58 per cent. In exportation cattle represent an amount of 10,717,248 frs.; skins, 4,319,285 frs.; and oils, 5,868,443 frs.

The Beetroot Crop.—Messrs. Arnold, Baruchson, and Co. give the following account of the position and prospects of the beetroot crop, in their circular, dated Douai, 1st July:—"At one time, the uninterrupted dry weather began to create great uneasiness; and although since then some slight showers have refreshed the plant, more rain is indispensable to neutralise the effects of the long-continued tropical heat; much greater mischief might, however, have been done, if the leaves, which shelter the root from the burning sun, had been less developed. It is impossible to give, as yet, any positive information as to the extent of damage, if any, done to the plant, except that the high state of temperature has greatly increased the number of insects, which, even in favourable seasons, always injure, more or less, the root, and which rains alone can help to destroy."

Colonies.

Queensland Cotton-growing. — A Brisbane paper says:—"The cotton season is being got through very satisfactorily, in so far as quality and quantity of crop are concerned, but the prices offered are very low. Unless there is an advance it is not likely that cotton-growing will extend here; the labour of packing and the expense of ginning, monopolise nearly the whole of what the staple at present fetches. Those growers who are in a position to do so, intend to keep back their cotton, in anticipation of an advanced price. One reason for regret that our growers should be driven into this course, is the uniformly high quality of this season's crop, which, did it reach Europe in quantity, could not fail to draw attention to this as a cotton-producing country. In length of staple, strength, and general appearance, it is greatly superior to that of the first few years' cotton grown here. The characteristics of the plant are also changing rapidly, and on not a few plantations have we seen samples peculiar to this colony. The seed will be retained and planted separate, so that the merits of the new varieties will have a fair chance of developing. Amongst others, we have been shown a plant of what is evidently a hybrid between Sea Island and Egyptian; it has every appearance of a really valuable variety."

Tea in Queensland.—A sample of tea manufactured from leaves taken from plants in the Botanical Gardens in this colony, by a Chinese firm, has been shown there. The principal of the firm appears to understand the process tea has to undergo before it is suited to the European taste; and the present sample bears a strong resemblance to orange pekoe.

Sugar in New South Wales.—Not long since the first parcel of colonial sugar, consisting of 120 bags and 34 casks of treacle, grown at Hastings, was submitted for competition in this colony. A portion of it made £34 per ton, and the remainder £33. This end has been effected by perseverance for some time, and it is hoped it will be continued, as there has been at last produced sugar from the cane, the produce of the soil of the colony, manufactured by colonial machinery; an article which must therefore be looked upon as a purely colonial product.

Meat Preserving.—The Melbourne sheep and bullock farmers are looking with some favour on the establishment of a meat preserving company, under the impression that by this means they may get rid of their surplus meat on better terms than by merely boiling it down for tallow. For the present, Mr. Ritchie's mode of tinning meat is the one to be carried out. £50,000 is to be the nominal capital, but it is not intended to confine operations to this mode; the company holds itself open to any, and Mr. Mort's would be preferred (says the *Sydney Mail*), were the experiments a little further advanced.

Notes.

Oxyhydrogen Light.—The experiments commenced last year on the Place de l'Hôtel de Ville, in Paris, on the oxyhydrogen light, are about to be continued, by order of the Emperor, in the court of the Tuileries. The magnesia cylinders having been found to corrode and waste away too rapidly for the purposes of a continuous light, an artillery officer, M. Caron, after experimenting with a variety of substances, has adopted zircon, a substance which Berzelius pointed out as infusible, and giving forth a very brilliant light under the blowpipe. It is said that M. Caron has had a cylinder of this substance in use with the oxyhydrogen light for a month without the slightest trace of volatilization. The luminous power of zircon, under the oxyhydrogen jet, is about one-fifth more than that of magnesia. The zircon employed is an oxyde of zirconium; it is found principally near Miask, at the foot of the Ural mountains. M. Caron economises the zircon, by mounting a point of it on a small stick of magnesia or fire-clay, the zircon being made to adhere by compression and afterwards baking.

The Foundations of the Old Louvre.—The municipal government of Paris caused a very careful examination to be made last year of the remains of the old Louvre, the fortified castle of Philip Augustus, which lie beneath the enclosed court or square of what is now called the Old Louvre, and it was found that the ideas respecting this ancient edifice were very erroneous. The base of the Donjon-tower, which figures conspicuously in history, was found intact, and only a few feet beneath the present surface of the ground. An admirable method has been adopted, of recording the form of the ancient fortress; the entire ground-plan has been laid in black and white asphalte, except where the old building lies beneath the pavement of the present court, in which case granite has been used to represent the foundation of the old building. There is an immense advantage in thus bringing so interesting a remnant of a byegone age bodily, as it were, under the eye of the public. Engravings would, of course, perpetuate the lines for all those who sought for information respecting them, but the method adopted will arrest the attention of many, and lead to inquiry.

International Exhibition in Chili.—An exhibition of machines, apparatus, animals for breeding, agricultural produce, dried meats and vegetables, timber, textile fibres, liquors of all kinds, and models for farm and rustic buildings, is announced to open at Santiago, the capital of the republic of Chili, on the 15th of September in the present year, and all the world is invited to contribute. There are to be five classes of medals, one grand medal of honour, and others of gold, silver, and bronze. Applications are to be made, before the 10th of August, to MM. Germain and Hermanos, commissioners, Paris and Havre, or to the Chilian consuls.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 3rd July*, 1868.

206. Bill—General Police and Improvement (Scotland) Act Amendment.
203. (5.) Railways Abandonment—Report of the Board of Trade.
335. Turnpike Trusts—Return.
360. Metropolitan Board of Works—Return.
371. Army (Artillery and Engineer Colonels)—Return.
Abyssinian Expedition—Further Correspondence.

Delivered on 4th July, 1868.

174. Bill—Court of Justiciary (Scotland) (amended).
207. ,, Inland Revenue.
130. (v.) Railway and Canal Bills—Sixth Report.
349. Turnpike Trusts—Return.
373. War Office (Control Department)—Correspondence.
Public Petitions—Twenty-ninth Report.

Delivered on 6th July, 1868.

209. Bill—Petit Juries (Ireland) (as amended by the Select Committee.)
170. Navy (Health)—Statistical Reports.
286. Harbour Loans—Return.
338. Coals, Cinders, and Culm, &c.—Accounts.
361. Public Bills (Ireland and Scotland)—Return.
381. New Courts of Justice—Letter.

Delivered on 7th July, 1868.

208. Bill—Indorsing of Warrants.
210. „ Salmon Fisheries (Scotland).
128. (I.) Navy (Channel Fleet)—Report.
270. East India (Finance and Revenue Accounts)—Parts I. and II. Accounts, Estimate, &c.
380. Roman Catholic University (Ireland)—Further Correspondence.
Public General Acts—Cap. 31 to 40.

Delivered on 8th July, 1868.

151. (IV.) Trade Accounts (Foreign Countries)—Belgium, Holland, France, and United States.
265. House of Commons (Arrangements)—Report.
318. Boundaries of Boroughs—Petitions, Letters, &c.
364. West India and Brazil Mails—Contract.
391. South Sea Islanders (Queensland)—Extracts of Correspondence.
The Danube—Convention.

Session 1867.

431. (B I.) Poor Rates and Pauperism—Return (B).

Delivered on 9th July, 1868.

212. Bill—Public Departments Payments.
215. „ Representation of the People (Scotland) (Lords Amendments).
216. „ New Zealand Assembly's Powers.
218. „ Tithe Commutation, &c., Acts Amendment.
316. Shipping—Return.
372. Bristol Election Petition—Minutes of Evidence.
375. West India Mails—Correspondence.
376. Brazils and River Plate Mails—Correspondence.
380. Roman Catholic University (Ireland)—Corrected Paper.
387. Oyster and Mussel Fisheries Act (1866)—Report.

Delivered on 10th July, 1868.

214. Bill—Court of Session (Scotland) (amended on re-commitment).
217. „ Vaccination (Ireland).
219. „ Trade Societies and Combinations of Workmen.
221. „ Mines Assessment (amended on re-commitment).
222. „ Sanitary Act (1866) Amendment.
223. „ Land Drainage Provisional Order Confirmation.
225. „ Army Chaplains.
239. East India (Contract Law)—Papers, Reports, &c.
244. East India (Education)—Report.
322. Poor Law (Ireland)—Returns.
362. Slave Trade—Return.
390. Petit Juries (Ireland) Bill—Special Report.
Customs—Twelfth Report of the Commissioners.

Patents.

***From Commissioners of Patents' Journal, July* 10.**

Grants of Provisional Protection.

Band-saw machines—1864—G. Finnegan.
Bobbins, machinery used in the manufacture of—2070—J. Tyson.
Boilers—2021—C. Johnson.
Boilers, apparatus applicable to, for utilising waste heat, &c.—2037—M. and J. Mackie.
Boots and shoes—2015—G. Taylor.
Boots and shoes, ventilating—2039—G. Smith.
Bottles, apparatus for cleansing—2052—C. D. Abel.
Brick machines—2023—A. V. Newton.
Buildings, heating—1478—J. M. Stanley.
Carding engines—2032—N. C. Underwood.
Cards for carding—2011—W. A. Gilbee.
Carriage doors, &c.—2010—W. E. Gedge.
Carriages, coaches, &c.—2030—W. Carr.
Ceramic matters, &c—1972—A. M. Clark.
Chairs, folding—2022—A. V. Newton.
Chairs, folding—2054—M. Burke.
Charcoal, animal, charring and preparing—2031—J. Gregory.
Chess boards and chess men—1992—G. Owen.
Colours, crystal brocatel, obtaining—1945—C. E. Schwartz.
Cotton, &c., drawing rovings, &c., of—1978—G. F. Redfern.
Cotton, &c., preparing—2058—J. Taylor.
Dredging machines—1959—D. Elder.
Educational apparatus for illustrating steam propulsion—2028—C. T. Sutton.
Electric conductors, coating—2012—M. Gray and L. Gibson.
Electro-magnetic machines, &c.—2060—F. H. Holmes.
Fabrics, woven, machinery for finishing—1976—A. Cochran.
Fenders, &c.—1951—T. Kendrick.
Fibrous materials, preparing for combing, &c.—2007—W. Tongue.
Fire-arms and cartridges—2018—C. M. H. Downing.
Fire-arms and cartridges—2049—G. T. Bousfield.
Fire-arms, breech-loading—2066—R. Warry.
Furnaces—2034—J. Mitchell.
Gas—1980—C. Hengst and H. Watson.
Gas—1948—L. S. Thomassin.
Guns, cartridges, and bayonets—2038—T. Restell.
Harbours and docks, cleaning—2068—C. Mather.
Hats, &c., ventilating—1876—R. Husband.
Ingot moulds, constructing—2043—J. Briggs.
Lime and cement, burning—2041—R. Elsdon.
Looms—2056—R. Clough.
Meats and fruits, preserved, packing for sale—2063—T. C. Blanchflower.
Mill bills and picks—2014—C. Whitehouse.
Millstones, apparatus for dressing—2050—J. Hine.
Millstones, instrument for ascertaining irregularities in the surfaces of—2024—P. and B. Brown.
Motive-power apparatus—1988—M. P. W. Boulton.
Neckties, &c., fastenings for—2057—S. S. Maurice.
Needles, polishing—2008—E. T. Hughes.
Oxide of manganese, obtaining—2072—W. F. Deane.
Pill-making machines—1974—J. and E. Lumley.
Printing machines, lithographic, &c.—1986—D. and J. Greig.
Railway trucks, &c., covering and uncovering—2053—T. Dodd.
Reaping and mowing machines—2020—J. and A. Douglas.
Reaping and mowing machines—2025—C. T. Burgess.
Reaping and mowing machines, sharpening the cutters of—1982—J. Hemington.
Rick cloths—2047—J. G. Garrard.
Rotary engines—1983—E. R. Kaulbach.
Rotatory engines and pumps—2006—R. and W. K. Austin.
Rock, &c., boring—1989—F. B. Dœring and R. H. Twigg.
Sewing machines, &c., actuating—2046—A. D. Aulton.
Ships' bottoms, preventing the fouling of—2076—R. Smith.
Ships, sailing, applying auxiliary screw propellers to—2044—J. Jack.
Steam engines—1993—W. Umpherston.
Steam engines, &c.—2002—J. Shelmerdine, W. Walker, and E. Holt.
Stench traps—1996—A. A. Common.
Stone or slate, artificial—2048—H. Highton.
Straps and belts—2000—C. H. Murray.
Straw shakers, &c., actuating—2016—J. Hayes, sen., and J. Hayes.
Thread, winding—2013—A. M. Clark.
Type setting and distributing machines—1984—A. Mackie.
Waterclosets—2059—A. Thomson.
Water, distilling pure from salt—2061—L. Thomas.
Water pipes, protecting from injury by frost—2029—B. T. Moore.
Wheat, cleaning and decorticating—1998—J. Hadley.
Wool, &c., carding and spinning—2019—H. A. Bonneville.
Woven fabrics, preparing—2045—E. Lever.
Yarns, finishing—2051—C. Hastings, J. Briggs, and J. Law.
Yarns or threads, treating certain waste—1994—G. H. Midwood.

Invention with Complete Specification Filed.

Fibrous substances, spinning, &c.—2124—C. Roussel.

Patents Sealed.

90. O. H. McMullen.
101. C. S. Lemon.
114. T. S. Ellin.
121. W. E. Gedge.
125. J. C. Ramsden.
126. T. Sagar and T. Richmond.
128. F. and I. Alekan.
129. W. E. Gedge.
141. T. Travis, W. H. Prince, and J. Tomlinson.
181. H. A. Bonneville.
192. T. G. F. Dolby.
294. A. Pickering.
336. J. Walker and J. Hudson.
350. J. V. Jones and G. J. Williams.
538. A. M. Keighley.
826. J. Vero.
1488. W. E. Newton.

***From Commissioners of Patents' Journal, July* 14.**

Patents Sealed.

130. L. M. Becker.
132. J. Lang.
133. D. Hodgson and J. Dodd.
135. W. Ayliffe.
136. J. Williamson.
143. J. J. Ashworth.
145. R. Schneider.
152. T. Nash.
153. G. E. Reading.
162. J. Hosking, jun.
164. H. Aitken.
166. J. M. Napier.
167. D. A. Fyfe.
172. J. Millward.
174. H. H. Lloyd.
201. J. Parsons.
220. A. B. Brown.
222. J. Dixon.
226. W. Thompson & T. Stather.
244. H. J. Dickinson.
250. G. Severn.
272. F. Wirth.
279. W. E. Rendle.
300. A. C. Pilliner & J. C. Hill.
317. W. E. Newton.
322. J. Grimes.
351. R. C Smith.
395. W. E. Newton.
423. J. B. Wilson.
611. W. E. Newton.
1065. J. Macintosh & W. Boggett.
1182. G. H. Palmer.
1721. W. R. Lake.

Patents on which the Stamp Duty of £50 has been paid.

1803. J. Bullough.
1796. E. H. Waldenström.
1865. J. Thornton.
1919. J. M. Croft.
1942. W. E. Newton.
1944. W. Barton.

Patents on which the Stamp Duty of £100 has been Paid.

1757. W. B. Adams.
1749. J. C. B. Salt.
1778. A., J., and J. Topham.

Journal of the Society of Arts.

FRIDAY, JULY 24, 1868.

Announcements by the Council.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, will shortly be published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

COMMITTEE ON TECHNICAL EDUCATION.

A meeting of this Committee was held on Tuesday, the 21st inst., WILLIAM HAWES, Esq., in the chair, to receive the report of the Sub-Committee appointed on the 26th February last (see *Journal*, p. 275), "with power to add to their number."

The following is a list of the Sub-Committee, as finally constituted :—

T. D. Acland, M.P.	Professor W. A. Miller, F.R.S.
General Sir W. Codrington, G.C.B.	Professor W. Pole, F.R.S.
R. Coningsby.	Dr. D. S. Price.
T. Connolly.	J. Scott Russell, F.R.S.
Sir Daniel Cooper, Bart.	Rear-Admiral Ryder.
Dr. Frankland, F.R.S.	B. Samuelson, M.P.
Thos. Gray.	J. P. Seddon (Sec. R.I.B.A.)
William Hawes.	R. P. Spiers (Pres. Architectural Association).
G. W. Hemans.	Dr. Storrar.
Hon. Auberon Herbert.	Capt. Toynbee.
Professor Hirst, F.R.S.	Professor Voelcker.
Professor Huxley, F.R.S.	Prof. Williamson, F.R.S.
Professor Fleeming Jenkin, F.R.S.	The Archbishop of York.
Professor Leone Levi.	

This Sub-Committee, having held twenty-six meetings, agreed to the following

REPORT.

The Sub-Committee, appointed on the 26th February, in the exercise of the power given to them to add to their number, have obtained the active and valuable co-operation of the following gentlemen:—Professor Hirst, F.R.S., Professor Williamson, F.R.S., Dr. Frankland, F.R.S., Samuel Redgrave, Dr. David S. Price, Sir Daniel Cooper, Bart., T. D. Acland, M.P., General Sir W. Codrington, G.C.B., Captain Toynbee, Thomas Gray, Professor W. A. Miller, F.R.S., Dr. Voelcker, J. P. Seddon, of the Royal Institute of British Architects, and R. Phené Spiers, President of the Architectural Association. This enlarged Sub-Committee has now the honour to present the following report:—

It has been thought unnecessary to enter into the questions of how far better technical instruction is desirable, how far this country may be behind other nations in this respect, or what degree of injury the arts, commerce, or manufactures of this country have sustained from the present defective state of education. The Committee have assumed that the country is unanimous in desiring improvement, and have confined their attention to the consideration of practical measures intended to effect that improvement.

The technical education of workmen must necessarily be considered apart from that of masters, managers, or professional men. The Sub-Committee have devoted their chief attention to the higher grades of instruction, believing that our defects are far more due to the ignorance of those who direct works than to imperfect technical education, want of skill, or incapacity in those who execute them.

At the outset of their inquiry the Sub-Committee felt some embarrassment as to the meaning of the words "technical education." Taken in their most general sense, these words include all manner of instruction required by the workman for his craft, by the manufacturer for his business, by the professional man for his practice. Technical education in this sense is synonymous with the whole education of the country, so far as that education is not directed to "culture;" and if, as we believe, culture be useful, technical education in this broad sense must be considered as embracing both education commonly so called, and in addition the special training received in the workshop, the factory, the office, and in all other places where young men learn to practise the craft, art, or profession by which they gain their bread.

The Sub-Committee did not understand that they were called upon to grapple with so gigantic a problem as a scheme for the general education of the country. Looking at the discussions which gave rise to their appointment, they believed that the complaints made of defective technical education arose from the belief (whether correct or not) that for the members of certain professions, arts, and handicrafts requiring a knowledge of mathematics and the natural sciences, no sufficient education was to be obtained in England. Although the system of apprenticeships may call for special inquiry, and, possibly, for legislation, your Committee, in order to restrict its inquiry within reasonable limits, and to carry out the views expressed by the general Committee, resolved that—"*For the purposes of discussion, technical education should be deemed to exclude the manual instruction in Arts and Manufactures which is given in the workshop.*"

When dealing with the higher grades of education, the Sub-Committee felt that on similar grounds they were precluded from the consideration of the practical training given to business and professional men, as clerks or pupils. The form of this practical training (which the Sub-Committee regard as essential) is determined in each case by special circumstances, over which no government or committee have any control; and it was therefore necessary to confine the investigation to the best form of preparation for this practical pupilage.

The consideration of the education of the members of the clerical, legal, and medical professions was also set on one side. The Sub-Committee were thus led to use the term "technical education," as meaning "*general instruction in those sciences, the principles of which are applicable to various employments of life,*" and further to consider only the following employments, so far as the higher grades of education were concerned :—

The Civil Engineer.
The Mechanical Engineer.
The Architect.
The Chemical Manufacturer.
The Agriculturist.
The Metallurgist.
The Miner.
The Merchant.
The Officers of the Army and Navy.
,, ,, ,, Mercantile Marine.

As regards the higher education, which will be first considered, two distinct schemes were discussed. Firstly, technical education might be given in special schools. Secondly, in institutions devoted to the general purposes of education. Special colleges for the education of the members of all the above professions are to be found abroad. The polytechnic schools of Germany and Switzerland were especially urged upon the Committee as worthy of imitation. Sufficient evidence exists that in those institutions good scientific instruction is combined with practical training to an extent which Englishmen can hardly credit, unaccustomed as they are to see practical work learned otherwise than by practice. While, however, your Sub-Committee recognise the great merits of these institutions, they do not recommend them for imitation, but, on the contrary, resolved—"*That technical instruction, as defined above, should not as a rule be given in separate professional institutions, but in institutions established for general education.*"

The reasons for this conclusion may briefly be stated as follows:—

Where training in polytechnic schools is adopted, the system of pupilage does not obtain; the number of years at the disposal of young men for their professional training does not allow of the combination of the higher school teaching with the teaching by pupilage, and of the two the latter is considered preferable. It would also be almost impossible, even if it were desirable, to substitute the foreign for the English system, and there is certainly no such clear advantage gained abroad as would justify the attempt. As a minor reason, may be mentioned the great difficulty in obtaining duly qualified professors. Very few of the foreign institutions are self-supporting, and in this country, competing against the pupilage system, they would need to be supported by very large Government grants, such as should not be given to secure a doubtful advantage. New special schools of the highest grade would also, in many places, compete with existing universities and colleges, and it would be improper to support by Government aid the special school, giving the narrower course of instruction, rather than the university or college, giving the more general culture and more purely scientific training.

The foreign polytechnic schools include a large number of classes for teaching pure science; these could be as well held, if not better, in universities or institutions giving a general education, and it is this part of the training which the Sub-Committee are chiefly desirous of recommending for imitation, not the practical portion, which is better given by the pupilage system. Again, our universities and colleges can readily adopt some courses on the applications of science, and thus provide such special teaching as may with advantage be given in class-rooms at much less expense than would be entailed by the institution of special schools. On these grounds the Committee decided against the institution of special professional schools as a rule.

None of the objections to these schools apply to special courses of study intended to fit students for a subsequent pupilage. The Committee, therefore, for the guidance of parents, students, and colleges, obtained reports on special courses adapted for each business from those members of the Committee who were specially conversant with each subject. The reports of these gentlemen are appended, and contain many valuable practical suggestions, but they rest solely on the authority of the gentlemen whose names are attached to them, and have not been adopted by the Committee. The uniformity as to certain subjects suggested is remarkable. Ten reports were received: of these all include mathematics, nine physics, nine chemistry, nine mechanical drawing. When these, which may truly be termed the mother sciences, have been stated, the other subjects appear in far smaller proportions. Three schemes include mineralogy, two geology, five applied mechanics under various titles.

With the exception of the reports presented by one gentleman, and the report on a mercantile education, all leave the special applications of science to the particular profession or business for the last year in the course; and although in this last year there was a clear concurrence in the recommendation of some special studies, there is a still more marked unanimity in recommending the study of pure science as the best ground-work for all technical education. The special applications of each science may be learnt in practice if a sound education in scientific principles has been received in early life. Without this sound elementary training the teaching of applied science at the best can only mean dogmatic instruction in rules which are not understood, and is liable to degenerate into mere quackery or child's play.

When the pupilage system takes the place of the foreign polytechnic school, and when it is understood that the best preparation for pupilage is instruction in pure science—it becomes clear that the colleges preparing students to become pupils must be institutions left by students at about the age of 18, and that these institutions will correspond far more nearly to the gymnasia and *lycées* of the Continent than to the universities or polytechnic schools. What is required is that students should enter on their pupilage as well instructed as foreign students enter the special schools of the Continent. This can be effected by existing colleges, if these institutions are willing to organize special courses of study, and found new chairs for professors of certain special applications of science. What those chairs should be may be gathered from the courses recommended in the appendix.

The existing colleges are, however, too few and too widely scattered to educate more than a small proportion of those who ought to receive a scientific education preparatory to technical pursuits. New colleges are therefore required; colleges of a type analogous to Owens College, and schools which would either prepare students for these colleges, or be analogous in their highest forms to those institutions. The class of schools required does not at present exist in England, though perhaps the modern department at Cheltenham nearly approaches to what is needed. Schools are wanted in which natural science should form the backbone, as it were, of the whole system of teaching, as classics may now be said to form the backbone of the teaching at Harrow or Rugby. Science in these new schools should be taught as a means of culture or mental discipline; and science here means mathematics, mechanics, chemistry, and physics. The study of languages, dead or living, should not be excluded from these schools, nor should the study of the natural sciences be excluded from the classical schools, but the two classes of schools, classical and scientific, should stand on one level, in a healthy antagonism, such as now exists between Oxford and Cambridge. Care should be taken that in the matter of buildings, endowments, and the salaries of professors, the new science schools should be on a footing of complete equality with the old classical schools; unless this be done, a certain stigma, involving less social consideration, and a lower standard in most respects, is certain to fall on the science schools, and this will result in filling those schools with outcasts from the more highly considered classical schools, and with boys of a lower social standing, a result now to be observed in the *real schulen* of Germany, and in the students following the "special" courses of the French *lycées*. With the object of putting science on its true level, the Universities of Oxford and Cambridge should endeavour to attract the students

from science schools by offering them equal advantages, as to degrees, scholarships, and fellowships, as are now enjoyed by students of mathematics and classics. The standard in science schools will not be so high as it ought to be, if they are merely used to train lads intending to enter professions or trades on quitting these schools, leaving the preparation for our great universities to the classical schools. These considerations led the Sub-Committee to resolve:—"*That, with a view to the development of a system of scientific education, it is desirable that schools be established having for their main object the teaching of science as a mental discipline.*" *These science schools should prepare some youths for the higher courses of a college, and other less ambitious pupils for their professional pupilage.*

How are these science schools to be provided? The answer to this question is to be found in the report of the Schools Inquiry Commission.

The Commission recommend that the funds arising from existing endowments for educational purposes should be dealt with by Parliament; not only existing endowments for education, but those for other purposes, which appear useless, mischievous, or obsolete. They further recommend that every town with more than 20,000 inhabitants should be allowed to levy a rate for building and keeping in repair a school of the first grade. Here, then, are the requisite funds for our new science schools.

The Commission report that three grades of schools are wanted—those of the first or highest grade, intended for those who propose to continue schoolwork to the age of 18 or 19. These are the schools which would prepare our professional or business pupils, as well as those who intend to prosecute their studies at the universities or higher colleges. The Commission further report that "it would seem expedient, provided the district appeared to desire it, that some (of these schools of the first grade) should be semi-classical, and replace the study of Greek by more instruction in modern languages, in mathematics, and in natural science. There are boys whom their parents wish to keep at school till 18 or past, but who are not intended for the University, and who need more of these three last-named subjects than a classical school can easily give. For such boys all the lately founded schools have provided modern departments; but in all probability it would be still better that such boys should be taught in schools devoted to this object."

Your Sub-Committee concur in this recommendation and in these opinions, but they would call these schools science schools not semi-classical schools, a name which suggests mere imperfection; and they would expect these schools in time to prepare as many youths for the university as their classical rivals.

Coming to the machinery by which the new schools would be instituted and managed, the Commission recommend that each school shall be immediately under a separate governing body; that groups of schools shall be under a provincial authority, while the whole shall be under one central authority. They recommend that the central authority should be the present Charity Commission, with new members, and presided over by a president, who might be a minister of education. This body would examine schemes for the resettlement of educational trusts and submit them to Parliament, appoint inspectors, audit accounts, etc. The provincial authorities might be local boards, each containing one official district commissioner for each of the registrar-general's divisions, paid by Government, and assisted by six unpaid commissioners. Or these boards might be more popular bodies if it should appear that the country town or district desired to manage its own schools. The functions of the provincial board would be to prepare schemes for the management of all schools in their district, and submit these schemes to the central authority. The provincial board would, therefore, prepare schemes for the establishment of the proposed new science schools, that is to say, they would report in each district whether in that district science schools or classical schools were most required, and on what scale, as to endowment and buildings, these new schools and old converted schools should be established.

The immediate management of each school would be carried on by a board of governors; and the commission show how present trustees, aided by new members, elected by householders or appointed by a town council, would form a new board of governors suited for day-schools, while for boarding schools a similar governing board might be formed out of the old trustees and new governors named by the provincial boards.

The adoption of some such scheme as this would provide the country with true public schools, without inflicting upon us a new huge government department with stereotyped courses of study, and with history, classics, science, all cut out to a regulation pattern. Without accepting the scheme of the commission in all its details, your Sub-Committee, seeing that if vigorously acted upon it would provide the new science schools which are required, resolved:—"*That the subject of secondary instruction having been reported upon ably and deliberately by the Schools Inquiry Commission, the Committee do not feel it necessary to enter into the details of this subject, while they desire emphatically to express their opinion of the necessity for the introduction of scientific teaching in all secondary schools.*" By this resolution the Committee did not mean to underrate the necessity for improved secondary instruction. On the contrary, they believe that the remedy for the defective technical education complained of in the upper classes lies chiefly in improved teaching of science in these secondary schools. With this object they recommend that science be taught in all secondary schools; that new science schools be created, and that this be done in some such manner as is recommended by the Schools Inquiry Commission.

While the Committee recommend that new science schools or colleges should be established, they observe that caution must be exercised that they should not be so placed as to compete on unequal terms with existing institutions, which have owed their creation to private munificence or enterprise. On the contrary, these older institutions should receive assistance analogous to that given to new schools and colleges, conditionally on their providing analogous courses of instruction. Although competition is desirable, special caution is necessary when Government is one of the competitors. Thus it would be important that no new science-school or college endowed by Government should be established so as to compete with University College or King's College, so long as their efficiency is curtailed for the want of similar endowments. It is, on the contrary, most desirable that such institutions as these should participate in the funds which ought to be devoted to giving the highest grade of scientific instruction. It is a favourite doctrine in England, that those who wish for any benefit should pay for it, but experience, both here and abroad, shows that no educational institution of the highest grade is really self-supporting, that is to say, the receipts never cover the expenses, leaving a margin as dividend on capital. Schools of the highest grade, to exist at all, must therefore be endowed, and no schools can better deserve Government assistance than those which have already done so much with the assistance of private munificence only. The Committee therefore do not wish to restrict all assistance given to science-schools or colleges to the forms proposed by the Schools Inquiry Committee; on the contrary, they desire to see Government assistance given wherever local enterprise or munificence directed to the establishment of the highest grade of science-schools or colleges prove that a real desire for good education exists. The assistance given to Scotch Universities, and that expected by Owens College (in Manchester), are illustrations of the spirit in which the Committee wish the Government to act.

When existing colleges have organised the proposed courses of study, and when the new schools, leading to those colleges, or giving analogous preparation for the scientific professions, have been established, it will be necessary that the proficiency of the students and the efficiency of the teaching should be tested by methodical examinations; and, in order that students should be induced, by a tangible reward, to present themselves well prepared for these examinations, it is desirable that diplomas or certificates should be granted for approved excellence. There would be serious objections to the granting of diplomas to civil engineers, architects, &c., if these diplomas were supposed to certify that, after a merely scholastic education, the students were ready to practice their professions, but there are no objections to certificates which simply attest that the student has attained such proficiency in his theoretical studies that he is fitted to enter on a practical pupilage with advantage to himself and his employer. The certificates will also be a valuable recommendation in early professional life, if they are granted with discretion. They might either be granted by some one public examining body in each profession, or by the various colleges where the higher studies are carried on. The Committee prefer the latter plan, as less likely to lead to one monotonous system of teaching; but they feel that certain guarantees must be taken, lest a sort of Dutch auction should occur, in which the inferior schools and colleges would bid for pupils by granting certificates for smaller and smaller acquirements. Such conduct would no doubt bring its own remedy in time, but, to avoid the occurrence of the evil, the Committee consider that the examinations at each school and college should be conducted with the assistance of two independent examiners, one appointed by the Government and one by the leading professional institute belonging to the profession with which the examination was connected. These two examiners should also report on the proficiency of the students at the various institutions, and would thus perform the office of inspectors, without subjecting the professors of the higher colleges to any degrading supervision.

After this good scientific instruction, tested by examination, comes the pupilage in all cases, and after the pupilage it is desirable that voluntary public examinations should be held, with the view of testing whether the young men have really profited by their pupilage. This examination, which should be partly practical and partly theoretical, might be conducted by similar boards of examiners to those specified above; and diplomas, which would then express real proficiency in the several professions, should only be granted to young men of undoubted merit. Severe examinations of this type are conducted at Carlsruhe and other large polytechnic schools on the Continent.

The above recommendations are an expansion and explanation of the resolutions:—"*That it is desirable that the higher scientific instruction should be tested by public examination, and that the proficiency of persons who pass these examinations should be certified by diploma;*" and "*That the preparation for the businesses considered by the Committee is not sufficient until due scientific instruction has been followed by practical pupilage in efficient works.*"

When, however, a methodical course of study has been rendered possible for each profession, and examinations have been instituted for testing the proficiency of students, it will at first be difficult to fill the classes of the new schools, and to induce young men in any numbers to present themselves for examination. It is incumbent on all those who really believe in scientific teaching to prove their faith by giving a practical value to the certificates obtained by students. This can be done only by the employers of labour, who must at first act on faith only. Hitherto no class of young Englishmen, trained in the manner proposed, has existed. In order to induce the rising students to follow this methodical training they must see that the few who take that course do find employment more readily than those who do not. The employers of scientific labour can give an enormous impulse to scientific training by showing a real preference for young men who have passed through the courses of study recommended. Thus engineers and architects ought to receive pupils more readily who are well trained; they might reduce their premiums for such pupils; they should grant free pupilships as rewards for very successful public examinations; they might give privileges in their professional institutes to the holders of diplomas. The Committee "*recommend employers of labour and others in the habit of taking pupils, apprentices, and clerks, to give the preference as far as possible to those adducing evidence of the possession of adequate instruction in the sciences applicable respectively to their professions or occupations.*"

As the greatest of all employers of labour, it is most desirable that Government should lead the way in this matter, and give some official value to certificates and diplomas of real value. From the examiners appointed to assist in the college examinations on the plan above described, they would obtain reports of the real value of each certificate or diploma; they might therefore allow, in competitive examinations, those students who had taken certificates or diplomas to count them as equivalent to a certain number of marks. They would thus encourage methodical study to an extent unapproachable by any other method, and would render the final competitive examinations quite unobjectionable, since no one could then complain, as Mr. Arnold complains, that while foreign governments encourage great public schools and methodical study by rendering these essential to the candidates for the vast number of appointments in their patronage, our Government only encourages professional crammers. If we are to fill public schools with a number of pupils equivalent to those in the public schools on the Continent, we must render public school education as essential to a man's career in England as it is abroad.

With a similar object, nominations, and, in the opinion of some of the Sub-Committee, direct appointments, might be given as the reward for taking the highest honours at these examinations. The general scheme, therefore, of technical education for the upper classes is this:—

The lad should receive his secondary teaching in science schools of a class to be created, completing his theoretical education, at about the age of 18, either in the higher forms of these schools or at higher colleges. During the last two or three years of his scholastic training he should follow courses of study arranged with a view to the profession which he may select, and consisting chiefly of the same pure sciences in all cases. In the last year of his scholastic teaching he should receive some instruction in the application of science to his special profession. On leaving these schools or colleges he should pass an examination, and receive, if successful, a certificate. He should next enter an office or works as a pupil, and on, or at some time after, the completion of his pupilage, he should present himself for a further and severer examination, in which his practical proficiency would be tested, and for which it would be necessary that he should study, either in evening classes or by himself, some advanced branches of science connected with his profession, and, on passing his examination, might receive a diploma.

Lastly, it is essential that young men who do enter their professions in this way should gain some immediate tangible advantages, such as can be appreciated by inexperienced youths and by ignorant or prejudiced parents.

In addition to this general scheme, or, in substitution for parts of it, many valuable suggestions are contained in the reports from members of the Sub-Committee, but as these have not been adopted by the Sub-Committee, these recommendations are not embodied in this report. Each report will receive the consideration due to the names appended to it. Attention may, however, be drawn to the suggestion, for the mercantile marine, that young officers should qualify as instructors and teach men while afloat, receiving payment on results and for mercantile

education generally; that the merchants of London and the chambers of commerce should appoint permanent committees to promote and supervise commercial education, raise funds, appoint professors, examiners, &c. For the details of these schemes the Appendix must be consulted.

No equally elaborate scheme has been prepared for the education of artisans. It has been felt that their education depends on the primary and secondary education given throughout the country. Until these are materially improved it will be impossible for the adults to follow any really scientific teaching. At present they have difficulty in performing simple arithmetical operations, in taking notes with rapidity, and in understanding diagrams. If they left primary schools able to do these three things thoroughly, they would have received a good preparation for the workshop and for future study. To attain this object existing teaching must be improved generally. Arithmetic must be taught as a branch of mathematics, not merely as a curious and complex series of empirical rules; plane geometry and algebra must be added, in the higher classes of the primary schools, and in the third-grade secondary schools,* for lads of 12 and 13; and mechanical or linear drawing must be taught to an extent for which even teachers would not at this moment be found.

In the lower grades of education, as in the higher education, it is essential to lay a sound basis, teaching the elements of science thoroughly. The sons of workmen of all grades should learn the elements of mathematics and mechanical drawing. In the higher classes of the third grade secondary schools the elements of experimental chemistry and physics should be added to the curriculum. This knowledge will enable men in after life to read and understand books, and learn practical rules which they now can neither understand nor apply.

The report of the Schools Inquiry Commission if acted upon will provide this education, and the Sub-Committee feel that they cannot do better than lend that report their most hearty support. The Commission state broadly that "the most urgent educational need of the country, is that of good schools of the third grade, that is of those which shall carry education up to the age of fourteen or fifteen." They note the failure of existing endowed schools, allude with approval to the existing Bristol trade schools; but they say "such schools are unquestionably not numerous nor well distributed." Making allusion to the alleged defective technical education among our artisans, they proceed, "we are bound to add that our evidence appears to show that our industrial classes have not even that basis of sound general education on which alone technical instruction can rest. It would not be difficult, if our artisans were otherwise well educated, to establish schools for technical instruction of whatever kind might be needed. But even if such schools were generally established among us, there is reason to fear that they would fail to produce any valuable results, for want of the essential material, namely, disciplined faculties and sound elementary knowledge in the learners. In fact, our deficiency is not merely a deficiency in technical instruction, but, as Mr. Arnold indicates, in general intelligence, and unless we remedy this want we shall gradually, but surely, find that our undeniable superiority in wealth, and perhaps in energy, will not save us from decline. If we could provide good schools for our artisans up to the age of fourteen, then those who showed aptitude for special industrial pursuits would be in a fit condition to enter on the needed special study. But our first object should be to enable the whole of this large population, whose education we are now considering, to cultivate their children's understandings and make them really intelligent men."

"We need schools that shall provide good instruction for the whole of the lowest portions of what is commonly called the middle class, and we cannot overstate our sense of the importance of the need. These are the schools that we have called schools of the third grade. It recommends that "in every town large enough to maintain a day school, it is desirable that there should be at once provision for ten boys per thousand of population, with a power of extension;" and "that of the whole presumed demand half at least should be assigned to the requirements of scholars of the third grade."

After recommending that every town of 5,000 inhabitants should have a school of the second grade, it recommends that *every town* should have a school of the third grade. No school of the third grade should be allowed to charge a fee above £4 4s. (nor below £2 2s.) per annum, the Commission being distinctly averse to gratuitous instruction. The funds by which these objects are to be attained, may be provided from the same sources as those already shown to be applicable to schools of the first grade, but the Commission further recommend that "every parish should be allowed to levy a rate for building and keeping in repair a school of the third grade; and if two or more parishes wish to combine for the purpose, they should be enabled to do so." If the report of the Schools Inquiry Commission be acted upon, the workmen of this country will be provided with a thoroughly sufficient number of well organised public schools, giving that elementary scientific instruction which must form the basis of all technical education.

The Schools Inquiry Commission further recommend the establishment of exhibitions, by which the ablest lads at the third grade schools might be passed onward to the second grade and first grade schools, and by which also the third grade schools would be fed from the primary schools of the country.

The Sub-Committee differ from the Schools Inquiry Commission as to the retention of Latin in these third grade schools, intended chiefly for workmen. They consider Latin clearly out of place in these schools, and believe that for every purpose the time of the young workman would be far better occupied in the study of English, and the natural sciences, and mathematics.

The proper sequel to this education is apprenticeship accompanied by evening classes. In these evening classes physics and chemistry might be added to the curriculum given above; also other natural sciences and foreign languages where a demand existed for these subjects. Even if not otherwise useful, these classes would bring culture within the reach of workmen. The teaching should not be gratuitous; it should not consist of lectures only, but be accompanied by frequent verbal examination and by written exercises; it should be given by regular teachers, connected, where possible, with the higher grade schools. Where new chairs are endowed by Government or other bodies, a condition might be attached to the endowment that evening classes should be taught by the professor or his assistant, and the fees derived from those classes should belong to the professor. Access to libraries and museums in connection with the evening classes, and independently of these, is demanded by workmen, and cannot be otherwise than beneficial. Prizes and honorary distinctions in connection with these evening classes would be useful, and mechanical drawing especially should be liberally encouraged in this way, since experience abroad and at home has shown that great proficiency can be attained by workmen in this art, and it is one which very greatly facilitates the expression of their ideas and quickens their intelligence in understanding the work required from them.

Young workmen living frequently as lodgers in the houses of married workmen have now few facilities for study, and we believe that the creation of lodging houses for these unmarried men, in connection with evening classes systematically arranged, would greatly assist young workmen in their studies. Thus each man might have his own furnished room as a bedroom and study.

* *Vide* Schools Inquiry Commission Report.

Meals might be provided in common halls at a small expense; and regular evening classes might be held. the attendance at which should be a necessary condition of residence. A library, reading-room, and museum would complete the establishment, which would thus offer to our workmen something analogous to the collegiate life of our great universities. Notoriously vicious conduct would be followed by expulsion, and students who failed to pass satisfactory examinations would also lose the privilege of residence. The classes might also be open to married men and other non-residents on the payment of sufficient fees. Gratuitous instruction and board might be given to a certain number of men in the form of scholarships and exhibitions, and certificates should be granted to all who pass good examinations. Some portion, if not all, of the funds required for an experimental college of this kind could be provided by taking advantage of the "Act to enable the Public Works Loan Commissioners to make advances towards the erection of dwellings for the labouring classes."

It appears that workmen are beginning to organize evening classes for themselves, appointing their own teachers and framing their own rules and terms of admission. Thus the trade union of Amalgamated Carpenters and Joiners have succeeded in establishing large classes both in London and Manchester. The chief difficulty met with by these men has been in finding suitable rooms for these classes. These efforts are especially worthy of encouragement, and the form of encouragement which would least interfere with the independence and self-reliance of the men would be assistance in finding meeting rooms, either by paying the rent or by the erection of suitable buildings. It would indeed be lamentable if a movement of this kind were stinted in growth from the mere want of suitable places in which instruction could be given. Mechanics' Institutions might offer accommodation in some cases, and grants might also be made by Government through the department at South Kensington. Suitable guarantees that the rooms would not be used for improper purposes could easily be devised.

Here the Sub-Committee would call attention to the great necessity there is for Sailors' Institutes in the Colonial and Indian ports, in many of which there are always from one to three thousand officers and seamen needing a building where their leisure time may be spent in self culture, and where the proposed instructors could hold their classes.

In conclusion, the following series of resolutions express the recommendations of your Committee as respects the action of the government of existing colleges or universities and of the leading men in each profession or business considered by the Committee. An expansion of each of these resolutions has already been given, and should the wording of any one resolution appear ambiguous, the meaning attached to that resolution is to be gathered from what has been said above:—

It is desirable that Government should encourage systematic scientific instruction by the following measures:—

1. *By adopting the recommendations of the Schools Inquiry Commission, for the introduction of the teaching of natural science into all secondary schools, and for establishing new science schools of the first grade, which schools should be on all points on a footing of equality with the endowed classical schools.*

2. *By co-operating with universities and colleges in holding examinations, which are or may be established for the purpose of conferring certificates or diplomas in connexion with systematic studies, intended to educate civil engineers, mechanical engineers, officers of the mercantile marine, metallurgists, miners, naval architects and marine engineers, architects, merchants, chemists, and agriculturists.*

3. *By giving some official value to those certificates or diplomas, such as allowing certain diplomas to represent a given number of marks in competitive examinations.*

4. *By putting at the disposal of the leading colleges which give methodical courses of scientific instruction, and diplomas of recognised value, a limited number of nominations annually.*

5. *By assisting old and new endowments where local subscriptions or donations prove the value set on the instruction proposed or given*

6. *By instituting night classes for workmen in connection with all new scientific endowments, with access to a library.*

7. *By providing free libraries suitable for the use of the students in night classes generally.*

8. *By providing suitable meeting-rooms for night classes organised among workmen, for the purpose of obtaining scientific instruction.*

9. *By according liberal prizes to workmen for excellence in mechanical drawing.*

10. *By taking steps to extend and improve primary education.*

It is desirable that colleges should encourage systematic scientific instruction by the following measures:—

1. *By instituting methodical courses of scientific teaching, adapted to students intending to enter a profession or business among those which have been enumerated above.*

2. *By the establishment of diplomas, corresponding to the several courses of study in conjunction with Government, and with the leading Institutes belonging to each profession.*

3. *By the establishment of fellowships and scholarships in connection with those diplomas.*

It is desirable that the leading civil and mechanical engineers, architects, merchants, shipowners, chemists, manufacturers, and agriculturists, should encourage systematic scientific instruction by the following measures:—

1. *By the creation of scholarships and fellowships in connection with those schools and colleges where methodical courses of instruction are given.*

2. *By co-operating in the examinations for diplomas.*

3. *By giving a practical value to those diplomas, such as would be evinced by a reduction of premiums to intending pupils holding such diplomas, and by attaching weight to the possession of a diploma when choosing among candidates for employment.*

4. *By granting distinct privileges, in connection with the professional institutes, to all holders of recognised diplomas.*

We here repeat the resolutions already quoted in order that all the formal resolutions may be found together:—

For the purposes of discussion, technical education should be deemed to exclude the manual instruction in Arts and Manufactures which is given in the workshop.

That the term "technical education" is understood by the Sub-Committee to mean general instruction in those sciences, the principles of which are applicable to various employments of life.

That technical instruction, as defined above, should not as a rule be given in separate professional institutions, but in institutions established for general education.

That, with a view to the development of a system of scientific education, it is desirable that schools be established having for their main object the teaching of science as a mental discipline. These science schools should prepare some youths for the higher courses of a college, and other less ambitious pupils for their professional pupilage.

That the subject of secondary instruction having been reported upon ably and deliberately by the Schools Inquiry Commission, the Committee do not feel it necesssary to enter into the details of this subject, while they desire emphatically to express their opinion of the necessity for the introduction of scientific teaching in all secondary schools.

That it is desirable that the higher scientific instruction should be tested by public examination, and that the proficiency of persons who pass these examinations should be certified by diploma.

That the preparation for the businesses considered by the Committee is not sufficient until due scientific instruction has been followed by practical pupilage in efficient works.

The Committee recommend employers of labour and others in the habit of taking pupils, apprentices, and clerks,

to give the preference as far as possible to those adducing evidence of the possession of adequate instruction in the sciences applicable respectively to their professions or occupations.

Your Committee have reserved for separate consideration the technical education of those who are producers of works of fine or decorative art, or directors of art manufactures, understanding by that last term manufactures in which beauty or ornament is one of the chief objects aimed at.

It is necessary to bear in mind that for the production of works of an æsthetic character, scientific principles occupy a subordinate position, while a knowledge of the details of execution is desirable for those who design or guide the work of others. Moreover, it must be borne in mind, that the taste of those to whom works of beauty appeal, is far more fluctuating than the demand for productions in which utility is alone considered.

Your Committee are of opinion that one of the first conditions of progress is, the cultivation of artistic knowledge and taste in all classes of society.

With this object in view, no less than with a view to the technical education of the art-workman, provision should be made for the teaching of drawing in all schools, primary and secondary, as a branch of general education, in order to train the eye and hand, and in order to cultivate habits of observation. It is essential that drawing should be part of the regular school course and not an extra lesson; and, further, that it should be taught intelligently, not from mere copies, but from real objects.

The art-workman needs, in addition to a power of freeband drawing, an acquaintance with geometrical drawing, in order that he may be able to execute work correctly, in accordance with the designs of the artist who directs him.

For artists, designers, and directors of art manufactures, the education should be a liberal one, in order that they may understand the feelings of those on whom they desire to make an impression. Their education should also be, to some extent, scientific, in order that they may have a knowledge of the properties of the materials they employ, and be able to adapt those materials to the structure of the objects produced, and those objects to the uses for which they are intended.

The recommendation already made with reference to other professions, namely, that the period of pupilage, or the earlier stages of practice, should be preceded by a special attention to those branches of knowledge which have a direct relation to their art, applies to the technical education of those who are concerned with artistic work. In this case that knowledge should include not only scientific principles, but also a history of the various forms in which, prior to any scientific theory, some of the noblest conceptions have found their expression in works of art.

It is therefore desirable, both for the artist workmen and for those engaged in the highest branches of art, that opportunity should be given by access to museums and to evening classes, for the study both of the theory and history of art.

Your Committee are of opinion that the Universities may render great service to the technical education of those engaged in artistic pursuits, by the recognition of art as an element in general education, and by professorial lectures. Some steps in this direction have been taken, by the regulations attaching importance to drawing in the Local Examinations; but your Committee would gladly see the practice carried further, and applied to the higher stages of academical education. They cannot doubt that the study of works of ancient and modern art would have a tendency, in connection with literature, to diffuse culture throughout the nation, and to raise the standard of technical education.

(Signed)

W. HAWES, *Chairman of the Sub-Committee.*
P. LE NEVE FOSTER, *Secretary.*

APPENDIX.

Courses of Study recommended by Gentlemen whose names are subscribed to each Course.

Agriculture and Gardening.

A THREE YEARS' COURSE.

First Year.

Mathematics. Physics. Mechanical Drawing.	Physical Laboratory Practice. Chemistry of Non-metallic Elements.

Second Year.

Chemistry of Metallic Elements. Organic Chemistry.	Chemical Laboratory Practice. Elements of Natural History or Biology.

Third Year.

Mapping and Surveying. Applications of Science to Agriculture.	Technical Chemical Laboratory Practice. Agricultural Machinery.

E. Frankland.
D. S. Price.
A. W. Williamson.

Chemical Manufactures.

A THREE YEARS' COURSE.

First Year.

Mathematics. Physics. Mechanical Drawing.	Physical Laboratory Practice. Chemistry of Non-metallic Elements.

Second Year.

Chemistry of Metallic Elements. Organic Chemistry.	Analytical Chemistry in Laboratory.

Third Year.

Lectures on the student's own branch of Technical Chemistry.	Technical Laboratory Practice. Machinery. Minerology.

E. Frankland.
D. S. Price.
A. W. Williamson.

Metallurgist.

A THREE YEARS' COURSE.

First Year.

Mathematics. Physics. Physical Laboratory Practice.	Chemistry of the Non-Metallic Elements.

Second Year.

Chemistry of Metallic Elements. Mineralogy.	Mechanical Drawing. Laboratory Practice.

Third Year.

Metallurgy. Applied Mechanics	Metallurgical Laboratory Practice, including Assaying.

E. Frankland.
D. S. Price.
A. W. Williamson.

Miners.

A THREE YEARS' COURSE.

First Year.

Mathematics. Physics. Mechanical Drawing.	Physical Laboratory Practice. Non-metallic Elements.

Second Year.

Geology. Mineralogy.	Chemical Laboratory Practice. Mechanical Drawing.

Third Year.

Mining. Applied Mechanics. Geology.	Surveying. Assaying.

E. Frankland.
D. S. Price.
A. W. Williamson.

Civil Engineer.

a two years' course.

[No student should be allowed to enter on a course of special study until he has passed an examination, proving that he has received a sound preliminary education not having special reference to his profession.]

Pure Mathematics	Algebra. Plane and Solid Geometry. Trigonometry.
Natural Philosophy	A general course on the properties of matter, and some one branch, such as Heat, Optics, Electricity, &c.

Chemistry (inorganic), with laboratory practice.
Geology, including instruction in the field.
Mathematics applied to Mechanics.
The application of Science to Civil Engineering.
The application of Science to Mechanical Engineering, Surveying, and Levelling.

Drawing	Geometrical Projection. Mechanical Drawing. Plans and Surveys.

After passing an examination in these subjects the student should enter a civil engineer's office as pupil, and examinations should be instituted by which his knowledge, at the end of his pupilage, could be tested. These examinations should be on special and limited subjects, but in these subjects they should be of a severe and searching character. They should comprise two groups of subjects—theoretical and practical—out of which the candidate should select one in each group.

Group 1.—*Practical Engineering.*

(*a*) The preparation of designs, specifications, and contents for some civil engineering work.
(*b*) The design of machinery, &c.; complete drawings, specifications, and estimates.

Group 2.—*Applied Science.*

(*a.*) Pure Mathematics (higher calculus).
(*b.*) Mathematics applied to Mechanics.
(*c.*) Chemistry, Geology, or some other branch of experimental physics.
(*d.*) Telegraphy.

3rd. Students should not be encouraged to select more than one subject in each group.

All these examinations should at present be voluntary, but it would be most desirable that the leading engineers should refuse to receive as pupils young men who had not passed an examination showing their fitness to enter the office with advantage to themselves.

Fleeming Jenkin.

Mercantile Marine.

Mechanical Drawing. Mathematics. Physics, including Meteorology and Steam. Physical and Topographical Geography.	Political Economy. Law—Maritime, commercial, and international. Languages.

Note.—That with regard to the scheme of instruction for the officer of mercantile marine, it is impossible to define the length of the course, seeing that the apprentices, seamen, and officers of the mercantile marine only return to the United Kingdom after more or less long intervals of absence and remain there only for a short time. Any course of instruction for these persons must necessarily therefore be indefinite as to the time of its duration.

A. P. Ryder, Rear-Admiral.

Admiral Ryder and Captain Toynbee, to whom this subject was referred, brought up the two following reports:—

We beg to report that in compliance with the resolutions 1 and 2 of the minutes of April 8, we propose to arrange the subjects for the higher course of instruction for members of the mercantile marine in the following order. We have placed the subjects in what we consider their order of relative importance:—

Subjects.	Preliminary Amount of Knowledge.
1. Law—Common, Commercial, International.	To have a good knowledge of the disciplinary clauses and a fair knowledge of the other clauses of the Mercantile Marine Act, and of a special elementary text-book on these branches.
2. Mathematics	Colenso's Arithmetic, First Book of Euclid, Algebra to Simple Equations.
3. Physics, including meteorology and steam	Use of mathematical instruments, preliminary chapters of text-books on steam.
4. Physical and Topographical geography..	
5. Political economy....	
6. Languages..........	Easy exercises in any one modern language (European.)
7. Mechanical drawing..	

In reply to the second resolution (2nd May, 1868), we beg to report that it will, in our opinion, be necessary to open night classes in the immediate neighbourhood of the docks at the sea-ports, for the secondary and higher instruction of the apprentices, seamen, and officers who are employed on board their ships all day; and that instruction in the higher course should also be given in the Science Schools at the sea-ports in the day-time, for the benefit of those officers, &c., who may be out of employment, and therefore able to avail themselves of instruction during the day.

We are of opinion that the course of secondary instruction which should be given to apprentices and seamen must, to a certain extent, be governed in practice by the nature of the examination required by the Board of Trade for the second-mate's certificate, which examination should, in our opinion, be considerably changed and extended, or it will be very difficult to induce more than a small minority of the young seamen to do more than prepare for the Government certificate. To study subjects not included in that examination, will appear to these young men to involve not only loss of time, but also to endanger their success at their final examination, as their attention, during the small portion of their time which they can devote to study, will be diverted from those subjects that alone are absolutely necessary for their Government examination. Under these circumstances we beg to submit that, at this stage of our proceedings, Mr. Gray, of the Board of Trade, be invited to join the Sub-Committee, so that we have the advantage of learning to what extent it is probable that the

Board of Trade may be induced to extend and raise the examination for second-mate.

A. P. RYDER, Rear-Admiral.
H. TOYNBEE.

In compliance with the last resolution in the minutes of the 8th of May, we beg to recommend that the instruction for adult officers and seamen be provided as follows, viz.:—

1. That *special classes* be established at the science schools, which (have been opened at some towns, and) ought to be opened at all seaport towns, for the purpose of giving instruction to adult officers and seamen.

2. That these classes be both day and night classes.

3. That *special day and night classes* for adults be also established at the schools which we have already recommended to be opened in the immediate neighbourhood of the docks.

4. The instruction offered at the science schools will probably be of a higher order, and more suitable to officers, while the instruction offered at the dock schools will be more suitable for the seamen.

5. There is this especial difficulty in the way of bringing instruction of a high order within the grasp of adult *seamen*, viz., that they have so little time at their disposal in harbour, and at sea they have no instructor. This applies, but to rather a less extent, to the young officer.

6. The large mass of adult seamen between say the ages of 18 and 30, have received such a wretchedly meagre education that we have little hope of making any great impression upon them; still, here and there we find men who are able and willing to learn.

7. The result of careful experiments tends to show that about $\frac{1}{6}$th of a ship's company, or 17 seamen in 100, are able and willing to take pains with themselves. This is probably about the proportion that are required to feed the officer class; but education would, of course, be beneficial for all.

8. Some officers of the Mercantile Marine have not considered it to be a waste of time, or otherwise than a creditable and useful mode of occupying it, to devote a portion of each day to the instruction of the officers, seamen, and apprentices under their orders.

9. It is on systematic instruction given *afloat* at spare hours that we must rely, if the adult seamen are to be instructed efficiently, and if the lads are to retain the knowledge which they have acquired on shore at the proposed night schools.

10. We recommend, therefore, that the Board of Trade be requested to take the necessary steps for encouraging the junior officers of the mercantile navy to qualify as *Instructors*, and that the seamen be invited to avail themselves of the opportunity of having among their officers a certified instructor, to study under him at such hours as the captain may permit.

11. The payment to the *Instructor*, if wished for, to be fees deducted from the seamen's wages, and a small payment on results from the Committee of Council on Education.

12. The payment on results to be measured by examination of the seaman's progress, to be held at the ports.

13. This proposal, if adopted, would tend, while it afforded an opportunity to seamen and apprentices of studying at sea, to raise also the officers; for if many of them were qualified as *Instructors*, they would become thoroughly and intimately acquainted with the subjects they had mastered, and thus become better able to acquire the more advanced knowledge instruction in which we propose they should be offered at the science schools at the seaports.

ALFRED P. RYDER, Rear-Admiral.
HENRY TOYNBEE.

Mr. Thomas Gray, one of the Assistant Secretaries to the Board of Trade, having joined the Committee as requested, has added the following remarks:—

I fully concur in the opinions expressed by Admiral Ryder and Captain Toynbee in the last paragraph of their report.

That the second mate's examination "should be considerably changed and extended if possible," I have long held; and have often stated: but how far it is possible and expedient to extend it, and if it be possible and expedient, whether the extension should be made at once or by degrees, are questions for the advice of the practical scientific officers of the department.

It has been urged, and I think with reason, that the second mate's examination (or the first examination passed by an officer of the Mercantile Marine, by whatever name that examination may be known), should be such an examination as will promote, and as far as possible ensure, a careful study of the elements of his profession, and this while the applicant for examination is still young, and his mind free, and while he has good opportunities of attending to study and acquiring knowledge. It is urged, that if the standard of the second mate's examination is raised, we shall get a superior class of young men to join the merchant service. On the other hand, it must be borne in mind, that as the employment of certificated mates in foreign-going ships is compulsory by law, the effect of raising the standard (unless it be very carefully and judiciously done), may be to stop the supply of young officers as second mates, and to cripple our commerce.

It is sometimes alleged that, with some bright exceptions, the officers of our Mercantile Marine are, as a class, below the officers of the Mercantile Marine of other countries in point of scientific knowledge, and knowledge of accounts and of Mercantile Marine law. Whether there is or is not any foundation for such an allegation, I am, after careful inquiry, utterly unable to say, but if there is any foundation for it, then I know of no steps so likely to be attended with success as to raise the standard of excellence in the junior ranks.

The rules for the examination of masters and mates of all maritime countries are now being collected and translated, and the subject of examinations is under the consideration of the Board of Trade. A careful examination and comparison of the British and foreign rules will be of great assistance to the members of this Sub-Committee.

THOMAS GRAY.

THE NAVAL ARCHITECT AND MARINE ENGINEER.

A THREE YEARS' COURSE.

First Year.

Pure Science { Mathematics. Physics. Chemistry.

Applications of Science { Descriptive geometry. Strength of material. Mechanics of structure. Elements of machinery.

Practical work, in laboratories and drawing office.

Second Year.

Pure science { Mathematics. Physics. Chemistry.

Applications of science { Constructive geometry. Resistance of fluids. Hydrostatics of ships. Nature of fuel. Seamanship. The marine engine.

Third Year.

Pure science { Mathematics. Chemistry. Natural History.

Applications of science	Hydrodynamics of ships. Naval designs. Ship-building and launching. Equipment and Stowage. Armament and tactics. Metallurgy.

Practical work to be conducted during winter in laboratories.—Drawing offices, and collections of models of ships and marine engines.

Practical work to be conducted during the summer half-years in the royal dockyards, arsenals, and engine factories.

Practical work to be afterwards conducted during several long voyages at sea, both in the service of the ship and in the service of the engine-room.

J. Scott Russell.

The Mechanical Engineer and Machinist.

A THREE YEARS' COURSE.

First Year.

Pure science	Mathematics. Physics. Chemistry.
Applications of science	Descriptive geometry. Elements of mechanism. Strength of materials of construction.

Practical work in laboratories and drawing office and museums to accompany each study.

Second Year.

Pure science	Mathematics. Physics. Natural history.
Applications of science	Constructive geometry. Prime movers and steam engines. Nature of raw materials. History of inventions. Elements of mechanism.

Practical work in laboratories and drawing office and museums to accompany each study.

Third Year.

Pure science	Mathematics. Ultimate mathematical physics. Political economy.
Applications of science	Statics of machinery. Hydraulic machinery. Prime movers. Electro-magnetic mechanism. Engine tools. Metallurgy. Design of factories.

Practical work to be carried on in laboratories, drawing office, and museums, and collections of machinery during the Session.

Practical work in factories and workshops should, if possible, alternate with study in periods of six months.

At the end of apprenticeship a course of travel, with work and study, should be recommended.

J. Scott Russell.

The Architect.

A THREE YEARS' COURSE.

First Year.

Pure science	Mathematics. Physics. Chemistry.
Applications of science	Descriptive geometry. Strength of material. Statical construction. Principals of style and design. Surveying and measurement.

Practical work in laboratories, drawing office, and museums to accompany each subject of study.

Second Year.

Pure science	Physics. Natural History. Physiology of health. Psychology.
Applications of science	Constructive geography. Principles of carpentry, metal, stone work. Mechanism of buildings. Principles of beauty in buildings. History of architecture.

Practical work in laboratories, drawing office, and museum to accompany each study.

Third Year.

Pure science	Mathematics of curve lines and surfaces.
Applications of science	Light and shade. Perspective. History of building materials. Health of buildings. Domestic economy of buildings. Principles of proportion and decoration. Practical design.
Practical work to be carried on during these three years in College, and continued afterwards.	In the Chemical laboratory. ,, Mechanical laboratory. ,, Drawing office. ,, Collection of drawings. ,, Collection of models and casts. ,, Museum of building materials and inventions. ,, Apprenticeship on works. ,, Foreign—French.

J. Scott Russell.

Our names having been added to the Committee after the special courses herein developed were drawn up, we venture to remark that several of the subjects which have been grouped under the head of "applications of science," as, for instance, "principles of style and design," "principles of beauty in buildings," "history of architecture," and "principles of proportion and decoration," are not, in our opinion, such as can be taught theoretically as the result of scientific research. On the other hand, some important branches seem to have been overlooked, to which we desire to call attention, as being important elements in the training of an architect, but which it is difficult to provide for efficiently under the system of pupilage. These are—

The study and delineation of ancient monuments.
The visiting and examining buildings in progress.
The study of ornament and of the human figure.
Modelling.
Perspective.
Decorative colouring.
Landscape painting.

We would suggest that students might be encouraged to attain a proficiency in the above by scholarships and travelling studentships.

(Signed)

John P. Seddon, Hon. Sec. R.I.B.A.,
R. Phené Spiers, Pres. Architect. Assoc.

The Merchant.

A TWO YEARS' COURSE.

First Year.

Languages:—English, French, German, Spanish, Italian; or English and any two foreign languages.

Mathematics, logarithms, statistics, accountancy.

Commerce	Principles of commerce. History of commerce. Banking, currency, foreign exchanges.

Geography—Physical and political.

Economic science—Principles of political economy.

Commercial Law	Agency. Partnership. Joint stock companies. Contracts of sale. Bills of exchange. Contracts of affreightment. Contracts of marine insurance.

Second Year.

Languages:—English, French, German, Spanish, Italian; or English and any two foreign languages.

Mathematics, elements of the theory of probabilities, logarithms, statistics.

Commerce	History of commercial and banking legislation. Institutions of credit and banking.
Geography	Physical and political.
Economic science	Production, labour, wages. Capital and wealth. Finance, taxation, the funding system.
Commercial law	Continuation of different branches of commercial law. Law of patents and copyrights. Life and fire insurance. Bankruptcy law. Law of arbitration.
International law.	Rights of neutrals. Rights of belligerents. Rights and duties of consuls.

Jurisprudence, including the principles of ethics.

Chemistry.

Geology.

Note.—As regards the qualifications necessary for a student entering on the above course, it is desirable that he should have acquired the knowledge of—

English—Commercial correspondence.
Latin.
Foreign languages—French, Spanish, Italian, German, or any one of them.
Mathematics — Elements of Algebra; elements of Geometry.
Drawing.
Physical geography.
Nature and history of commercial products.

With a view to the practical adoption of the suggestions relating to the technical education of the merchant, it is recommended:—

1. That the merchants of the City of London and the Chambers of Commerce be requested to form Committees for the purpose of promoting and supervising commercial education.

2. That the Committees so formed should provide a fund for the maintenance or subvention of classes on Commerce, Economic Science, and Commercial Law, in connection with any institution providing instruction in the other branches of science required for the two years' course.

3. That upon an examination, conducted jointly by members of such Committee and members belonging to such institutions, certificates of honour and merit be awarded in relation to commercial education.

OBSERVATIONS UPON THE TWO YEARS' COURSE PROPOSED FOR THE HIGHER GRADE OF COMMERCIAL EDUCATION.

It is assumed that the students proposing to enter upon these courses have had a good secondary education before leaving school, and that they are qualified, when entering upon their commercial career, to take up the various subjects proficiency in which is indispensable, before they can enter upon the higher grade of scientific or technical commercial instruction. The first question, then, is, how is this proficiency to be obtained?

A young man in a merchant's office has only his early mornings, evenings, and holidays to devote to study. To study successfully at such times requires a place for reading—a library—courses of lectures—and a recognised body of examiners, to test, by half-yearly examinations, the progress and attainments of each student, previously to granting certificates, that he has passed an examination in the higher grade of commercial education.

It may be safely asserted that no organisation now exists fit to direct and to test the scientific education of the number of young men who would voluntarily enter upon these courses of study, and submit to severe examinations, had they the opportunity afforded them for so doing.

It is considered as essential to the attainment of success from entering upon such courses of education, that the student should be at the same time practically engaged in the business of life, should have determined upon his future occupation, and be of an age to select such of the courses proposed as will best aid him in his future prospects.

If this view be correct it is necessary to suggest machinery by means of which the required knowledge may be obtained without unduly interfering with the duties of the office in which the student may be employed. This may be found in the arrangements now in operation for the study of the law and for the study of medicine, which appear to be capable of practical application to the study of the science of trade and commerce.

The Law Institution does for students in the law that which Chambers of Commerce, in towns where they exist, or which an Institute of Merchants in London or other places where they do not exist, could and ought to do for commercial students. Students in medicine are obliged to pass examinations before the most distinguished members of their profession, beginning with the Society of Apothecaries, and terminating with the Colleges of Surgeons and Physicians.

Courses of lectures on all the subjects indicated in the programme we have suggested for students in commerce could be given morning and evening, at suitable hours, by duly competent persons; and yearly examinations, presided over if not conducted by merchants of the first-class—as the leading solicitors and the members of the medical profession now conduct the examinations of the medical and law institutions—could be held, and certificates granted according to proficiency. It would be necessary for the successful conduct of such examinations, and to give students the opportunity of acquiring the requisite knowledge, that a Commercial Institution should be established, to be superintended by an able and influential executive.

The fees from students, on entry, for attending lectures, for the examinations, and for contributions to a library fund, would amply pay the expenses of such an institution.

It would be necessary, also, that a preliminary examination should take place of every student who enters himself for attendance at the lectures, or that he should bring a certificate from the school at which he has been educated of proficiency to a certain degree in the subjects proposed to be taught in the two years' courses at the institution.

It is not for us to show how the same plan and principles of action could be adopted for giving the higher grade of scientific instruction to the students in other branches of industry to which the attention of the subcommittee has been directed; but the Institute of Civil Engineers, the Institute of Architects, the Royal Agricultural Society, the Institute of Naval Architects,—might all make arrangements under which the large class of students who cannot remain at school or devote their time exclusively to educational pursuits after sixteen or eighteen years of age, might carry on their studies in the highest branches of scientific knowledge whilst actually engaged in learning the practical details of their profession. It is believed progress would be more satisfactory when obtained in this way, and be more thoroughly

impressed on the mind than when obtained in a college or in a separate educational institution, and that the pursuit of theoretical and practical knowledge during the same period would tend to greater proficiency in both than can be acquired by the present plan of education. But in all probability a course of two years, sufficient if the two years were devoted exclusively to study, would require three, or, in some cases, four years, to enable a student to pass the final examination if he were occupied in business.

In connection with such educational institutes, residences might be established for young men desirous to make the best use of their time, which, while bringing together a number of the more studious men, might conduce to good conduct and great economyof living.

D. Cooper.
Leone Levi.
W. Hawes.

The foregoing report was taken as read, having been previously circulated amongst the members of the Committee.

Mr. Ayrton, M.P., said that he had very carefully read the report which the Sub-Committee had presented, and which in itself was an ample reward for all the trouble that had been taken. It seemed to him that the fundamental proposition which the Sub-Committee had laid down tended very greatly to illustrate, in the first instance, the leading principles which must guide anyone in dealing with this question. Undoubtedly, when the question was taken up by that Committee it was involved in a great amount of confusion, and it was difficult to say what anyone intended when he spoke of a desire to promote "technical education" in this country. The first subject, therefore, which the Sub-Committee considered was, what was to be understood by the term "technical education." Their first decision was to eliminate from what was called technical education manual instruction in arts and manufactures given in the workshop, and this view, he thought, would commend itself to all those who had taken any interest in the subject. Undoubtedly there were some who took a different view, but he thought the more they studied the argument the more they would be induced to concur in the conclusion at which the Committee had arrived. It was no less satisfactory to see that the Committee had properly confined technical education to mean general instruction in those sciences the principles of which were applicable to the various employments in life. This proposition appeared to him to be invaluable in getting rid of those attempts that had been going on in so many educational institutions to cram children with a few interesting facts which they might repeat when they went home, and so appear very learned, whereas, in truth, they had learned these few facts without any clear appreciation of the principles upon which they depended, and therefore in after-life they were wholly incapable of applying any of these facts. He had himself seen many instances of that state of things. As director of a large railway company, he naturally met with many people who professed to be very well instructed, but it was generally rather in certain scientific facts than in the principles upon which those facts depended, and therefore, when they were placed in any new set of circumstances, and had to deal with new ideas, they were found rather endeavouring to proceed empirically upon the little experience they possessed, than to apply first principles to these new circumstances. This was really a serious defect in all branches of industry. It was a common observation, that if they wanted a man to go beyond the mere experience of what was going on around him, they must go either to France or Prussia to find such a man at any reasonable expense, because a knowledge of scientific principles was in England possessed by so few, except leading scientific men, whose services could not be obtained except at a very great expense. Where there was one in England there were twenty in France or Germany, who knew enough of scientific principles to be able to apply them to the common affairs of life. He considered, therefore, that the Sub-Committee had done great service, simply by endeavouring to fix public opinion upon the proposition he had referred to. It was of course in accordance with that view that they had come to the conclusion that technical instruction should not be given in separate scientific institutions, but in the existing schools; in other words, that the general principles of things should be taught, leaving to a subsequent stage the application of those general principles to particular courses of study more immediately connected with the profession or employment which might be ultimately selected. He very heartily appreciated what had been done by the Sub-Committee, and was very anxious that they should continue their labours in the same spirit. They had appended to their report several courses of study, which were recommended by the gentlemen whose names were attached thereto, and upon this appendix he should like to make one or two observations. One was that they all pointed at what might be called a final course, but they did not introduce that by a complementary preliminary course. Now it was quite clear that they would not attain the object they had in view, unless they had both, because one great evil under which they now suffered was that youths approached the scientific course too late in life, and with absolutely blank minds. They must bear in mind that in the larger class, and particularly the class which they were desiring especially to benefit, they could not expect their educational course to be carried on beyond the age of 17 or 18. The only way in which that difficulty could be met was by arranging that the scientific education should be begun so early as to be brought to a satisfactory end by the time when circumstances required that the young men should have finished their education. They could not get over this fact, that if the desired education was not given before the age of 17 or 18, it was not got at all. They would much prefer that education should go on longer, but as family exigencies generally prevented it, they must conform to what was inevitable. What had been the experience of centuries? What had been done with classical education? It had been asserted and acted upon for three hundred years, that a boy of eight years old could embark in a scientific study of considerable complication and considerable abstraction, viz., the study of grammar; that he could learn all the elementary rules of grammar; examine the construction of a sentence analytically; engage in the construction of sentences synthetically; consider general rules as applied to particular cases; and also examine particular cases as containing the elucidation of general rules. That was admitted to be practical with regard to two dead languages, which were now only symbols of ideas. If that could be done, and if that was the practice in all schools, why could not a boy be taught science in the same way? Again, they found that arithmetic was taught in schools to boys of seven years old, and this was one of the purest abstractions possible, for numbers, in the first instance, had no relation to definite ideas. A boy of ordinary intelligence, however, would be in the Rule of Three by the time he was eleven or twelve, and then he was pursuing the theory of numbers into abstract reasoning. How, then, could any one possibly undertake to say that they could not teach science in the same manner, and to the same extent? It had been asserted again and again that this could not be done, but the assertion was based upon no authority, and was contrary to all knowledge and experience. The first proposition, therefore, was, that if they wished to pursue a scientific education to its highest limit, they must begin early and ground well, and a boy must be as familiar with all the fundamental rules of material things, and to a large extent with their application, by the time he was

thirteen or fourteen, as he was now with the rules of Latin and Greek grammar, and with the application of those rules. He wanted the Sub-Committee to examine their appendix from that point of view, and so prepare for the the consideration of the educational world a scheme showing what was the best mode of approaching the study of science by children who intended to pursue that study to its highest limits, just as it had been considered what was the proper method of teaching those children who desired to become classical scholars, and who did become very sound scholars, in that branch of learning, by the age of eighteen. They need not be discouraged by the apathy which had hitherto been felt on this matter. There could not be a more striking fact than this, that classical education had been going on for three centuries, and it was only within the last two years that the masters of public schools had met together to consider whether their system of elementary teaching was a wise one, and had re-constructed, to a great extent, their elementary Latin primer. If the Committee would do the same thing, a great good would be accomplished. The next thing, then, would be, with regard to what might be called the secondary or higher course; of course many boys did not remain at school even until eighteen, and for their sakes it would be a grand thing to have a good elementary course which would prepare them for adding whatever higher knowledge they could obtain hereafter; but, with regard to the higher course, he did not think it would be satisfactory if they were to send out, as a final result of their labour, the seven different sets of ideas which appeared in the appendix; but he hoped they would settle some course of high scientific education which they could recommend. He had no doubt, looking to the names of the gentlemen attached to the report, and the admirable manner in which they had developed the three or four propositions to which he had directed attention, that if the Sub-Committee would only evolve a course of their own, and define that course accurately and clearly, they would achieve the only success and the only effective result they could hope to obtain—the general adoption of that course by the educational establishments of the country—that being obtained by the only authority they could exercise, the authority of public opinion based upon intelligence and reason. He held in his hand a book which would illustrate what he meant better than any further enlargement; a description of the course of study at the special school of Arts, Manufactures and Mines at Liège, which gave a detailed programme of the course of instruction. That was recognized in Belgium by Government authority as defining what was a proper course of study in scientific pursuits, and he thought that without the seal of a minister, but simply by the influence of opinion, the Sub-Committee might do as much for scientific instruction in England. Without going too much into detail they could set forth a course of study which would be intelligible to any schoolmaster, and which would enable him to guide the progress of his pupils. If they could lay down such a scheme as would be supported by public opinion, it would necessarily be adopted by those educational bodies which possessed the rewards of learning, and which of course exercised a very powerful influence over all educational establishments in the kingdom. He did not say they should produce so large a book as that which he held in his hand, but it would be necessary to go somewhat into detail, because if they did not clearly define what was meant, they would be liable to the charge of having given only a superficial consideration to the matter, and of concealing the difficulties which lay below the surface; and if this was once suspected, there would be an end to any idea of their moral ascendency. He hoped the Sub-Committee when they prepared a course, would be careful to avoid the grave error of confusing the species with the genus, or the only result would be an increase of difficulties. He did not say this by way of adverse criticism on what had been done, because he looked upon that as the first effort to approach the subject, and as done with a view to future consideration; but, on the contrary, he desired to express his cordial thanks to the Committee for what they had done, and, as he had said before, if they had done nothing but establish the first proposition contained in their report, they would have well earned the thanks of those by whom they were appointed. He hoped they would be encouraged to pursue their useful labours, and give the public a clear idea of what scientific instruction ought to be, and lay the foundation of a sound public opinion upon this important question, which was the first step towards attaining the object they had in view. He concluded by moving the adoption of the report.

Prof. Voelcker thought it was worth consideration whether it would not be wise to leave out the appendix altogether. He fully agreed in all that had fallen from Mr. Ayrton; and, having read the report of the Sub-Committee very carefully, was perhaps qualified to give an opinion upon it. It appeared to him a very excellent report, and he had no doubt the public in general would regard it as such; but he thought perhaps the undefined and sketchy manner in which the scheme was put forward in the appendix might detract from its value. This, however, was a matter upon which those who had drawn up the report would probably be the best judges. He would impress upon those who were interested in this question the importance of introducing the elements of science into every description of school, whether it were a village school or a classical academy; the elements of natural science, more especially what were called the descriptive branches, might be taught to all grades of society. He did not see why a child at the age of five or six years could not be interested in what he saw around him, and taught by those very objects to obtain correct and definite ideas. He was sure that the elements of botany, as far as descriptive botany was concerned, might be taught to the children of labourers, and it would be equally useful to those who afterwards had the privilege of attaining to a higher kind of education. It was really marvellous to see sometimes highly educated members of society perfectly unacquainted with the first laws of natural science. They could not describe the different parts of a flower, and hardly knew the head from the tail of some animals. If their efforts were directed to the introduction of the elements of descriptive science into every kind of school, a very useful service would be done to the furtherance of technical education.

Professor Williamson, F.R.S., had listened with great interest to the thoughtful remarks of Mr. Ayrton. He thought it was of the greatest importance that attention should be drawn, above all things, to laying the foundation of a scientific education as early as possible, and by drawing special attention to that, Mr. Ayrton had seized hold of the difficulty with which those who attempted to organise any general system of scientific education would have to deal. At the same time he thought that those who had had most opportunities of observing what was done, and also the failures that had occurred, were keenly alive to the fact that at present the methods of instruction in elementary science were very imperfect. They really looked upon this as a problem which ought to be worked out—and certainly anything which could be done to accelerate the sound and solid realisation of a scheme of that kind was of pre-eminent importance—but the difficulties were so great, that he had himself always felt considerable hesitation in propounding any specific scheme. In the first place, he did not think it probable that any one absolutely uniform scheme would be adopted throughout all primary or secondary schools, but that considerable diversity of opinion was likely to prevail among even the better teachers of elementary mathematics, and the other branches of science, either pure or applied. It appeared to him that the usefulness of the work of this Committee might be somewhat diminished if instead of drawing attention mainly to

those things upon which they were all pretty well agreed, they were to venture much upon particulars which, however important, they were as yet less definitely agreed upon. For that reason, although he certainly felt that nothing could be so desirable as to put forward a specific scheme of elementary education in physical science, he was so strongly impressed with the difficulties of that problem, that he thought it better to be too slow rather than too fast in attacking it. With regard to the age up to which young men might be expected to pursue the study of pure science, irrespective of its ulterior application, the remarks of Mr. Ayrton were quite true. The great majority of young men would not go on beyond the age of 17 or so, but at the same time they must not shut their eyes to the fact that some did pursue their studies considerably longer, and did reap from that greater investment of time an advantage so important that he conceived it to be his duty to point it out to others who did not believe in the importance of remaining longer at college; for this higher instruction was in the main such as was given at college as contradistinguished from school. He had seen the benefit of this for practical money-making purposes in a considerable number of cases, during his connection with University College for the last twenty years. There were a certain number of young men who, under his recommendation, had remained until the age of 22, or even longer, and who afterwards applied their knowledge to practical purposes, and he did not remember a case in which it had not paid admirably to do so. Such young men obtained such a power of dealing with everything relating to matter, that there arose quite a competition for their services; in fact, such men were rarely to be found, without seeking in Germany or elsewhere for them, not because an Englishman, if well educated, was not equal to any one; not because he was not even better, but because there were not enough of these educated men in this country. What he had said with regard to a special scheme for elementary education must be held to apply, to some extent, to the schemes of higher education, in which the Sub-Committee had gone into some particulars. Whether the words they had used were accurate or not was a question he would not enter upon, but he would merely say that, whilst admitting that physics was a word nearly synonymous with natural phenomena, and which properly included all natural phenomena, and admitting how undesirable it was that it should be limited to heat, light, electricity, and some branches of dynamics, it must still be admitted as a fact, that in a good many chairs of natural and experimental physics the word was thus understood. Chemistry, which of course denoted the study of a certain branch of science, was a branch of natural philosophy, but was not generally so regarded. For these reasons the Sub-Committee had purposely avoided going too much into particulars, but at the same time had endeavoured, as far as possible, to define in general terms such a course of study as would form a good preparation for a young man before devoting himself to any branch of manufactures. Still he quite agreed in the view that the sooner details could be worked out the better.

Dr. Storrar, as a member of the Sub-Committee, wished to say a few words in support of the view taken by the last speaker. He thought it one of their special merits that they had not ventured to define too distinctly the several subjects which should constitute a course of study in natural science, for it was utterly out of the question to suppose that a committee sitting in those rooms could exercise an omnipotent authority, even if it were omniscient, over the independent judgment of the professors of the physical sciences in the different universities. It was one great advantage in this country that there existed such an amount of diversity and elasticity in courses of study as were fitted to meet the wants of minds of various degrees of growth, and presenting a variety of peculiarities. If the Sub-Committee had ventured upon the course suggested by Mr. Ayrton, he thought they would immediately have had turn round upon them all the science faculties of the universities, asking by what authority a Sub-Committee of the Society of Arts could contemplate dictating to them how they should teach science. That view had been very strongly before the minds of some members of the Sub-Committee, and he confessed he thought they had gone quite as far as was desirable in even sketching out those courses in the appendix. He also agreed with Professor Williamson that if they wanted to cultivate science in this country with a view to its useful application to the arts, they must not contemplate education ceasing at the age of 17, they must not so readily accept the prejudices of society when they were so injurious. In the University of London young men could not take a science degree at an earlier age than 18, and many took it at 19 or 20; and it would be some encouragement to know that that University having had three of Mr. Whitworth's exhibitions assigned to it, actually one of their Bachelors of Science did not think it unbecoming in him to compete for one of these exhibitions. He thought it would be more conducive to the advancement of science honestly to say what they meant and to set up a high standard, rather than accept any crude notions which were entertained by the public, that they must have young men in business at the age of seventeen. He felt some little difficulty in joining issue with Mr. Ayrton on the subject of elementary science teaching. He did not doubt for a moment that it was of importance, and so strongly did the School Inquiry Commission feel upon this subject, that in their report they recommended the introduction of natural science into all classes of secondary schools. At the same time, it was all very well to sit in a room and think how very easy it was to introduce natural science into a school, but it was a very difficult thing to accomplish, and he did not see how it was to be done. Not having been engaged in teaching himself, he had taken some pains to ascertain how it could be done, and had lately visited Rugby and Harrow, the two public schools where most attention was paid to this branch of knowledge. He had no hesitation in saying that they devoted themselves most honestly to it; but, at the same time, the ablest teachers amongst them felt considerable perplexity as to the way in which it was to be effected. It was easy to teach children a mere knowledge of facts, to give them object-lessons, and at a certain stage of development to go a little higher, say in botany, and teach them the different parts of a flower and the principles of classification; he had seen a class of this kind at Rugby two months ago, each pupil having before him specimens of plants, a three-power microscope, and a syllabus of the natural orders of British plants; and they were being drilled in the best mode of differentiating out these plants, and assigning them to their proper natural orders. This was an admirable exercise, but, as far as he could make out, that kind of inductive faculty which enabled a youth to attack natural science with advantage was not of early growth, and he thought children could be taught a good many things before they could be taught science. Of course he felt the responsibility of so saying, and he said it with some diffidence, but so far as his own experience of the young mind was concerned, and so far as he had been able to ascertain from the experience of schools, he very much doubted if anything satisfactory in the way of teaching science, as science, could be done before the age of fifteen. He had not formed this opinion hastily, or without much consideration; and seeing what difficulties surrounded the question, although he was very anxious for the introduction of natural science into schools, and almost considered himself an apostle on the subject, he would not rashly interfere with linguistic institutions for the mere purpose of introducing instruction in things. The two departments of knowledge should proceed side by side, and, in due time, they would find their relative

places. He did not think any advantage would be gained by remitting this subject again to the Sub-Committee. The report now presented was the fruit of great labour and considerable time, and, for the reasons already given, he did not think, if they were to elaborate that report at greater length, it would produce any results which would further the object they had in view.

Dr. Yates, as a practical schoolmaster, could confirm almost everything which had fallen from Dr. Storrar. He had read the report repeatedly, and it seemed to him a most judicious one. As to what might be done in the way of teaching science to children of eight years of age, he would venture to give a little of his own experience. He was the son of a schoolmaster, and at 16 or 17 he went to Holland, and became a naturalised Dutchman, in order to pass through their schools for the purpose of learning how to teach. From there he went to Switzerland, and subsequently spent a considerable time in Leipzic and in Berlin. After ten or twelve years of careful preparation on the Continent, he came back, in 1851, to the neighbourhood of the Crystal Palace, determined to lend such aid as he could to the cause of scientific education. He began teaching science; and although himself possessed of some knowledge of chemistry, which he had studied at Edinburgh, he selected Mr. Galloway, one of the most eminent teachers of that science, now in the School of Industry at Dublin, to render him assistance in that department. He was most zealous in his profession, having a thorough love for it; and he associated himself with him (Dr. Yates) for three years, working in the kitchen, and making use of the kitchen furnace for his experiments. But, with all his endeavours, he could not make chemistry grow there, and he was obliged to take his talents elsewhere. Then Mr. William Crookes, now a fellow of the Royal Society, and a very able chemist, was good enough to try what he could do for 12 months, to see if chemistry could not be made to grow. But they could not create a demand for that which they brought into the market, and it was therefore useless to continue the effort. They must act first on the parents, and if they could create an improved public opinion, they might then hope to do something. Mr. Crookes was with him for 12 months, and it could not be said that during that time chemistry was not well taught; but out of more than 250 pupils which he then had, he could not say that more than one had become a chemist. He had tried very hard to introduce science teaching, but in a school of nearly 300 he did not find more than six or seven per cent. who would take to scientific pursuits. Since then he had found a difficulty in inducing persons to co-operate with him, and had been obliged to be content with imparting a certain amount of instruction in general science, sending his pupils to South Kensington afterwards for examination. What had beaten him was, in the first place, the great expense connected with having good science teachers; the labourer was worthy of his hire, but in the business of teaching the great difficulty was how to increase a man's emoluments in proportion to his value. The prospects of introducing science depended so much on circumstances that they could not lay down any definite plan; and although the teachers might be in earnest for some time at least, the money question would baffle their endeavours.

Mr. G. F. Wilson, F.R.S., said he would venture to call the attention of gentlemen who doubted the practicability of teaching science at a very early age, to the experience of Professor Henslow, in teaching botany to village children in Suffolk. Some years ago he had an opportunity of testing the real value of their knowledge, in this way. Being in Scotland, he found a flower which he knew none of the children could have seen, and he therefore sent it to the Professor, who returned to him the papers written by all the scholars in the first class upon it, which were wonderfully correct, showing that they had attained a very considerable knowledge of botany. This knowledge was of course useful to them in after-life, and, he might add, that it was considered in the neighbourhood that there were no such nursemaids to be had anywhere as the Professor's scholars.

Mr. E. A. Davidson wished to add a word on the subject of elementary education, which formed the special theme of a paper read by him before the Society of Arts in December last. He did not mean for a moment to degrade science to such a point as to say that you could teach science positively to little children in national schools, but they could be prepared with elementary knowledge, and the crudities of their minds cleared away, so that when they reached a higher stage of education, the teacher under whom they might be placed would be free to do something towards teaching them real science, instead of having simply to clear away not only their natural roughnesses, but those caused by acquired ignorance, by positive mistakes of knowledge. Children were always learning something, and if they did not learn rightly they would learn erroneously, therefore the sooner they began to learn something correctly the better. But he thought there were great mistakes made as to what boys really could do. Having himself been engaged in teaching, as part of his occupation in connection with national schools, he had some thousands of boys per year pass under his eye, and he could mention many instances of boys, under the age of eight years, who had taken honours and prizes, under the Science and Art Department, in practical and plane geometry. Although some teachers might have crammed boys with some thirty or forty problems in plane geometry for the purpose of an examination, he could honestly say that he had never done such a thing, and it was therefore evident that a really sound knowledge of geometry and its application to a certain extent might be taught to boys at an early age. Then he would call attention for a moment to the Jewish schools. In the Jewish Free School in the City there were about 3,000 boys, and not a boy there but, if you opened a Hebrew Bible at any part, could read and translate it; when a boy of eight could do that with a dead language, acquired simply for the purpose of reading the Scriptures in the original, it was evident he was able to receive other teaching. The whole question, however, seemed to him stopped by a sentence which the Sub-Committee in their report had applied to one branch of study, but which he thought might with propriety be attached to all. The words used were "Mechanical or linear drawing must be taught to an extent for which even teachers would not at this moment be found." That was the grand difficulty. A man who was to teach properly, even elementary science, to teach it in such a manner as to interest children, must know a great deal more than the elements himself. The higher a man's knowledge was, provided he were possessed of aptitude for teaching, the better would he teach. The Science and Art Department certified a few men to go about as visiting teachers, but anyone acquainted with the practical business of teaching, must know that the man who came into a school for an hour or two in a week had but little influence over the children. If science were to be taught effectually, it must be by the master, who was with them every hour, who acquired a personal grasp of their minds, and who created a certain spirit of love amongst them. Therefore the teachers must be trained purposely, and the sciences, —especially what were called the applied sciences—must be efficiently taught in the training schools for national schoolmasters, so that when they went to a national school, however elementary the scientific knowledge which they imparted, it should at least be sound, and then the boys whom they taught, when they left school, would be much better qualified to learn the trades to which they were apprenticed, and would be at once instructed in them by their masters, instead of being left for a considerable period really in the position of errand-boys. He had been surprised to hear the age of 18 spoken of as the limit; he was connected with the scientific staff of the City Middle-class Schools, and he was sorry to say that they could rarely keep a boy beyond 15—very

often not so long,—but, even then, all who had left the school had positively taken positions distinctly because of the amount of knowledge they had acquired. They had sent out a considerable number this year much earlier than they wished, but the money consideration stepped in, and parents found there were openings which they felt compelled to take advantage of, and they could not keep them longer. But even in national schools, where the boys left at 12 or 13, such little scientific education as could be given would be of great service. Mr. Davidson concluded by narrating the difficulty he had experienced in getting a simple Bunsen's gas-burner made in London, having applied in vain at two shops, and succeeding at the third only when he undertook to cut out in paper the shape and size of the pieces of metal required, whereas a very slight knowledge of the principles of projection and solid geometry would have rendered the task perfectly easy to any workman. He should be happy to place at the disposal of the Sub-Committee the schemes of instruction which he had obtained from Darmstadt, Hanover, and Wurtemburg, when he was preparing his paper on technical education.

Mr. H. Pooley, as representing the Liverpool Chamber of Commerce, wished to express his pleasure at being present, and at reading the comprehensive and valuable report which had been presented. He hoped the labours of the Committee would be pursued, which he believed would be of the greatest national advantage.

The Chairman said, if no one else had any remarks to offer, he would put the resolution for the adoption of the report which had been presented, but before doing so, he must give to the gentleman to whom they were mainly indebted for the report, Mr. Fleeming Jenkin, the credit which was his due. He (the chairman) had not been able to attend the more recent meetings of the Sub-Committee, but the earlier ones he had attended as regularly as he could, and he was sure they were all much indebted to Mr. Jenkin for his valuable services in so clearly apprehending, retaining, and embodying in the report the opinions of the Committee. It was a very difficult report to draw, for when they entered on their inquiry almost every variety of opinion was represented on the Sub-Committee, and it was not until the seventh or eighth meeting that their views began to take a definite shape. Mr. Jenkin then began to prepare a skeleton report which had since been elaborated with great patience and skill into the form in which it now appeared. In their discussion that morning they had certainly branched out a good deal, partly in reference to primary education, which was carefully excluded from all their discussions on the report, but that branch of the subject he hoped would come before them when they met later in the year, for having done so much, he could hardly believe the Committee would now stop short and say they would not enter into a consideration of the beginning and end of that course of instruction to the intermediate stage of which they had given so much attention. He quite agreed that they could not teach very young children pure science, but they could undoubtedly teach them to love science, and if they could do that it was much better than cramming them with a number of historical facts. Unless a child began to look into nature, and to appreciate its varied phenomena, to think what a thermometer or barometer was, to speculate on the causes and effects of thunder and lightning, there was very little chance of his being fond of science when he was fifteen, or when he got into the hard business of life. He always considered those children very fortunate who had parents or tutors, at an early age, who were fond of science. If this had not been his lot, he would have had no knowledge of it at all. It was his good fortune, at a very early age, to be associated with Mr. Joyce, whose "Scientific Dialogues" were well known, and to be constantly meeting Dr. Wollaston and several men of that class, and in that way he had imbibed a love of science which would last him his life. He had never been to school, and was put into business at the age of fourteen, and all he had learned since was in consequence of the taste which he had acquired at an early age.

Dr. Storrar said children might be taught the facts of science, but when they came to science itself a more mature mind was required.

The Chairman said he would not discuss that question. There was no dispute that children might be taught, with great advantage, much of which they were now left in total ignorance, and this early training would be of great service to them hereafter. Perhaps some gentleman present would second the resolution for the adoption of the report.

Mr. Antonio Brady had much pleasure in doing so. From his experience of elementary teaching, he feared the great difficulty would be to find masters competent to teach science, and so induce in children that love for it which would lead them to follow up their investigations. He could mention one instance, however, that of his friend Mr. Gilbert, who taught the children in the Plaistow Marshes so much botany that it became quite a rage. In national schools they did not so much want to teach science in its strict sense as to impart a taste for it, and this might very well be done. He had had many thousand children under his notice, but they could never keep them after 12, and many left at 11 years of age. It was quite plain that in such cases they could not teach science, but at the same time a good deal of elementary scientific knowledge might be imparted which would be very useful in after life. In conclusion, he hoped they would see the principles embodied in the report thoroughly carried out.

The resolution was then carried unanimously.

The Chairman then put successively resolutions that the Council be requested to print and circulate the report, and that the Sub-Committee be requested to continue their labours next session, which were both carried unanimously.

A vote of thanks to the Sub-Committee, for their valuable services in the preparation of the report, was then passed; and, in conclusion, a vote of thanks to the Chairman (Mr. Hawes) was passed by acclamation.

Cantor Lectures.

"On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture I., delivered Monday, January 20.

Varieties of Food—their Chemical Composition and Nutritive Value.

(*Continued from page* 619.)

Maize or *Indian Corn* is one of the most extensively used grains in the world. It enters largely into the food of the inhabitants of America, Italy, Corsica, Spain, the south of France, and the Danubian Principalities. Since the famine in Ireland, it has there also become a common article of diet, especially when potatoes are dear; but its flavour is harsh and peculiar, and nothing but a scarcity of more agreeable food reconciles people to its use. The young grain called *cob*, is, however, more palatable, and forms, when boiled in milk, an American luxury, which takes the place of green peas.

The farina is peculiar when examined under the microscope, and will thus serve to recognise it.

Although the meal is rich in nitrogenous matter and fat, it does not make good bread. It is, therefore, either cooked by baking it into cakes, or by stirring it into boiling water, or boiling milk, as in the case of oatmeal, and thus making a sort of hasty-pudding, or thick porridge. This is the method of using it in Ireland, and it is flavoured with salt, or butter, or treacle. The favourite mess called *corn-lob* by the creoles of British Honduras, is prepared with milk in the same way. Indian meal mixed with maple sugar, and baked into

cakes, formed, at one time, the chief article of diet of the almost extinct Delaware Indians.

When deprived of its gluten, and harsh flavour, by means of a weak solution of caustic soda, and then dried, it forms the expensive food called *Oswego* or *corn flour*, which is now largely used for puddings.

Lastly, it is often mixed with wheaten-flour and baked into bread, but its harsh taste is never completely covered.

The grain is said to cause disease when eaten for a long time, and without other meal—the symptoms being a scaly eruption upon the hands, great prostration of the vital powers, and death after a year or so, with extreme emaciation. These effects have been frequently observed among the peasants of Italy, who use the meal as their chief food, but I am not aware of any such effects having been seen in Ireland, where it is often the only article of diet.

The nutritive power of Indian meal is very high, and, considering its price, it is almost, if not altogether, the cheapest food for the poor. Calculated according to the physiological wants of the system, a week's diet for an adult will only cost about 10½d., and excepting split-peas, which are of doubtful digestibility, there is nothing approaching it for economy.

Rice is the principal food of eastern and southern nations. It is extensively cultivated in India, China, South America, and the southern countries of Europe; and it gives nourishment to not less than a hundred millions of persons. In this country, however, it is rarely employed, except as an adjunct to other foods. Now and then, in times of scarcity, it is used in the place of potatoes. Perhaps 50 per cent. of our labouring classes use it in this manner. It is imported into this country in a decorticated or cleaned condition, but when it has the husk upon it, it is called *paddy*. The kinds which are most esteemed in this country are Carolina and Patna; but according to Dr. Watson, there are many Indian varieties which are nearly equal to the American. The proportion of gluten in it is only about 6·3 per cent., and it rarely exceeds 7. It is, in fact, one of the least nitrogenous of all the cereals, and cannot be made into bread, unless it is mixed with wheaten-flour, as is the custom in Paris, in making the best white bread. The proportion of nitrogenous to carbonaceous matter is as 1 to 12·7, or nearly twice the amount in wheat. It is, therefore, a good adjunct to highly plastic foods, as ox-liver, poultry, veal, and fish; with all of which it goes well, especially in the savoury form of *curry*. Boiled with milk also, and dressed with egg, as rice pudding, it forms a substantial meal; but in no country is it eaten alone.

The *Millets*, called also *Dhurra* or *Dhoora*, are another kind of grain, and are derived from many species of plants, as *sorghum*, *penicellaria*, *panicum*, &c. Like rice, they are extensively cultivated in India, Egypt, and the interior of Africa, where they are important articles of diet. They are a little more nutritious than rice: for they contain, on an average, about 9 per cent. of nitrogenous matter, with 74 of starch and sugar, 2·6 of fat, and 2·3 of mineral matter. We have no experience of their nutritive properties in this country, except in feeding birds; but in India the grains are ground whole and made into bread.

The last of the grains of any importance is *Quinoa*, a species of *chenopodium*. It is hardly known in this country, although it is extensively cultivated and consumed on the high table-lands of Chili and Peru. Mr. Johnston has described it, and he says there are two varieties of it—the sweet and bitter—both of which grow at an elevation of 13,000 feet above the level of the sea, where barley and rye refuse to ripen. It is very nutritious, and approaches oatmeal in its chemical composition, the amount of gluten being about 19 per cent., the starch and sugar 60 per cent., and the fat 5.

The next class of farinaceous foods are the *pulses*, as *peas*, *beans*, and *lentils* of this country, and the *dholls* and *grams* of India. They are grown and eaten in all parts of the world, and are everywhere regarded as very nutritious when they can be digested. Nothing, however, but the most prolonged cooking will serve to help in this particular. As will be seen by reference to the tables, where the composition of peas, the type of all of them, is given, they are rich in nitrogenous matter, for peas and beans contain about 23 per cent., and lentils about 25; but the carbonaceous constituents amount to only 59 per cent., or 1 to 2½. They are therefore, when eaten, invariably associated with fat. In India, the favourite pea (*cajanus Indicus*) is rubbed with oil before it is cooked. In Yucatan, and throughout the whole of Central America, where black beans, called *frijoles*, are extensively used as food, they are well boiled in water, and eaten with pepper, salt, and pork. In this country, butter with peas, and fat bacon with beans, are inseparable companions. Lastly, revalenta or ground lentils with cocoa, which contains over 50 per cent. of fat, are mixed in a well-known fancy preparation. The nitrogenous matter of the pulses is not of the nature of gluten, but is more like casein, or the cheesy matter of milk, and it was named by Braconnot, its discoverer, *Legumine*.

Other farinaceous foods, of little importance to us, are the meal of the *edible chesnut*, which is largely used by the peasants of Lombardy; the *Manioc* and *Lotsa meal*, which, Dr. Livingstone says, are the chief vegetable foods of the natives of some parts of South Africa; perhaps, also, the *horse-chesnut* and the *acorn* might be added to the list, for there is hope of their being easily freed from the bitter principle which now renders them useless.

And last of this class of foods are the *starches* and *arrow-roots*, which are largely imported or prepared in this country. They are *Bermuda*, *Jamaica*, or *West Indian arrow-roots*, from *maranta arundinacea; East Indian arrowroot*, from various species of *curcuma; Tous-les-mois*, from *canna; Brazilian arrowroot*, from *jatropha manihot*, which, when dried and partially cooked on hot plates, makes *tapioca;* and which, when baked in its whole condition, forms *cassava* bread; *sago* and *sago-meal*, from the fruit of various species of *sagus; Tahiti arrow-root*, from a *tacca; Portland arrowroot*, from the tubers of an *arum;* and *English arrowroot* from *potatoes*. All these are obtained in the same way—namely, by crushing, or bruising, or rasping the root or other substance containing them, and after diffusing through water, allowing the starch or fæculoid matter to deposit; it is then collected on a cloth and dried. In this country, starches are obtained by soaking the grain in an alkaline liquor, which dissolves the gluten, and then crushing between mills, straining to keep back the husk and cellulose, and then washing with water, and allowing the starch to subside. By this method of manufacture a quantity of gluten is obtained, which can be set free from the alkali by an acid, and collected for food.

All the starches and arrowroots are known by their microscopic characters; and although they have the same chemical composition and nutritive value, yet they are very different in their digestibility, for the true arrow-roots of the West Indies, as Bermuda and Jamaica, will often remain on the stomach of an invalid when the others will be rejected.

They contain no nitrogen, or but a trace of it, and therefore have no nitrogenous value, but they are useful for their carbonaceous properties; and they are best cooked by stirring them into boiling water or boiling milk, and then simmering for a minute or so.

The next class of vegetable foods are those which contain much water, and which may be called *succulent vegetable foods*, of which the *potato* is the most important.

Brought to us from America, in the seventeenth century, as a rarity, by Sir Walter Raleigh, it has gradually become an almost universal article of diet; for its advantages are so numerous that it will ever be a favourite food. It is, for example, easily cultivated, easily kept, easily cooked, and easily digested; besides

which it requires but little flavouring matter, and never wearies the palate. It is therefore used in times of plenty by all classes of persons, and is often eaten in quantities that approach very nearly to the rice allowance of a hungry Hindoo. "In Ireland," says Dr. Edward Smith, "when the season arrives and potatoes are plentiful, as much as 3½lbs. are consumed three times in a day by an adult. This, indeed, is the regular allowance, and an Irishman finds no difficulty in consuming his rations of 10½lbs. of potatoes daily." In England, the farm labourer consumes, on an average, hardly as much in a week. In Anglesea, however, potatoes are eaten twice a day, and the consumption is about 16½lbs. per adult weekly; and in Scotland the average allowance is 15lbs. per head weekly.

The nutritive value of the potato is not great, for, in the first place, it contains only about 25 per cent. of solid matter, and of this hardly 2·1 is nitrogenous. Potatoes are also deficient of fat, and therefore they require admixture with nourishing materials. They go well with meat and fish, and are considerably helped with a little dripping or butter; but the great adjunct is milk. In Ireland, potatoes and buttermilk are the principal diet, even in times of plenty.

Considering the cheapness of potatoes, they are a most economical food. At the price of a halfpenny a pound, as set down in table No. 4, it costs but two shillings and threepence a week to provide the carbon and nitrogen required by an adult; but when potatoes are cultivated upon cottage ground, by wife and children, as is the practice almost everywhere, as much as seven pounds can be easily obtained for a penny, and then the weekly diet would be rather less than eight-pence. At this price no vegetable food can compete with it.

Potatoes are best cooked in their skins, for the waste is then only about three per cent., or half an ounce in a pound; whereas, if they are peeled first, it is not less than 14 per cent., or from two to three ounces in a pound. The mealy varieties are more digestible than the close and waxy; in fact, when they are in this state, as is the case with new potatoes, and potatoes late in the season, which have begun to grow, they are best cooked by stewing them.

All succulent vegetables are endowed with anti-scorbutic powers, but potatoes are especially renowned for this property. As far back as the year 1781, Sir Gilbert Blane, in his work on the "Diseases of the Fleet," alluded to the beneficial action of the potato in scurvy, and from that time to the present, its salutary powers have been repeatedly observed. The late Dr. Baly remarked, in his inquiries into the diseases of prisoners, that wherever potatoes were used scurvy was unknown; and it is the almost universal practice now to carry potatoes, fresh or preserved, in all ocean-going vessels, with the view of preventing scurvy.

Other succulent vegetables in common use, as *turnips*, *parsnips*, *carrots*, *artichokes*, *onions*, *leeks*, *cauliflower*, *cabbages*, and *greens*, have, among themselves, nearly the same nutritive value, but they are all much less nutritious than the potato, as will be seen by reference to the Table No. 3; in fact, they do not contain more than from 9 to 17 per cent. of solid matter, and of this only about 1·2 is nitrogenous. They are chiefly valuable for their anti-scorbutic properties, and for their quality of flavouring insipid food, and diluting strong ones.

Banana and *bread-fruit* are also valuable esculent foods, and are largely used in the tropics. The former contains about 27 per cent. of solid matter, of nearly the same nutritive value as rice. About 6½ lbs. of the fresh fruit, or 2 lbs. of the dry meal, with a quarter of a pound of salt meat or fish, is a common allowance for a labourer. The *bread-fruit* is largely eaten by the natives of the Indian Archipelago, and of the Islands of the South Sea. There are several varieties of it which come into season at different times. It is very juicy, containing about 80 per cent. of water, and is generally gathered before it is ripe, when the starch is in a mealy condition, and has not undergone change into sugar. The fresh fruit is cooked, by peeling it, wrapping it in leaves, and baking it between hot stones. It then tastes like sweet bread; but much of the ripe fruit is preserved by peeling it, cutting it into slices, and packing it very closely in pits in the ground, made water-light, and lined with banana leaves. After a while it undergoes a sort of fermentation, or, as we should call it from the smell, putrefaction, and the fruit settles into a mass, of the consistence of soft cheese. When it is required for use, it is well kneaded, wrapped in leaves, and baked, like the fresh fruit, between hot stones.

Ripe fruits, as *apples*, *pears*, *peaches*, *pine-apples*, *oranges*, &c., are not of much nutritive value, for they rarely contain above 13 per cent. of solid matter, and this is of no more value than so much rice, but they have agreeable flavours, and serve the purpose of anti-scorbutic drinks.

Marine Algæ.—Everywhere along our coasts, there is abundance of comparatively nutritious food, which may, by a little management, be made palatable. I allude to our *sea-weeds;* and this Society has distinguished itself by its efforts to utilize this stock of now almost profitless food. Judging from the analysis of Dr. Davy and Dr. Apjohn, of Dublin, it would seem that when in a moderately dry condition sea-weeds contain from 18 to 26 per cent. of water; and that the nitrogenous constituents amount to from 9½ to 15 per cent., while the starchy matter and sugar average about 66 per cent. These results place sea-weeds among the most nutritrious of vegetable substances; in fact they are richer in nitrogenous matter than oatmeal or Indian corn.

The varieties of sea-weed at present used are the following:—

Porphyra laciniata and *vulgaris*, called *laver* in England, *stoke* in Ireland, and *slouk* in Scotland.

Chondrus crispus, called *carrageen* or *Irish moss*, and also *pearl-moss*.

Laminaria digitata, known as *sea girdle* in England, *tangle* in Scotland, and *red-ware* in the Orkneys; and *laminaria saccharina alaria esculenta* or *bledder-lock*, called also *hen-ware* and *honey-ware* by the Scotch.

Ulva latissima or *green laver.*—*Rhodomenia palmata*, or *dulse* of Scotland.—These, with many others, are eaten by the coast inhabitants of this country and the Continent. In some parts of Scotland and Ireland they form a considerable portion of the diet of the poor.

To prepare them for food, they should first be steeped in water to remove saline matter; and in some cases a little carbonate of soda added to the water will remove the bitterness. They are then stewed in water or milk until they are tender and mucilaginous; and they are best flavoured with pepper and vinegar. Under the name of *marine sauce*, the lavers were once a luxury in London.

As to the last of the vegetable foods—namely, the *fungi* or *mushrooms*—I have but little to say; for although the edible varieties are highly nutritious, yet they can never become an important article of diet. Most of them are employed at the present time as flavouring agents; and among these are the *common mushroom* for ketchup, the *morel* for gravies, and the *truffle* for turkeys and the livers of geese *(Pâté de foie gras)*.

Sugar and *Treacle*.—Both of these are very generally consumed on account of their flavouring and fattening qualities Dr. Edward Smith found that 98 per cent. of indoor operatives partook of sugar, to the extent of 7½ ozs. per adult, weekly. 96 per cent. of Scotch labourers use it, and 80 per cent. of Irish. In Wales, also, it is commonly used to an average extent of 6 ozs. per adult weekly; but there is a marked difference in the rate of consumption in the northern and southern portions of the country. In North Wales, for example, the average amount per head is 11¼ ozs.; whereas, in South Wales it is only 3 ozs. The principle use of it is to sweeten tea.

Treacle has more flavour than sugar, and it is also cheaper. It is, therefore, more largely employed; and that description of it properly called *mollasses*, which

is the draining from the raw or unrefined sugar—treacle being the drainings from refined sugar,—is preferred on account of its stronger flavour, and is most usually sold for treacle. They go well with all descriptions of farinaceous food, as porridge, pudding, dumpling and bread.

Sugar contains from 4 to 10 per cent. of moisture, and treacle about 23. The rest is carbonaceous matter, without nitrogen. They are, therefore, heat-producing and fattening agents, and their power, in these respects, is about the same as with starch. Whether they can produce disease when used in excess is a matter of doubt; but Dr. Richardson declares that they cause blindness by creating opacity of the lens *(cataract)*.

Animal Foods—First on the list of these is *milk*, a liquid which contains all the elements of food required by the very young, and is therefore regarded as the type or standard of food.

In some countries, as Switzerland, it is the chief diet of the peasantry; and everywhere, if easily obtained, it is largely consumed. 76 per cent. of the labouring classes of England make use of it; 83 per cent. take it as butter-milk; and 53 per cent. as skimmed-milk. In Wales, the average consumption of it by farm labourers is $4\frac{1}{4}$ pints per adult weekly—South Wales averaging only 3 pints, while in North Wales it is $7\frac{1}{2}$. In Scotland the consumption among the labouring classes is still larger, for it amounts to $6\frac{1}{4}$ pints per head weekly, and in Ireland it reaches $6\frac{3}{4}$ pints. Those who take least of it are the poor in-door operatives of London; the weavers of Spitalfields, for example, use only about 7·6 oz. per head weekly, and those of Bethnal-green only a fraction above $1\frac{1}{2}$ ozs. per head. When examined under the microscope, milk is found to consist of myriads of little globules of butter floating in a clear liquid. On standing for a few hours the oily particles rise to the surface and form a cream, the proportion of which is the test of quality. Cows'-milk is heavier than water in the proportion of from 1,030 or 1,032 to 1,000. Asses' milk is the lightest, for its gravity is only about 1,019; then comes human milk, 1,020; and, lastly, goat and ewes' milk, which is the heaviest of all, from 1,035 to 1,042.

The quality of milk varies with the breed of the cow, the nature of its food, and the time of milking, for afternoon milk is always richer than morning, and the last drawn than the first. Taking, however, the average of a large number of samples, it may be said that cows' milk contains 14 per cent. of solid matter, 4·1 of which are casein, 5·2 sugar, 3·9 butter, and 0·8 saline matter. The relations of nitrogenous to the carbonaceous is 1 to 2·2; but as fat is $2\frac{1}{2}$ times more powerful than starch, the relation may be said to be as 1 to 3·6.

When milk is heated to the boiling temperature, the casein is coagulated to some extent; and if the milk has stood before it is heated, so that the cream may rise, the coagulum includes the cream, and makes the so-called Devonshire or *clotted cream*.

Acids also coagulate the casein, and produce a curd, as in the making of cheese and curds and whey.

Cream is rich in butter, as will be seen by reference to Table No. 3. It contains 34 per cent. of solid matter, 26·7 of which are butter, and its gravity is about 1,013.

Skim-milk is the milk from which the cream has been removed. It contains only about half as much butter as new milk, and its gravity is about 1,037. In all other respects it is similar to new milk.

Buttermilk is the residue of the milk or cream from which the butter has been removed by churning. It is still poorer in fat than skim-milk, containing, in fact, only about half as much. Unless it is very fresh, it is generally a little acid, and frequently the acidity has gone so far as to set the milk into a kind of jelly.

The *whey* of milk is the opalescent liquor from which the curd has been removed in making cheese. Although not highly nutritious, it still holds a little casein in solution, as well as the sugar and saline matter of the milk. It is rarely used as food by the poor, but is given to pigs. In Switzerland, however, it is considered to have medicinal virtues, especially for the cure of chronic disorders of the abdominal organs, and the treatment, which is somewhat fashionable, goes by the name of *cure de petit lait*. There is a popular notion, that the whey of milk is sudorific, and hence we have our *wine whey*, *cream of tartar whey*, *alum whey*, *tamarand whey*, &c., when the milk has been curdled by these several substances.

Cheese is the coagulated product of milk, obtained by the addition of rennet or a little vinegar. When cream is coagulated it makes *cream cheese*, which will hardly bear keeping, but must be eaten fresh. It contains about half its weight of butter, and a fifth of its weight only of curd.

When cream is added to new milk, and the mixture is curdled, it forms very rich cheese, as *double Gloucester* and *Stilton*.

When new milk alone is used the cheese is less rich, but still of high quality, as *Cheddar*.

When an eighth or a tenth of the cream has been taken off, it produces the quality of cheese which is most sought after, as single Gloucester, Chester, American, &c.

And when all the cream has been removed, and the skim-milk is curdled, it forms the poor cheese of Holland, Friesland, Suffolk, Somersetshire, and South Wales.

At first every variety of cheese is soft and comparatively tasteless, but by keeping they undergo change, and develop their flavours, when they are said to be ripe.

Analyses of two of the most important of them are shown on Table No. 3, and it will be noticed that they contain from 56 to 64 per cent. of solid matter, about half of which is curd. In skim-milk cheese the curd amounts to 44·8 per cent., and the fat to only 3·6; whereas, in Cheddar, the curd is only 28·4 per cent., and the fat 31·1. In nutritive power, therefore, especially in nitrogenous matter, cheese ranks high, and is a valuable article of diet; but there is a limit to its digestibility, and hence it cannot be taken in large quantity. Considering its price also, it is hardly so profitable as many other foods; although, where good skim-milk cheese can be purchased at from $2\frac{1}{2}$d. to 3d. a pound it forms, in small quantities at a time, a good adjunct to bread.

Meat.—There is hardly a class of individuals, however poor, who do not make a strong effort to obtain meat. It would seem, therefore, to be a necessary article of diet. In this metropolis the indoor operatives eat it to the extent of 14·8 ozs. per adult weekly; 70 per cent. of English farm labourers consume it, and to the extent of 16 ozs. per man weekly; 60 per cent. of the Scotch; 30 of the Welsh; and 20 of the Irish. The Scotch, probably, have a larger allowance than the English, considering that braxy-mutton is the perquisite of the Scotch labourer; but the Welsh have only an average amount of $2\frac{1}{2}$ ozs. per adult weekly; and the Irish allowance is still less.

It is difficult to obtain accurate returns of the quantity of meat consumed in London; but if the computation of Dr. Wynter be correct, it is not less than $30\frac{3}{4}$ ozs. per head weekly, or about $4\frac{1}{2}$ ozs. per day for every man, woman, and child. In Paris, according to M. Armand Husson, who has carefully collected the *octroi* returns, it is rather more than 49 ozs. per head weekly, or just 7 ozs. a-day. We are not, therefore, such large meat-eaters as the French.

Butchers' meat differs very much in nutritive value according to the proportions of fat and lean; and there is a strong prejudice in favour of beef as the strongest kind of meat. In reality, however, the lean of all meat is of nearly the same nutritive power, provided it is digested; but in this respect there are large differences. The flavour also varies with the nature of the animal, and with its mode of feeding. Pampas-pig, and indeed most wild swine, are horribly rank, but by proper feeding they become delicious. In store animals, the proportion of lean is always greater than the fat, and the solid matter does not amount to more than 28 or 29 per cent.; not so, however, in fat animals, for then the fat is largely

in excess of the lean, and the solid matters make up about half the total weight. The tendency, indeed, of the fattening process is to substitute fat for water in the carcass; and the quality of the meat depends on the intimate intermixture of fat with the muscular tissue. All animals are not alike in their method of depositing fat, for some put it upon the surface of the body, and others accumulate it among the viscera. The art of breeding and feeding stock is to overcome both of these tendencies, and, at the same time, to produce a fat which will not melt or boil away in cooking. Oily foods have always a tendency to make soft fat.

The average proportions of fat and lean in the offal and carcases of animals are shown in Table No. 6

TABLE VI.—PERCENTAGE PROPORTIONS AND NUTRITIVE VALUE OF THE CARCASS AND OFFAL.

	In Animal.		Water.		Nitrogenous.		Fat.		Salts.	
	Carcass.	Offal.	Carcass.	Offal.	Carcass.	Offal.	Carcass.	Offal.	Carcass.	Offal.
Store Oxen	59·3	38·9	60·8	—	18·0	—	16·0	—	5·2	—
Half Fat do.	—	—	54·0	59·6	17·8	20·6	22·6	15·7	5·6	4·1
Fat do.	59·8	38·5	45·6	52·8	15·0	17·5	34·8	26·3	4·6	3·4
Fat Heifers	55·6	41·3	—	—	—	—	—	—	—	—
Fat Calves	63·1	33·5	62·3	64·9	16·6	17·1	16·6	14·6	4·5	3·4
Store Sheep	53·4	45·6	57·3	63·7	14·5	18·0	23·8	16·1	4·4	2·2
Half Fat do.	59·0	40·5	49·7	61·1	14·9	17·7	31·3	18·5	4·1	2·7
Fat do.	—	—	39·7	55·2	11·5	16·1	45·4	26·4	3·5	2·3
Very Fat do.	64·1	35·8	33·0	45·1	9·1	16·8	55·1	34·5	2·8	3·6
Fat Lambs	—	—	48·6	58·5	10·9	18·9	36·9	20·1	3·6	2·5
Store Pigs	79·3	18·8	55·3	67·9	14·0	14·0	28·1	15·0	2·6	3·1
Fat do.	83·4	16·1	38·6	59·4	10·5	14·8	49·5	22·8	1·4	3·0
Mean of all	64·1	34·3	48·4	53·8	13·5	17·2	34·4	21·0	3·7	3·0

and Table No. 3 (p. 616) exhibits the proportion of the principal nutritive constituents in ordinary joints of meat. Lean meat is evidently deficient of carbonaceous matter, and this is best supplied in bread or potato; but in fat meat, considering that the nutritive power of fat is twice and a half as great as that of starch or sugar, the carbonaceous matter is often in excess of the right proportion; it is remarkably so in pork, which will bear dilution with the flesh of rabit, poultry, and veal.

The amount of bone in meat varies: it is rarely less than 8 per cent. In the neck and brisket of beef it is about 10 per cent., and in shins and legs of beef it amounts to one-third, or even half the total weight. The most economical parts are the round and thick flank, then the brisket and sticking-piece, and lastly the leg. In the case of mutton and pork, the leg is most profitable, and then the shoulder.

Horse-flesh is hardly known in this country, except as canine food; but on the Continent, and especially in Germany, Belgium, and Switzerland, it is regularly sold in the public markets, and is considered by many persons superior to beef. Possibly we have often eaten it on the Continent without knowing it. A *Châteaubriand*, or double beef-steak of Paris, is said to be best of horse-flesh; and no doubt the frequenters of the *restaurants* of Paris have unwittingly acquired a fondness for it, and have relished it as good beef. A story is told by a writer in the *Saturday Review* of a Frenchman who blandly remonstrated with an Englishman for his scorn of French beef. "I have," he said, "been two times in England, but I navère find the bif supérieur to ours. I find it vary conveenient that they bring it you on little pieces of stick, for one penny, but I do not find the bif supérieur." "Good heavens!" cried the Englishman, red with astonishment, "you have been eating cat's-meat." To be serious, however, I do not see why the flesh of healthy horses should not be used as human food. It has indeed many powerful advocates, among whom is the great naturalist, Geoffroy St. Hilaire.

Venison and the dark flesh of other wild animals differs from butchers' meat in the circumstance that it is leaner, and that it contains more blood; but its nutritive power, when properly cooked, is not inferior to that of beef or mutton, and it is always more digestible.

The offal of meat constitutes about one-third of the entire weight of the slaughtered animal. It consists of the blood, the head and its contents, the tongue and brain, the heart and lungs, the abdominal viscera—as the diaphragm, the liver, spleen, pancreas, stomach, intestines, and reproductive organs, the feet, tail and skin. In the case of the pig, the skin and head are parts of the carcass.

Nearly all these, when properly treated, are good for food. The *blood* of the pig is mixed with groats and fat, and converted into *black-pudding*, which contains about 11 per cent. of nitrogenous matter. The *stomach* of the bullock is cleaned and boiled for *tripe*, which contains 13 per cent. of albumen and 16 of fat. The *heart*, *lungs*, and *pancreas*, which constitute about seven per cent. of the live weight of animals, are as nutritious as lean meat. The *head*, especially of the ox, makes good soup; but it requires long boiling to extract the nutriment. Boiled for eight or nine hours it will yield one-fourth of its weight of gelatine; besides which an ox-cheek will furnish about 4lbs. of good meat. Bones also contain much fat and nitrogenous matter, which they give up when broken small and boiled for many hours. Six pounds of bones are equal to one of meat for nitrogen, and to nearly two pounds of meat for carbon.

Bacon differs from fresh meat in the relatively large amount of fat and small proportion of water. It is an almost universal article of diet among the labouring classes. Seventy-four per cent. of farm-servants use it to the extent of from $\frac{1}{4}$lb. to 2lbs. per adult weekly. Sixty-nine per cent. of the Scotch use it, and 40 per cent. of the Irish. It is perferred to butchers' meat for many reasons—as that it goes further, especially with children, who don't generally like fat; it has more relish; it is easily cooked, and suffers less waste in cooking; besides which it is easily kept, and is always handy. Preference is nearly always given to the English bacon, notwithstanding that it is double the price of American, for the flavour is better, and it does not boil away in cooking. No doubt the inferiority of American bacon

is due to the method of feeding the pigs, for they run wild and eat large quantities of acorns and oily nuts. Good bacon should not lose more than from 10 to 15 per cent. in cooking.

The nutritive value of both green and dried bacon are shown in Table III. and Table IV. Their peculiarity is the large amount of carbonaceous matter they contain as compared with nitrogenous. Calculated as starch, it is as 20 or 24 to 1. Hence it is that it will improve the value of substances rich in nitrogen, as eggs, veal, poultry, beans, and peas.

Poultry and the *white meat* of *rabbits* are not of themselves very nourishing. They contain too much nitrogenous matter and too little fat. In the case of aquatic birds, as the goose and duck, the fat is more abundant; but in contains certain flavouring matters which are not easy of digestion. The darker flesh of game is also somewhat indigestible, and requires management in its culinary treatment.

Fish is not a favourite article of diet with the labouring classes, unless it is salted or smoked, and then it is chiefly used for its flavouring qualities. There is a prejudice that is has no nutritive strength, and it arises, perhaps, from the circumstance that it does not easily satisfy hunger, and is quickly digested, but the inhabitants of our coasts use it largely as food.

The nutritive value of the white varieties of fish, as *whiting*, *cod*, *haddock*, *sole*, *plaice*, *flounder*, and *turbot*, are shown in the Tables No. 3 and No. 4, and it will be remarked that they contain only about 22 per cent. of solid matter—18 of which is nitrogenous. They want butter, therefore, to increase their nutritive value.

Mackerel, *eels*, and *salmon*, are, however, richer in fat, for the former contains about 7 per cent. and the latter 6, while the oily matter of eels amounts to nearly 14 per cent. The same is the case with the *sprat*, the *herring*, and the *pilchard*, and with most of our fresh-water fish.

All fish are in their best condition at the time of the ripening of the milt and roe, for not only are they fatter at that time, but when cooked they have a better flavour, and the flesh is solid and opaque. On the other hand, when they are out of condition the flesh is semi-gelatinous and watery.

Shell-fish of all descriptions have nearly the same nutritive values. They contain about 13 parts of solid matter in the hundred, and this has the composition of white fish. Their digestibility varies—*mussels*, *limpets*, and *whelks* being rather hard of digestion, while, *scallops*, *cockles*, *periwinkles*, *lobsters*, and *crabs* are, perhaps, a little more easily digested, and *oysters* still more so. None of them are suited for delicate stomachs, although the poorer inhabitants on the coast eat them freely; and vinyard snail on the Continent, and even *slugs* in China, have a reputation for delicacy and nutritive power.

Eggs contain about 26 per cent. of solid matter, 14 of which is nitrogenous, and 10½ carbonaceous or fatty. The *yolk* is the part which contains the fat, for it there amounts to 31 per cent., while the *white* of the egg, which is entirely free from fat, is the richest in nitrogen —the albumen amounting to 20·4 per cent. Altogether, however, eggs are very deficient of carbonaceous matter, for, calculated as starch, it is only in the proportion of 1·75. to one of nitrogenous. Hence it is that eggs consort well with oil in salads, with fat bacon, and with all kinds of farinaceous matters in puddings.

Fat of some descriptions, as *butter*, *lard*, *suet*, or *dripping*, is universally consumed. In many cases it exists in sufficient quantity in the food, as in bacon and fat meat, but when this is not the case, it is invariably supplied from some other source. 99 per cent. of farm labourers use fat of some sort—butter or dripping, to the extent of 5½ ozs. weekly per adult. It is difficult to say how much is really required by the human system, but looking at the proportion in milk, it would seem to be not less than 28 per cent. of the dry solid food. The fats in common use contain about 80 per cent. of real fatty matter, the rest being water and salt, and although butter is the fat ordinarily purchased, yet dripping is equally valuable, and so also are the vegetable fats of the tropics. *Cocoa* and *chocolate* owe their chief value as foods to the fat they contain. Cocoa is composed of 50 per cent. of solid fat, called cocoa butter, and chocolate is a sweet preparation of it.

Of liquid articles of diet, *beer* and *porter* stand first in nutritive value. They contain about 9 per cent. of solid matter, 8¾ of which are sugar and gum. Their nutritive power is not, therefore, great; and yet, according to Liebig, whenever beer and porter are not used, there is always a larger consumption of bread.

The nutritive functions of *tea* and *coffee* are hardly understood; for although they are largely used, and as if by an instinctive craving, yet their actual nourishing power is insignificant. I shall deal further with this subject hereafter.

The last constituent of food that we have to consider is saline matter. Broadly, it may be stated that we require *phosphates* and *sulphates* of *potash*, *lime* and *magnesia*, and that we also want a still larger porportion of *common salt*. In most cases the phosphates and sulphates are in sufficient quantity in ordinary foods; in fact, Mr. Lawes found in his experiments on the fattening of animals that for every single part of saline matter retained in the system of the pig, there were from 14 to 15 parts in the food; not that the whole of this was lost, for probably it performed important functions in the processes of assimilation and secretion. Common salt, however, is not present in the food to any large extent, and therefore it must be added to it.

And now, before leaving this part of the subject, let us pause to consider the vast machinery which is in operation for the supply of food to this metropolis. At the present time over three millions of people have to be fed daily; and yet so regular is the supply, that no one considers even the possibility of its failing. On the other hand, there is no redundancy; and not only does this supply regularly reach the metropolis, but it is distributed to our very doors. About 4,200 tons of fish; over 4,000 sheep; nearly 700 oxen; about 90 calves; 4,000 pigs, including bacon and hams; not less than 5,000 fowls, and other kinds of poultry; besides a million or so of oysters; and eggs innumerable, with flour enough to make nearly a million quartern loaves; and vegetables, butter, and beer in proportion, are daily brought to this city. "Imagine," as Archbishop Whateley says, "a Head Commissioner entrusted with the office of furnishing all these things regularly to the people. How would he succeed?" And yet all this goes on with the regularity and precision of a machine —without Government or even municipal interference, but simply through the magical power and unfettered action of free-trade.

The lecture was profusely illustrated with specimens of foods from the collection in the Economic Museum of Mr. Twining, who kindly lent them for the occasion.

Fine Arts.

A French View of the Royal Academy Exhibition.—A correspondent of the *Moniteur des Arts*, of Paris, notices the exhibition in Trafalgar-square in the following severe terms:—"It has been this year, as it always is, the most deplorable thing in the world, as regards organisation and arrangement; if French artists could visit it, the sight of those pictures heaped together without logic or taste, from floor to ceiling, in a series of small, ill-lighted rooms, would cure them for ever of ineffective criticism respecting the Palais de l'Industrie in the Champs Elysées, which is a perfect museum in comparison with the hole in Trafalgar-square, to say nothing of the egotism of the English academicians. According to the precept that 'charity begins at home,' their first care is to secure for themselves the best places.

After them the Deluge! As to foreign artists, they are banished to the background, pushed into dark corners where the eye of a visitor scarcely ever falls upon their works. The artist world of London still echoes the scandal which occurred two years ago, when an admirable landscape by Daubigny was placed up in the roof. A simple act of courtesy on the part of the committee is so extraordinary, that the fact of pictures by Leys and Edouard Frère being placed in the first line, or rather within reach of the eye—for the first row of pictures here touch the floor—was talked of for two good months." After enumerating a few of the works in the exhibition, the writer proceeds to say:—"One thing that struck me forcibly was, the decay of landscape and portrait painting. Landscape especially seems to be languishing in complete disfavour. It is nearly thirty years since a landscape painter was elected a member of the Royal Academy, and, judging by the hanging of landscapes, the committee feels nothing but contempt for them. As to portrait painting, how can English artists cultivate it with success? The life-sized drawing of the figure is not the object of special instruction as it is in France. There are no ateliers, and consequently no emulation. The academic courses include little more than the elements necessary for cabinet pictures; thus large canvasses are almost unknown in England, where artists confine themselves generally to a third the size of life. The removal of the Academy to Burlington-house, which, it is said, will take place shortly, is looked forward to with impatience; the exhibition will then have a less confined and more hospitable theatre, but when changing its mansion will the Academy abandon its littlenesses and its partizanship?"

Manufactures.

Flax Crop in the Netherlands. — The report of the Committee of the Netherlands Society for Promoting the Cultivation of Flax says:—"The committee at one time was in hopes of being able to give about the growing flax-crop equally as favourable a report as they could issue about all other outstanding crops. This hope has, however, been disappointed, as the excessive and continued drought during the months of May and June has proved prejudicial to the young plant, and to the late sown in particular. The breadth sown by our growers for their own account is hardly equal to that of last year; and, although a few landowners grew flax to sell in its green state, it may be concluded that the high price for corn, madder, and beetroot, has once more acted against the sowing of flax. The straw ripened sooner than last year, nevertheless it is not possible as yet to give a reliable report of the quality of the seed; at the same time it may fairly be expected that the well-grown flax will produce good seed, as the flowering season passed off regularly. In those districts which suffered from insects the result is doubtful. As to length, our new flax leaves much to be wished for, and as the reports from the various growing districts are not very satisfactory, it may be assumed that our this year's crop will not come up to an average one. In summing up, it appears to us that, with the exception of some parts, the early-sown flax, or say three-fourths of the quantity sown in our country, will produce an average crop, as it was strong enough to resist the continued and excessive drought. The prices paid for green flax range from £450 to £750 per bunder, being about equal to £15 or £25 per imperial acre. It will be some time before it can be ascertained whether the late rains have improved part of the late sown; the seed, at all events, has certainly been benefited by them. Pulling is now general, and being very early, the new flax will sooner than usual be ready for steeping."

Wages of Women in Paris.—The Chamber of Commerce of Paris have instituted an inquiry into the employment of females in that city, and the following are said to be results:—There are in Paris 106,310 ouvrières. They may be divided into four principal classes; those who earn from 3s. 9d. to 8s. per day, of whom there are 770; those who earn from 1s. 10d. to 2s. 6d. per day, of whom there are 39,000; those who earn 1s. 8d. a day, who are said to number 49,000; and, lastly, 17,000 who earn between 5d. and 1s. per diem. The average will thus be about 1s. 8d. per day, from which, however, deduction must be made for Sundays and fête days, and also for dead seasons, which amount, according to general calculation, to nearly a third of the whole year. The result arrived at is that, taking the whole year round, the average earning of a Parisian workwoman is about 11d. per diem.

Commerce.

Rolling Stock on the French Railways.—Th rolling stock of the six principal railway companies, who possess upwards of 13,000 kils. of railways in France, is composed of 110,400 vehicles (locomotives, carriages, waggons, &c.), and is as follows:—

Companies.	Locomotives.	Carriages.	Waggons.
Paris, Lyons, and Mediterrannean	1,262	2,108	35,659
Chemin de fer du Nord	549	1,032	13,123
Chemin de fer de l'Est	762	1,962	16,316
Chemin de fer de l'Ouest ..	514	1,770	10,160
Chemin de fer d'Orleans....	690	1,945	12,299
Chemin de fer du Midi.	287	878	9,092

Silk Trade between France and Italy.—The following are the exports and imports of silk between France and Italy, for the first four months of the present year, as compared with those during the similar period in 1867:—

Exports to France.

	1868.		1867.
	Kils.	Frs.	Frs.
Grains (eggs)........	3,000	232,500	153,000
Cocoons	15,600	322,608	285,000
Raw silk............	51,200	3,456,000	2,953,200
Spun silk	288,900	27,445,500	23,235,800
Floss silk	379,800	6,972,175	3,362,500

Exports to Italy.

	1868.		1867.
	Kils.	Frs.	Frs.
Printed foulards	5,560	422,560	720,450
Plain stuffs..........	22,365	3,064,005	6,773,316
Worked stuffs	1,950	286,650	563,732
Mixed stuffs	6,750	567,000	1,151,970
Tulle	2,782	347,750	296,000
Trimmings, with gold	457	134,815	246,210
Ditto, in silk	542	73,170	115,290
Ditto, mixed	2,892	202,440	468,220
Ribbons	2,961	334,593	682,784

Correspondence.

Memorial Tablets.—Sir,—On looking at the last *Journal of the Society of Arts*, with which I am supplied as a member of the Society, I observed in p. 621, under the heading of "Memorial Tablets of Great Men and Events," one matter which, I think, needs some little correction. It is said that "Marquis Wellesley, soldier and statesman, lived and died in Listowel-house, Kensington, which stood upon the site of the present Ennis-

more-gardens." Having resided in this vicinity very nearly 57 years, *i.e.*, from my birth, I have, of course, considerable recollection of the locality, and I think the following is correct:—The Marquis lived and died in the Earl of Listowel's house (which I believe has been known as "Kingston-house") in the Kensington-road, in the parish of St. Margaret's, Westminster, and lying between Knightsbridge and Kensington-gore. This house is still standing, in front of Hyde-park, between Ennismore-gardens, on the one side, and Prince's-terrace and Prince's-gardens, in the Exhibition-road, on the other. Ennismore-gardens stands on the ground which was formerly attached to Lord Listowel's house, in which the Marquis Wellesley lived and died, and I suppose this may probably account for the little inaccuracy.—I am, &c., John Blore, architect.

223, Brompton-road, S.W., 20th July, 1868.

The Electric Telegraph Post Bill.—Sir,—Not one of the chief facts which were brought before the Society and the Chambers of Commerce in Union with it, in support of this Bill, was disproved before the select committee of the Commons. The leading principles propounded were recognised, and they have now been sanctioned by a full committee of the whole house, after hearing the objections raised by railway directors, and raised truly, that the whole measure went against what they called their industries, and the bill has been passed there. Looking at it as a precedent for future legislation, Mr. Leveson Gower, a director of the Bodmin railway, and a voter, on the railway commission, against interference with the companies, declared that its importance could not be over-rated. He was alarmed at the precedent it would set for the purchase of the Irish railways. He deprecated it as the inauguration of a new and large policy. Mr. Robert Phillips, another opponent, said that it should be brought before the constituencies at the hustings. Undoubtedly I concur in the suggestion, provided it be brought before them in a proper manner, and by parties who have no other than the public interests in view. I could not at first perceive the grounds of the opposition of some of the larger wholesale houses to the principles of a small parcel post, and of the cheap electric telegraph post; but I am informed, that whilst the measure would enable the retail dealers in country towns and rural places to save stocks, by telegraphing for articles as they want them, it would oblige the wholesale houses to keep more stocks, to go to additional expense for warehouse-room, and put them out of their present comfortable paces, without additional profit—that they can see. I hope their apprehensions, as to a fair remuneration, may not be well founded. But it marks a progress of opinion, that all the impassioned vaticinations of the representatives of the railway interests now failed to produce any impression on the house; they did not dare to provoke a division on the principle of the measure, and the great precedent has been deliberately sanctioned. The chief opposition raised to the measure was on financial points, on which I wish to make some observations. Mr. Göschen questioned Mr. Scudamore's estimates of the probable future of telegraphic returns. If, however, there were to be no improvement whatever in the use of the telegraph, it was demonstrated that the public or the Government was in reality giving three-and-a-half per cent. for a return of five; but all the evidence proves a steady advance of the telegraph receipts at the existing charges, set down, in the case of the International Company, at the rate of ten per cent. Unless it is to be assumed that the existing commercial depression is to be permanent, there is every reason to calculate upon the increase, even of that company's revenue, as progressive. With the increase at the rate of ten per cent., was Mr. Göschen's proposal equitable to base the compensation on a three years' average, instead of the net results progressively attained? He argued that future inventions would depreciate the value of the purchase. On the contrary, it is fair to anticipate that they will augment it. The tendency is to reduce the capital employed, or not to increase it, but to cheapen the working. To give one practical instance. If there be an increase of traffic along a line, the usual way of meeting it is to put down an additional wire, which costs ten pounds a mile and ten shillings per annum for maintenance. But by a new invention of Sir Charles Wheatstone's one wire may be made to do the work of six, at a cost one-fourth less than the cost of maintenance. The tendency of improvements must be to cheapen the work, or else why should they be adopted? and these improvements would always be available to the public. It is true that new companies might adopt them too, but it is a truth, not yet it would seem perceived, that any new company must have separate establishments, offices and staffs to pay for, and therefore cannot successfully compete with the government which has them paid for already. Mr. Gower preferred that the companies should by agreement try and do the work by an amicable arrangement with the post office;—an amicable arrangement to go on with separate establishments, in some cases three sets of establishments, from the same place to the same place! Mr. Göschen, in proof of the high price to be given for the works, cited the fact that the telegraphic works of France had cost only £900,000, and here we were going to pay several millions for telegraphic works. Just so, as I have previously stated; this is the penalty the public will have to pay for the commercial ignorance and incapacity of its representatives, in having permitted immense duplicate and triplicate expensive establishments to be constructed which the government of France with proper foresight prevented. The economic question is, in reality, less what the Government shall give, than how much it shall take out of the gains derivable from consolidation, and from the utilization of its own establishment, by taking up for the public the business of the trading companies. The International Company for one may justly say, "Whilst you (the Government) have hitherto been indolent and apathetic on the subject, we have worked up a good-paying and increasing business, with a large reserve fund; and now Mr. Göschen wants to take from us this business, yielding at present ten per cent., for sixteen years' purchase, at which, from anything in the market, we cannot replace our present income. He treats twenty years' purchase, or a selling value of 207, as being too high for this secure and improving income, which we do not want to sell;"—and the fact is there has been little of the stock in the market to sell. "But for how much less can we get even an unimproving income of the same amount. Will it be fair, by a practically compulsory sale, thus to augment your gains at our expense?" Mr. Childers proposed to refer the whole question of compensation to arbitration; but he must be young in public administration not to be aware how uniformly and heavily arbitrations are given against the public. In this very department the railway companies have got for the conveyance of mails double the price at which they were and are actually conveyed by coach. On the whole, looking at the practice in such cases, more would be lost than could be gained by delay. Besides one important point of administrative principle, to which I shall beg to draw distinct attention, for its practical application, I repeat, we have now a legislative sanction to the precedent for railway reform, *i.e.*, of the principle of unity of management, under public responsibility, of the means of intercommunication, and for sharing the gains thence derivable between the public and the shareholder. In railway administration it is to be borne in mind that the proved gains derivable are upwards of twenty per cent. on the net income. Shall not that gain be achieved for the shareholders as well as for the public? The government may there get five per cent. for three and a-half. Shall it not be got as in the case of the telegraphs? The early consideration of the sequestions, in the first instance for Ireland, is opened by the great electric telegraph measure.—I am, &c., Edwin Chadwick.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb. *Delivered on 11th July*, 1868.

151. Bill—Titles to Land Consolidation (Scotland) (amended).
211. ,, Municipal Elections (Scotland) (amended).
213. ,, Registration (Ireland).
220. ,, Liquidation.
224. ,, Tain Provisional Order Confirmation.
257. (I.) Customs (Landing Department)—Minutes, &c.
340. Coinage—Account.
357. Poor Rate (Scotland)—Return.
377. Ordnance—Report.
386. Army (Prize Money)—Account.
Trades Unions and other Associations—Ninth Report.
Public Petitions—Thirtieth Report.

Delivered on 13th July, 1868.

226. Bill—General Police and Improvement (Scotland) Act Amendment (amended).
227. ,, Danube Works Loan.
229. ,, Drainage and Improvement of Lands (Ireland) Supplemental (No. 3).
98. (IV.) Civil Services Estimates—Corrected Pages.
366. Military Savings Banks—Account.
383. Friendly Societies (Scotland)—Report.
405. Railways (Ireland)—Return.
Public Health—Tenth Report of the Medical Officer of the Privy Council.

Delivered on 14th July, 1868.

363. Education (Ireland)—Return.
365. Cape of Good Hope Mails—Correspondence and Contract.
389. Merchant Shipping—Account.
404. Curragh of Kildare Bill—Report.
419. Civil Services—Supplementary Estimate.

Delivered on 15th July, 1868.

228. Bill—St. Mary Somerset's Church, London.
230. ,, Sir Robert Napier's Annuity.
231. ,, Poor Law Board Provisional Order Confirmation.
234. ,, Admiralty Suits.
370. Burials in Churchyards (Ireland)—Return.
373. (I). War Office (Control Department)—Further Correspondence.
385. Chamber of London—Annual Accounts.
394. Navy Estimates—Memoranda.

Session 1867.

500. East India (European and Native Troops)—Return.

Delivered on 16th July, 1868.

232. Bill—Compulsory Church Rates Abolition (as amended by the Lords).
233. ,, Artisans' and Labourers' Dwellings (as amended by the Lords).
235. ,, Drainage and Improvement of Lands (Ireland) Supplemental (No. 4).
236. ,, Colonial Shipping.
392. Grand Jury Presentments (Ireland)—Report.
396. Army (Non-purchase Corps)—Instructions.
422. Marriages (South Australia)—Act, &c.
428. War Office (Audit Department)—Letter.
Manufactures, Commerce, &c.—Reports from Her Majesty's Secretaries of Embassy and Legation (No. 4, 1868).
Colonial Possessions—Statistical Abstract (1852 to 1866)—Fourth Number.

Delivered on 17th July, 1868.

237. Bill—Railway Companies.
238. ,, Sale of Poisons and Pharmacy Act Amendment (amended).
379. Ecclesiastical Commission (Ireland)—Annual Report.
354. Bank Holidays Bill—Report and Evidence.
410. Abyssinian Expedition—Return.
415. East India Irrigation Company—Return.
Technical and Primary Education—Circulars, together with their replies.

Delivered on 18th July, 1868.

239. Bill—Electric Telegraphs (amended by the Select Committee).
240. ,, Hudson's Bay Company.
241. ,, Expiring Laws Continuance.
242. ,, Woods and Game Assessment.
351. Superior Courts of Common Law, &c.—Return.
401. Special and Common Juries—Report of the Select Committee.
409. Kitchen and Refreshment Rooms (House of Commons)—Report from Select Committee.
414. Penang Mails—Correspondence.
435. Electric Telegraphs Bill—Special Report.
Foreign Statistics—Part XI. Statistical Tables.
Public Petitions—Thirty-first Report.

Patents.

From Commissioners of Patents' Journal, July 17.

GRANTS OF PROVISIONAL PROTECTION.

Ammonia, extrication and condensation of—2067—I. Baggs and F. Braby.
Billiards, &c., marking board for—2114—F. A. Pavey.
Boilers—1942—T. H. P. Dennis.
Boilers—2075—J. Morris.
Boilers—2080—J. Wardman and J. and F. Baldwin.
Boilers—2091—G. Bower.
Boilers, furnaces, &c. 2089—F. J. Drechsler.
Bottles, manufacturing—779—W. Langwell and H. Spring.
Brick making machinery—2073—H. Large.
Cartridges—1834—R. Woinar.
Engines and pumps—1334 C. B. and J. Hardick.
Engines, &c., replacing on the line of rails—2069—J. Bowker and J. Ivers.
Fabrics, &c., bleaching—2085—C. E. Brooman.
Fabrics, &c., drying—2081—W. Baxter, D. Waring, & J. S. Wooller.
Fire-arms, &c., breech-loading—2077—W. C. Stiff.
Fire-arms, &c., breech-loading—2096—A. M. Clark.
Flax, &c., preparing—2120—A. M. Clark.
Fuel economizer and feed-water heater—2138—R. Needham.
Iron and steel—1696—J. J. Harrop and W. Corbett.
Liquid and gas meters—2132 J. A. Muller.
Liquid meters—2084—A. V. Newton.
Locomotive engines—2128—J. and G. M. Ward.
Looms—2082—R. Shaw and J. Clayton.
Manure, spreading—1863—S. Wilkerson.
Metal castings—1849—A. Prince.
Metals, smelting, by the use of hydrocarbonaceous fluids and superheated steam—2065—P. R. Hodge.
Motive-power—1878—J. Bourne.
Naphtha, burning the vapour of—2088—W. R. Lake.
Naphtha, &c., apparatus for the combustion of—2090—G. Glover.
Paper pulp, manufacturing—2126—J. H. Johnson.
Parkesine, treating—741—J. Lewthwaite.
Printing materials—2108—L. Francis.
Railway breaks—2102—W. Brookes.
Saccharine and saline solutions, treating—2134—A. Fryer.
Saltpetre, &c., manufacturing—2112—J. E. Poynter and T. L. Patterson.
Sewing machines, stands for—2093—J. Blomfield.
Shawls, &c.—2087—C. E. Brooman.
Ships' signals, &c.—1768—F. N. Gisborne.
Shoes for horses, &c.—2122—J. H. Johnson.
Tape measures, &c., cases for holding and winding—2074—G. H. Wilson.
Thrashing machines—2118—D. Fender.
Thread-polishing machines—2071—G. McCulloch.
Tickets, numbering and printing consecutively—2094—M. Bebro, O. Hopwood, and W. Elam.
Tobacco, twisting—2100—T. Ward and W. S. Black.
Toys, automaton—2130—W. E. Newton.
Velocipedes or vessels, marine—1990—A. J. B. P. Thierry.
Watches, &c.—2086—G. H. Wilson.
Warps, &c., sizing and drying—1306—J. H. Bolton.
Winches and cranes—2035—S. Owens and T. Patterson.

INVENTION WITH COMPLETE SPECIFICATION FILED.

Railway carriages—2211—W. R. Lake.

PATENTS SEALED.

176. E. Dorsett.
212. W. J. Coleman.
216. W. Davis.
251. W. J. Jennings.
280. W. E. Newton.
284. J. Roberts and J. Morgan.
367. W. R. Lake.
394. W. E. Newton.
444. W. B. Adams.
465. A. Brin.
494. W. R. Lake.
609. J. Macintosh and W. Boggett.
1276. T. A. Warrington.
1343. C. Brown.
1552. S. B. Boulton.
1613. W. Allday.
1622. W. Manwaring.

From Commissioners of Patents' Journal, July 21.

PATENTS SEALED.

21. A. Cox.
70. M. Walker & G. H. Money.
228. S. Bennett.
235. T. Cook.
238. D. Y. Stewart.
239. H. Hodge.
240. G. Kirk and W. Murray.
241. J. C. Sanders.
246. G. Allibon and A. Manbré.
252. J. and D. Storer.
254. E. W. De Rusett and R. F. Dale.
258. K. J. Winslow.
263. C. Kilburn.
265. C. Ritchie.
268. E. J. W. Parnacott.
270. A. McDougall.
288. H. A. Bonneville.
289. W. A. Gibbs.
301. J. H. Johnson.
302. J. D. Brunton.
346. J. Frame.
303. W. H. Richardson and W. Beardmore.
352. H. Aitken.
356. J. Jameson.
383. P. Graham.
391. F. Ardiche.
439. W. B. Marston.
441. N. C. Szerelmey.
459. C. and L. Verhulst.
481. J. G. Willans.
515. L. Mummenhoff.
537. J. and J. Thompson.
557. J. G. Jones.
587. W. Wilson.
965. H. Bessemer.
967. H. Bessemer.
1058. J. G. Jones.
1095. H. Bessemer.
1365. A. Clark.
1482. C. J. Chubb.
1511. H. N. Penrice.
1559. J. W. Chamberlain.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1894. W. La Penotière.
2128. N. C. Szerelmey.
1882. D. Caddick.
1880. W. Tranter.
1893. R. C. Bristol.
2152. J. Bowden.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

1777. B. Browne.
1821. W. and P. H. Savory.
1825. J. H. Johnson.
1818. P. Shaw.

Journal of the Society of Arts.

FRIDAY, JULY 31, 1868.

Announcements by the Council.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

"On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture II., delivered Monday, January 27.

Comparative Digestibility of Foods—Functions of Different Foods.

The phenomena of digestion are altogether of a physical and chemical nature; there is nothing whatever of a vital quality about them; for the comminuted food is brought successively under the influence of special solvents furnished by the saliva, the gastric juice, the pancreatic fluid, the biliary secretion, and the intestinal mucus; all of which are associated with a large volume of water. Digestion, indeed, as Berzelius remarked, is a true process of rinsing—the amount of fluid secreted into the alimentary canal, and again absorbed from it, being, according to the researches of Bernard, Bidder, and Schmidt, not less than three gallons in the twenty-four hours. The following, in fact, are the daily proportions of the several secretions and their solid constituents :—

——	lbs.	Solid Matter.	Active Principles.
		grs.	grs.
Saliva	3·54	231	37 of ptyalin.
Gastric juice	14·11	2,960	316 of pepsin.
Pancreatic fluid ..	8·82	6,172	773 of pancreatin.
Bile	3·54	1,233	1,073 { of organic ferment.
Intestinal mucus ..	0·47	46	28 of ditto.
Total	30·48	10,642	2,227 { of special solvents.

All of which, by their special solutive actions on the several constituents of food, rob it of its nutritive quality, and carry it into the circulation.

Each of the fluids, so largely secreted into the alimentary canal, has its special functions.

The *saliva*, which is a secretion from many glands opening into the mouth, is a thin glairy liquid, of slight alkaline reaction, except while fasting; and containing about 1 per cent. of solid matter—half of which is a peculiar organic body, called *ptyalin*, and the rest is composed of chloride and phosphate of sodium, with a little carbonate and sulphocyanide. Ptyalin is a nitrogeneous substance, of the nature of diastase—the ferment, which in the vegetable converts starch into sugar, and hence it has been called *animal diastase* by Mialhe, who attaches great importance to it as the principal agent concerned in the digestion of starchy foods—one part of ptyalin, according to him, being capable of converting 8,000 parts of insoluble starch into soluble glucose. Saliva has no chemical action on fat, or fibrin, or albuminous bodies—its real functions being to lubricate the food for deglutition, to carry oxygen into the stomach, and to furnish a solvent for starch and tender cellulose. Those animals which feed chiefly on woody matters, as the beaver, have large salivary glands, and provision is made for a prolonged contact of the secretion with the vegetable tissue.

An artificial saliva may be obtained from seeds which have fermented, and in which the diastase is abundant. *Liebig's Extract of Malt* is an example of this; and Mr. Morson has taken advantage of the discovery of M. Mège Mouriès, that the inner layer of bran contains a nitrogenous digestive principle called *cerealin*, of the nature of diastase, and has extracted it, and consolidated it with sugar, in a preparation which he has named *saccharated wheat phosphates.* Both of these are aids to the digestion of farinaceous matters.

Gastric juice is a secretion from the entire surface of the stomach. It is a transparent liquid, of a pale yellow colour, and of a saline and acid taste. It is much heavier than water (sp. gr. about 1,020), and it contains from 2 to 3 per cent. of solid matter—about 1·7 of which is a remarkable nitrogenous organic body, called by Schwann, its discoverer, *pepsin*. Its peculiarity is, that in the presence of an acid, it converts almost every description of albuminous and fibrinous matter into a soluble form of albumen, called by Lehmann, *peptone*, and by Mialhe *albuminose*. It differs from common albumen in many particulars—it is, for example, more liquid; it is not coagulated by heat, nor by weak spirit, nor by acids, nor by most mineral salts; it is not very prone to decomposition; and it is capable of *dialysis*, that is, of transudation through animal membrane, and, therefore, of absorption, which albumen is not. The digestive power of it is very great, for Wasmann found that an acid liquid containing only one part of it in 60,000 of the solution—that is, about one grain in a gallon, was capable of dissolving meat; and Lehmann ascertained that 100 parts of the gastric juice of a dog would digest 5 parts of coagulated albumen.

The nature of the free acid in gastric juice is somewhat doubtful; Lehmann, who has frequently examined it, says it is lactic acid, but Schwann asserts that he has often found free hydrochloric acid. It may be that the chlorides contained in the stomach are partially decomposed by lactic acid, especially during the process of analysis, and thus the hydrochloric acid may be accounted for. When the acid is in too large excess, the digestive action is abnormal, and so also when it is deficient; Lehmann states that the best proportion is when 100 parts of the gastric juice is just neutralised with 1·27 of potash.

Considering the importance of pepsin as a digestive agent, the preparation of it has become a common affair of trade. In France it is obtained from the stomach of the pig by carefully washing it, then scraping off the soft mucus membrane, rubbing it down with a little water, filtering, precipitating the foreign matters with acetate of lead, again filtering, and then precipitating the excess of lead with sulphuretted hydrogen, after

which it is allowed to stand, or it is warmed, to get rid of excess of sulphuretted hydrogen; it is then filtered once more, and after carefully evaporating to the consistence of syrup it is consolidated with dry starch. In this country it is prepared from the stomach of the sheep as well as of the pig, and we have our *pepsina ovis* and *pepsina porci;* besides which, the use of lead and sulphuretted hydrogen are avoided by precipitating the foreign matter with alcohol,—pepsin being soluble in weak spirit. On the lecture-table are specimens of Boudault's pepsin, as well as those of Mr. Morson, of London, Messrs. Turner and Co., and Mr. Claridge, of Warwick, all of which are also in operation, showing their relative digestive powers on animal fibrin.

The pepsin preparations on the table contain varying proportions of starch, as from 20 to 50 per cent.; but the digestive power of any specimen may be easily tested by putting a dose of the preparation into a small bottle with half an ounce of water, acidulating with 20 drops of hydrochloric acid, and then adding half a drachm of hard boiled egg chopped small, or the same weight of lean meat, or 120 grains of the fibrin of blood. On standing in a warm place at a temperature of from 100 to 110°, the digestion should be complete in two hours. Tried in this manner, Dr. Pavy found, some time ago, that nearly all the preparations in common use were inert; not so, however, at the present time, for, as you will notice, digestion is proceeding rapidly.

I am told that the strongest pepsin is obtained from young healthy pigs which are kept hungry, and are then excited by savoury food which they are not allowed to eat while the influence of it is strong upon them, and the secretions are pouring out in expectation of the meal, the animals are pithed.

Pepsin, like diastase, is rendered inert by a temperature of from 120 to 130° Fah.; and, therefore, very hot drinks after a meal are hurtful.

Pancreatic fluid is a secretion from the pancreas or sweet-bread. Until recently its true digestive functions were not well determined. It is a colourless fluid of a gravity of 1,008 or 1,009. Like the saliva, it is generally a little alkaline, and it contains about 1·3 per cent. of solid matter, one-eighth of which is a nitrogenous organic substance of the nature of ptyalin or diastase, and is called *pancreatin.*

More than twenty years ago, Bernard proved, what Valentin had long before suspected, that the pancreatic fluid was concerned in the digestion of fatty matters; but he fell into error in supposing that its action was to saponify the fat, and to set glycerin free. Here is a specimen of glycerin and of lead-soap obtained from fat upon which the pancreatic fluid had previously acted, showing that saponification had not been effected. The true action of the pancreatic secretion is evidently to break up the large granules, and crystals and globules of oil and fat, into myriads of minute particles of from 1-3,000th to 1-15,000th of an inch in diameter. In this way the fat is emulsified and converted into a milky liquid, which mixes freely with water, and passes through the tissues of the intestines into the lacteals. We are indebted for this knowledge to Dr. Dobell, who had long been of opinion that the functions of the pancreas were important in certain diseases, and required elucidation. With the assistance of Mr. Julius Schweitzer, of Brighton, the then manager of the laboratory of Messrs. Savory and Moore, he made a large series of investigations into the properties of the pancreatic secretion, and he found that when the fresh pancreas (and best of the pig) is rubbed down in a mortar with twice its weight of hog's lard, it rapidly emulsifies it; and on adding about four or five times the bulk of water, and straining through muslin, there is obtained a thick milky liquid, of the consistence of cream, which gradually consolidates. If this be treated with ether, the pancreatised fat dissolves; and when the ether is separated by distillation, there remains the purified pancreatised fat, which is still miscible with water; in fact, when mixed with four or five parts of water it forms the creamy emulsion which is used dietetically and medicinally in doses of a teaspoonful at a time.

The properties of the pancreatic fluid have been well described by Dr. Dobell, in a paper recently read before the Royal Society of London; and it would seem that the fluid has not only the remarkable property of emulsifying oil and fat, and so rendering them capable of absorption, but it has also the power of dissolving starch by converting it into glucose. In this respect its action is like that of saliva, but it is much more energetic; for in its fresh state, one part of the pancreas will dissolve eight parts of starch, and even after it has emulsified fat it will dissolve two parts of starch. It is, therefore, a powerful agent of digestion, in so far as fat, and starch, and young cellulose are concerned, but it has little or no action on albuminous substances.

I am indebted to Dr. Dobell and to Mr. Morson for the specimens of *pancreatin* and *pancreatized* fat upon the table. The first of these preparations is obtained by treating the fresh pancreas with water, and carefully evaporating the solution to the consistence of syrup, and then consolidating it with the flour of malt. Perhaps the dried pancreas, powdered and mixed with malt, would be a stronger preparation.

The *Bile* is a complex liquid, consisting of biliary acids (*taurocholic*, *glycocolic*, &c.) in combination with soda. Its reaction is slightly alkaline, and it contains about 14 per cent. of solid matter, not less than 12 of which are organic.

The true function of the bile is unknown; perhaps it aids in neutralizing the acid peptones from the stomach; perhaps, also, in emulsifying fat; and it may be that it helps the digestion of starchy foods. Lehmann thinks it is a rich residuum from the manufacture of blood globules in the liver, and that it is secreted into the alimentary canal, only to be reabsorbed into the blood. Mr. Lee, also, is of opinion, from his examination of the fœtal liver, that it separates a highly nutritious substance from the portal blood, which is elaborated in the intestines. Its functions, however, are manifestly obscure.

Lastly, the *intestinal secretion* which is thrown out along the whole course of the small intestines, is, according to the researches of Bidder and Schmidt, a powerful agent of digestion; for it combines the activity and digestive power of all the other secretions—starch, fat, and albuminous substances being all equally well digested by it.

The food, therefore, coming into contact with these special solvents, and being copiously drenched with fluid, gives up its nutritive constituents. Admirable, however, as this provision is for the digestion of food, a considerable portion of useful matter passes through the bowel unchanged; for cellulose, starch globules, and muscular fibre are common constituents of sewage. Dr. Lyon Playfair says that in the case of an adult man, with good digestion, 1-12th of the nitrogen of the food passes away with the excreta, and others have computed it at an 8th. In a dry state the fæces of man contain about 6·5 per cent. of nitrogen, and in the fresh state, 1·7. In Ranke's experiments, it was ascertained that the nitrogen in the fæces was to that in the urine as 1 to 12·5. Much of this is, doubtless, derived from the secretions which have done the work of digestion, and have thus become effete; indeed, Dr. Marcet is of opinion that the alvine discharges are chiefly composed of the residuum of albuminous substances which have been secreted into the bowel for the purposes of digestion. In ordinary individuals they amount to from 4 oz. to 5·5 oz. a-day—(Wehsurg says 4·6 oz.; Liebig, 5·5 oz.; Lawes, 4·2 for a middle-aged adult, and 6·2 for a person over 50—the mean amount for adult males being 4·2 oz., and for adult females 1·3 oz.); and when calculated in a dry state they amount to about 1·1 oz. daily. It would seem, however, that when indigestible and irritating food is used, the quantity of fæcal matter is increased, as if the food was hurried through the intestines without under-

going digestion. At the Wakefield Prison, for example, it was found that when brown bread, containing bran, was given to the prisoners, the weight of the fæces was 7 oz. per head daily; and the same fact has been observed at the Coldbath-fields Prison.

With this general account of the digestive function of the different secretions discharged into the alimentary canal, we are prepared to inquire into the digestibility of different alimentary substances.

Nitrogenous or *proteinaceous*, or *albuminous substances*, which constitute the leading articles of diet, are evidently digested by the gastric juice and the intestinal mucus. In the former case they are converted into acid peptones, of which, according to Lehmann, there are several varieties, as *albumino-peptones*, *fribrino-peptones*, *caseino-peptones*, *gelatino-peptones*, &c., according as they are derived from albumen, fibrin, casein, gelatin, &c., and of these substances the fluid form of albumen is most easily converted; then coagulated albumen; then fibrin; then casein; and, lastly, the derivatives of albumen, gelatin, chondrin and cartilage. The tegumentary forms of albumen, as hair, wool, feathers, &c., being entirely indigestible. Here is an example of the indigestibility of hair—it is a ball of it, obtained from the alimentary canal of a cow, and has come from the calf which the cow has a habit of licking. Serpents and other animals that swallow their prey entire, digest the soft tissues and bones, but they disgorge the hair and feathers untouched.

It is difficult to speak of the comparative digestibility of different nitrogenous foods; for the well-known experiments of Dr. Beaumont on the Canadian with a fistulous opening in the stomach, and even experiments made in bottles with pepsin, do not represent the full and natural conditions of the process: at the present time there are, no doubt, great differences in the digestibility of different animal substances. Dr. Beaumont found, in his inquiries, that soused pigs' feet and soused tripe were the most digestible of all foods, and that boiled tendon of meat was the least digestible. The following, in fact, are the times given by him for the chymification of different animal foods:—

Articles of diet.	How cooked.	Time of chymification. H.	M.
Pigs' feet (soused)	Boiled	1	0
Tripe (soused)	Do.	1	0
Eggs (whipped)	Raw	1	30
Salmon trout	Boiled	1	30
Venison steak	Broiled	1	30
Brains	Boiled	1	45
Ox liver	Broiled	2	0
Codfish (cured dry)	Boiled	2	0
Eggs	Roasted	2	15
Turkey	Boiled	2	25
Gelatine	Do.	2	30
Goose	Roasted	2	30
Pig (sucking)	Do.	2	30
Lamb	Broiled	2	30
Chicken	Fricasseed	2	45
Beef	Boiled	2	45
Do.	Roasted	3	0
Mutton	Boiled	3	0
Do.	Roasted	3	15
Oysters	Stewed	3	30
Cheese	Raw	3	30
Eggs	Hard boiled	3	30
Do.	Fried	3	30
Beef	Do.	4	0
Fowls	Boiled	4	0
Do.	Roasted	4	0
Ducks	Do.	4	0
Cartilage	Boiled	4	15
Pork	Roasted	5	15
Tendon	Boiled	5	30

It is doubtful, indeed, if cheese or tendons are ever digested except in small quantity; and it is evident, from these experiments, as I shall hereafter explain, that cooking has considerable influence on the digestibility of food.

It is a curious problem why the stomach does not digest itself, seeing that it belongs to the class of most easily digestible substances, as tripe. Hunter explained it by referring the protective power to the vital force, for when dead the stomach digests itself in common with the food contained in it; but Bernard's and Pavy's experiments have proved that this is not the right explanation, for if the legs of living frogs, or the ears of living rabbits, are introduced into the stomach of a dog through a fistulous opening in the side, they digest like other proteinaceous substances. Liebig supposed that the protective power was in the thick mucus which lined the stomach, but Pavy denuded a part of the inner walls of a dog's stomach, and found that the tissue did not digest, but, on the contrary, quickly healed, and he is of opinion that the protective power is in the alkaline condition of the blood, which circulates so freely through the capillaries vessels of the stomach during digestion.

Starchy substances and *cellulose* are digested by the ptyalin of the saliva, and the pancreatin of the pancreatic fluid, as also by the animal diastase of intestinal mucus. The solution is effected by the conversion of the starch and cellulose into a low form of sugar, called *glucose*, which is freely absorbed into the circulation, or becomes changed into lactic acid, that serves so important a function in the digestion of nitrogenous matter. The time necessary for the digestion of different vegetable substances, as determined by Dr. Beaumont, is as follows:—

Articles of diet.	How prepared.	Time of chymification. H.	M.
Rice	Boiled	1	0
Apples (sweet and mellow)	Raw	1	30
Sago	Boiled	1	45
Tapioca	Do.	2	0
Barley	Do.	2	0
Apples (sour and mellow)	Raw	2	0
Cabbage with vinegar	Do.	2	0
Beans	Boiled	2	30
Sponge cake	Baked	2	30
Parsnips	Boiled	2	30
Potatoes	Roasted	2	30
Do.	Baked	2	33
Apple dumpling	Boiled	3	0
Indian corn cake	Baked	3	0
Do. do. bread	Do.	3	15
Carrot	Boiled	3	15
Wheaten bread	Baked	3	30
Potatoes	Boiled	3	30
Turnips	Do.	3	30
Beets	Do.	3	45
Cabbage	Do.	4	0

It would be seen from this that the time of digestion is in proportion to the amount of cellulose or woody tissue in the food. No doubt there is a more complete solution of these matters in the small intestines, where the pancreatic fluid and intestinal mucus, aided by the alkaline condition of the fluids, exert the greatest actions on them, but it is very doubtful whether hard cellulose and woody matter are at all digested by man. Even in the case of the pig, whose digestive powers are singularly active, it is thought by Messrs. Lawes and Gilbert, from their experiments on the fattening of animals, that there is little or no digestion of these substances; and, under any circumstances, a very prolonged contact with the secretion is necessary for their digestion. Raw starch will pass

considerable distance along the alimentary canal of man without much change, and it is only towards the end of the small intestines that the starch granules undergo marked disintegration. Those animals which feed entirely on vegetables have always a contrivance for keeping the food for a long time in contact with the secretions. It occurs as the paunch in ruminants, the crop in birds, the large cœcum in rabbits and other rodentia, and as the long alimentary canal of all of them; but even then a large portion of the vegetable tissue passes through the bowels unchanged. Cooking, grinding, and otherwise disintegrating the tissue helps considerably in the digestion of it.

Gum and *pectin* are probably not digested at all, for as they are unchanged by contact with the secretions, and are incapable of dialysis or absorption, they must pass through the alimentary canal without serving any purpose in nutrition.

Fatty matters are digested by the emulsifying action of the pancreatic fluid; and by being thus broken up into extremely minute globules they are freely admitted into the lacteal vessels; in fact, the emulsified globules of fat are seen covering the villi of the intestines, penetrating their tissues, pervading the subjacent cellular bodies, and thus entering the lacteals; and, no doubt, the peristaltic action of the intestines contributes largely to this emulsifying process.

Saline substances are generally soluble in water, and are therefore easily absorbed, but when this is not the case, as with the earthy phosphates, they are attacked by the acid constituents of the gastric juice.

And here I may remark that the great aids to digestion are:—

1st. Proper selection of food, according to the taste and digestive power of the individual.

2nd. Proper treatment of it as regards cooking, flavouring and serving it.

3rd. Proper variations of it, both to its nature and treatment, so that the appetite may not fail.

4th. Exercise, warmth, and a genial disposition.

Functions of food.—Although much attention has been directed to this important subject, viz., the immediate and remote functions of food, yet it must be admitted that the difficulties of the question have not been surmounted, and that we are hardly able to particularise the phenomena which are incidental to its transformations. We can see clearly enough that its ultimate destiny is the manifestation of force—the letting loose of the cosmical agencies which were bound up in it—when, by undergoing oxydation, it returns more or less completely to its original forms—carbonic acid, water, and ammonia; but how and where these changes occur, and what are the subsidiary phenomena, and concurrent functions, besides those of common motion and animal heat, are as yet almost unknown to us. Nor are we sufficiently acquainted with the special attributes of the principal constituents of food, as the albuminous, the fatty, the farinaceous, the saccharine, and the saline; for although the well-known opinions of Liebig, with regard to the dynamic or force-producing functions of the nitrogenous or plastic elements of food, and of the thermotic or respiratory powers of the carbonaceous have been generally received, yet there are abundant reasons for believing that both of these classes of food may perform exactly the same functions in respect of the development of force; and, again, it is more than probable that the nitrogenous, or plastic constituents of food may, like the carbonaceous, be oxydised and consumed in the living body without ever entering into the composition of tissue. In these respects, therefore, there are great points of divergence from the views of Liebig.

Looking, however, at the proximate elements of food, it may, perhaps, best serve our present purpose if we inquire generally into the several functions of water, albuminoid compounds, fatty substances, farinaceous and saccharine matters, and mineral salts.

1st. *Water* is, unquestionably, of great physiological value, for as much as 75 per cent. of the muscular tissue of the animal frame is composed of it; and of the 20 lbs. of blood which an average-sized adult contains in his body, about 15½ lbs. are water. It is computed, also, that not less than 30 lbs. of fluid ebb and flow daily from the blood and alimentary canal by secretion and absorption. Bidder, indeed, estimates that about 28·6 lbs. of chyle and lymph are carried daily by the thoracic duct alone into the circulation—a quantity of fluid that amounts to about one-fifth of the entire weight of the adult human body; and, then, with regard to the excretions, we find that rather more than a pound of water is exhaled daily by the breath, about a pound and three-quarters by the skin, and not less than two pounds and three-quarters by the kidneys, making altogether about five pounds and a-half per adult daily.

These results indicate the importance of water in the functions of the animal body. It serves indeed to dissolve the food and carry it into the circulation; to effect the distribution of it throughout the system; to dissolve effete matters, as the metamorphosed constituents of worn-out tissues, and so convey them out of the body; to establish the chemical activity which is necessary for nutrition and decay; to combine mechanically with the tissues and lubricate them, so that they may perform their functions; and lastly, to evaporate by the air-passages and skin, and thus maintain the proper temperature of the body.

2nd. The second constituents of our food—namely, *albuminous*, *nitrogenous*, or *plastic matters*, were once, and until very recently, thought to have the sole function of constructing and repairing the muscular parts of the body; and having so entered into the composition of tissues, their oxydation and decay were attended with manifestations of force which were the working powers of the animal machine. "We see," says Liebig, "as an immediate effect of the manifestation of mechanical force, that a part of the muscular substance loses its vital properties,—its character of life; that this portion separates from the living part, and loses its capacity for growth and its power of resistance. We find that this change of properties is accompanied by the entrance of a foreign body (oxygen) into the composition of the muscular fibre; and all experience proves, that this conversion of living muscular fibre into compounds destitute of vitality, is accelerated or retarded according to the amount of force employed to produce motion. Nay, it may safely be affirmed, that they are mutually proportional; that a rapid transformation of muscular fibre, or, as it may be called, a rapid change of matter, determines a greater amount of mechanical force; and conversely, that a greater amount of mechanical motion (of mechanical force expended in motion), determines a more rapid change of matter." He further remarks that "the amount of azotized food necessary to restore the equilibrium between waste and supply is directly proportional to the amount of tissue metamorphosed," that "the amount of living matter, which in the body loses the condition of life, is, in equal temperatures, directly proportional to the mechanical effects produced in a given time." That "the amount of tissue metamorphosed in a given time may be measured by the quantity of nitrogen in the urine;" and "that the sum of the mechanical effects produced in two individuals in the same temperature, is proportional to the amount of nitrogen in their urine; whether the mechanical force has been employed in voluntary or involuntary motions; whether it has been consumed by the limbs, or by the heart and other viscera."

These are the generalizations of Liebig, and they go to show, not only that the dynamical action of the animal body depends wholly on the transformation of muscular tissue, and may be measured by the quantity of nitrogen excreted as urea; but also that no oxydation of nitrogenous matter can take place until it has passed from the condition of food to tissue, and has thus be-

come organized. According to this view, the mechanical force of the human machine is derived entirely from its own combustion, and not from the oxydation of matters contained in the food.

For some time past there have been suspicions that this view of the case is not correct; and the doubts of physiologists have been strengthened by the circumstance that great labour might be performed for a short period without the use of a nitrogenous diet; and that while there was always a relation between the quantity of nitrogen in the food and that excreted as urea, there was no such relation between the dynamical actions of the body and the proportions of urea. Moritz Troube, in fact, asserted in 1861, after a careful examination of the subject, that all muscular force was derived from the oxydation of fat and hydrocarbons, and none from the oxydations of tissue. Haidenham, in 1864, arrived at a similar conclusion; and Donders was likewise of opinion that tissue transformation would not account for all the force of the animal body.

The hypothesis of Liebig has been further shaken by the investigations of Dr. Edward Smith, who has shown that the proportions of nitrogen in the urine does not increase with exercise, although the amount of carbonic acid exhaled by the lungs does. But the most convincing proof of the fallacy of the hypothesis was furnished in 1866 by the experiments of Dr. A. Fick, the Professor of Physiology at Zurich, and Dr. J. Wislicenus, the professor of chemistry.

On the 29th of August of that year they prepared themselves for an ascent of the Faulhorn, one of the Bernese Alps, which rises 6,417 feet above the Lake of Brientz. For seventeen hours before the journey, they took nothing in the way of solid food but cakes composed of starch, fat, and sugar; and on the following morning, at half-past five o'clock, they began the ascent, choosing the steepest of the practical paths from the little village of Iseltwald on the Lake of Brientz. At twenty minutes past one in the afternoon their journey was accomplished without fatigue, and from that hour to seven in the evening they remained at rest in the hotel at the top of the mountain. During the whole of that time (a period of thirty-one hours) they took no other food but the non-nitrogenous biscuits; but at seven o'clock they had a plentiful meal of meat, &c.

The urine was collected at three intervals, namely:—

1st. From 6 o'clock, p.m. of the 29th to 5 a.m. of the 30th; and this they called the *night urine.*

2nd. From 5 a.m. of the 30th to 1.20 p.m.; and this they called the *work urine.*

3rd. From 1.20 p.m. to 7 p.m.; and this they called the *after-work urine.*

4th. From 7 p.m. on the 30th, to the morning of the 31st; and this they called the *night urine.*

All these were analysed for nitrogen, and the results were as follows:

	Grains of Nitrogen Secreted by			
	Fick.		Wislicenus.	
1st. Night urine	106·7		103·1	
2nd. Work urine	51·1	88·6	48·3	85·6
3rd. After work urine	37·5		37·3	
4th. Night urine	74·3		82·5	

So that not only were they able to perform the work without a nitrogenous diet, but the quantity of nitrogen excreted was less during the work than before or after. Even calculated at the hourly rate of excretion, it stands thus:—

	Grains of Nitrogen Hourly Excreted.	
	Fick.	Wislicenus.
During 1st night	9·72	9·41
During time of work	6·33	6·02
During rest after work....	6·17	6·17
During 2nd night after work	6·94	7·87

The work which they had performed was estimated thus:—Fick weighed 145·5 lbs. avoirdupois, and Wislicenus 167·5 lbs.; and as they had ascended 6,417·5 feet, it is clear that Fick had raised 933,746 lbs. one foot high (145·5 × 6417·5), and Wislicenus 1,074,931 lbs. 167·5 × 6417·5); so that for an expenditure of muscular tissue, represented in the one case by 88·6 grains of nitrogen, and in the other by 85·6 grains, the foregoing amounts of work had been done. Now, as 1 of nitrogen represents 6·4 of dry muscular tissue, it is evident that Fick had consumed 567 grains of muscle, and Wislicenus 547·8 grains.

At the time of the experiment, the thermotic and mechanical powers of these proportions of flesh were not accurately known, but they have been since determined in a very careful manner by Dr. Frankland, who finds that when pure dry lean of beef, albumen, and urea are completely oxydised in a proper apparatus, they develope the following amounts of heat and mechanical force:—

	Lbs. of water raised 1° Fahr.	Lbs. lifted one foot high.
10 grains of pure dry beef..	13·1	10,083
,, ,, ,, albumen..	12·8	9,878
,, ,, ,, urea	0·6	436

In considering the mechanical power of muscular tissue, it must be remembered that it is never completely oxydised in the animal body, but it is changed into carbonic acid, water, and about one-third of its weight of urea, so that the potential energy of muscle is not so great as in the preceding results. Calculated, indeed, according to the proportions of urea formed, the tissues of Fick and Wislicenus were capable of the following amounts of physiological energy:—

	Fick.	Wislicenus.
Quantity of muscle consumed	567·0 grs.	547·8 grs.
Actual energy if fully burnt	571,706 ft.-lbs.	552,347 ft.-lbs.
Available energy, deducting the urea	563,466 ft.-lbs.	544,386 ft.-lbs.
Work actually done	933,746 ft.-lbs.	1,074,931 ft.-lbs.

So that, in the case of Fick, 370,280 foot-pounds of work and, in the other, 530,545 foot-pounds are unaccounted for. But this is not all, for, besides the mere labour of ascending the mountain, there were the movements of respiration, and the beating of the heart, and other motor actions, to be added to the work actually done.

Now each beat of the heart is estimated as equal to a lift of 4·61lbs. one foot high; and it is considered from Dondor's well-known investigations that the work of an inspiration is nearly the same—namely, 4·54lbs. a foot high. Fick says that during the ascent his pulse beat at the average rate of 120 a minute, and his respirations were 25. The beating of his heart, therefore, during the 5½ hours actually taken in the ascent was equal to 182,556 lbs. lifted a foot high; and the respiration to 37,455 lbs.

If the internal labour, or, as it may be called, the *opus vitale* of Wislicenus was in proportion to his bodily weight, as compared with Fick's—that is, as 7 to 6, then the ascertainable work done, was to the power of the muscle consumed, as follows:—

	Fick.	Wislicenus.
	Ft.-lbs.	Ft.-lbs.
Work of ascending the mountain	933,746	1,074,931
Work of circulation	182,556	212,982
Work of respiration	37,455	43,698
Total ascertainable work	1,153,757	1,331,611
Actual energy of the consumed muscle	563,466	544,386
Energy unaccounted for	590,291	787,225

From which it appears that taking only the three factors of ascertainable work—namely, external labour, circulation and respiration, and disregarding other unascertainable motor actions of the body, which are estimated by many as greater than all the rest, the work actually performed exceeds the energy of the oxydised muscle by more than as much again.

It may be said, and truly, that these experiments of Fick and Wislicenus were of too short a duration to afford an opportunity of ascertaining whether the oxydised muscle was not afterwards excreted; but the recent researches of Dr. Parkes on the elimination of nitrogen by two healthy men (soldiers) in the prime of life, during a period of seventeen days, and under different conditions of diet and exercise, have shown that, although the results are not altogether accordant with those of Fick and Wislicenus—yet the conclusions are certainly born out, that a non-nitrogenous diet will sustain the body during exercise for a short time, and that exercise produces no notable increase in the nitrogen of the urine. On the contrary, the amount of urea is actually less during work than at a period of rest; and he thinks that the muscle, instead of oxydising, and, therefore, losing its substance during labour, actually appropriates nitrogen and grows —its exhaustion being dependent, not so much on its decay, as on the accumulation of the oxydised products of hydro-carbon, as lactic acid, &c., in its tissue, which require rest and time for their removal. That some decay of the muscle takes place there can be no doubt; for, as Dr. Parkes observes, "although it is certain that very severe exercise can be performed on non-nitrogenous diet for a short time, yet it does not follow that nitrogen is unnecessary. The largest experience shows, not only that nitrogen must be supplied, if work is to be done, but that the amount must augment with the work. For a short period the well-fed body possesses sufficient nitrogen to permit muscular exertion to go on for some time without a fresh supply; but the destruction of nitrogenous tissues in these two men is shown by the way in which, when nitrogen was again supplied, a large amount was retained in the body to compensate for previous deprivation." It would seem, too, from the great exhaustion of the men on the second day of a non-nitrogenous diet, that their muscles and nerves were becoming structurally impaired, and that if the experiments had been continued for a third day there would have been a large diminution in the amount of work. The work which they actually performed on a non-nitrogenous diet of starch and butter, in the form of biscuits and arrowroot, was walking exercise of 23·76 miles the first day, and 32·78 the second. The first day's work occupied, with intervals of rest, about ten hours and three-quarters, and it was done without fatigue; but the second day's work took twelve hours, and the last thirteen miles were accomplished with great fatigue. Calculated according to Haughton's formula (that walking upon a level surface is equal to lifting 1-20th of the weight of the body through the distance walked), the labour in the two days was, for—

——	S. Weighing with clothes 162·4 lbs.	T. Weighing with clothes 124·2 lbs.
The first day........	1,018,676 ft.-lbs.	779,062 ft.-lbs.
The second day	1,405,397 „	1,074,817 „
Total work	2,424,073 „	1,853,879 „
Total nitrogen excreted	529·16 grains.	492·46 grains.
Equal to muscle oxydized	3,386·92 „	3,151·74 „
The energy of which (minus urea) is ..	3,267,361 ft.-lbs.	3,040,483 ft.-lbs.

The amount of nitrogen excreted during the time of actual exercise was only about half the above; and, calculated in this way, it would only account for about two-thirds of the labour-force. The results, therefore, prove that although the basis for the calculations of Fick and Wislicenus was too narrow for accurate deductions, yet the mechanical force of the oxydised muscle is not sufficient to account for external and internal work; and the conclusion is that, in the above experiments, the motive power of the muscles was not derived from their own oxydation of non-nitrogenous matters.

The researches of Dr. Edward Smith throw additional light on the subject, for he ascertained that the amount of carbonic acid exhaled by the lungs was in proportion to the actual work performed.

During sleep it was at the rate of ..	293	grs.	per hour.
When lying down and approaching sleep	355	„	„
In a sitting posture	491	„	„
When walking two miles an hour .	1,088	„	„
When walking three miles an hour	1,552	„	„
And when working at the treadmill	2,926	„	„

It is highly probable, therefore, that the largest amount of muscular force is derived from the hydro-carbons of our food; not that the nitrogenous matters of it may not also be a source of power; but there is no necessity, as Liebig supposes, for their being previously constructed into tissue. The experiments of Mr. Savory, in fact, show that rats can live and be in health for weeks on a purely nitrogenous diet, and it is nearly certain that under these circumstances the nitrogenous matters are mostly oxydised without entering into the composition of tissue. This, as I have said, is the main point of divergence from the hypothesis of Liebig; and it is further indicated by the fact that the amount of nitrogen excreted is not in proportion to the work done, but to the quantity of it in the food, even when there is no muscular exertion.

That the chief functions of nitrogenous matters is to repair tissue, there can be no doubt, for animals kept on a purely carbonaceous diet quickly lose weight, and at last die from a disintegration of tissue; but it is equally certain that the nitrogenous constituents of food have other offices to perform. A daily diet of 2lbs. of bread contains enough nitrogen to supply the mechanical wants of the system, but it will not maintain life. There is required an addition of animal food to render it sufficient for this purpose; and indeed the instincts and habits of the human race show, beyond all question, that a comparatively rich nitrogenous diet is necessary for the proper sustenance of life; and it is very probable that it assists the assimilation of the hydrocarbons. In this way it may help in the development of force without itself contributing directly to it; and this may serve to explain the fact, that there is a relation between the amount of nitrogen contained in the food and the labour value of it. Carnivorous animals are not only stronger

and more capable of prolonged exertion than herbivorous, but they are also fiercer in their disposition, as if force were superabundant. The bears of India and America, says Playfair, which feed on acorns, are mild and tractable, while those of the polar regions, which consume flesh, are savage and untamable; and taking instances of people—the Peruvians whom Pizarro found in the country at its conquest, were mild and inoffensive in their habits, and they subsisted chiefly on vegetable food; whilst their brethren in Mexico, when found by Cortes, were a warlike and fierce race, and they fed for the most part on animal diet. The miners of Chili, who work like horses, also feed like them, for Darwin tells us that their common food consists of bread, beans, and roasted grain. The Hindoo navvies also who were employed in making the tunnel of the Bhore Ghat Railway, and who had very laborious work to perform, found it impossible to sustain their health on a vegetable diet, and being left at liberty by their caste to eat as they pleased, they took the common food of the English navigators, and were then able to work as vigorously. Abundant examples of this description—some of which will be further discussed as we proceed, may be cited in proof of the direct relation of plastic food to mechanical work; but there is no proof that this material must first form tissue before its dynamical power can be elicited.

It is, however, a remarkable fact that all forms of nitrogenous food have not the same nutritive value; the glutinous matters of barley and wheat, though almost identical in chemical composition, have very different sustaining powers. It is the same with muscular flesh and artificially prepared fibrin and gelatine. Magendie found that dogs fed solely, for 120 days, on raw meat from sheep's heads, preserved their health and vigour during the whole of the time; but more than three times the amount of isolated fibrin, with the addition of much gelatine and albumen, were insufficient to preserve life.

We may conclude, therefore, that although the main functions of nitrogenous matters are to construct and repair tissue, yet they have manifestly other duties to perform of an assimilative, a respiratory, and force-producing quality which are far from being understood. What do we know, indeed, of the actual *modus operandi* of the nitrogenous ferments—ptyalin, pepsin, pancreatin, &c., which are secreted so abundantly into the alimentary canal; or of the conjugate nitrogenous compounds which are present in the bile? and how far have we advanced in interpreting the functions of the nitrogenous constituents of tea, coffee, maté, guarana, cocoa, &c., which the instincts of mankind in every part of the globe have evidently chosen for some physiological purpose? The same may be said of the crystalline nitrogenous matters of soup—as creatin, creatinin, inosic acid, &c., which can hardly be regarded as foods, although they have powerful sustaining properties. But enough of this for the present; and before leaving this part of the subject, I would direct attention to the fact, that nitrogenous matters when oxydised in the animal body never yield up the whole of their potential energy, for, by being converted into urea, which is the chief product of their decay, there is at least a seventh part of their power lost in the secretion. It may be that this is a necessity arising out of the circumstance that if they were completely oxydised in the animal body and converted into carbonic acid, water, and nitrogen, the last-named gas would be unable to quit the system, because of its insolubility in the animal fluids.

(*To be continued.*)

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—Bradford Mechanics' Institute.—The acquisition of 1,000 yards of land at Bowling-green, for the erection of a new building for the Mechanics' Institute, being now an accomplished fact, the directors draw attention to the circumstance that thirty-six years ago the Institute began its career in rented rooms, and with funds not exceeding £100. From that time the Institute has continued to grow, and its success "has been its extremity." The present building has long been inadequate to meet its wants, and, encouraged by liberal offers from several quarters, the directors have entered on a scheme involving an expenditure of £25,000,—£12,500 for land, and £12,000 for the proposed new building. The directors state that "taking the most liberal estimates of the resources which will arise from the sale of the present building, and the appropriation of certain portions of the new erections so as to yield a profitable return, a sum of not less than £12,000 must be raised by the friends of popular education in Bradford;" and they think that if scope be given to its operations, "this healthy and vigorous Institution will rise to the rank of a people's college for Bradford, worthy of the town, and ready to do its part in the advanced education upon which, happily, the nation has now set its heart."

EXAMINATION PAPERS, 1868.

(*Continued from page* 623.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

GEOMETRY.

THREE HOURS ALLOWED.

1. Show how to bisect a given rectilineal angle. How would you do this graphically?

2. If from a point within a triangle straight lines be drawn to the extremities of the base, the sum of these lines shall be less than the sum of the sides of the triangle, but they shall include a greater angle.

3. Parallelograms upon the same base, and between the same parallels, are equal to one another.

4. Describe a parallelogram that shall be equal to a given rectilineal figure, and have an angle equal to a given rectilineal angle. Does not this include the last proposition of Euclid, book ii.? Explain fully.

5. If a straight line be divided into two equal and also into two unequal parts, the squares of the two unequal parts are together equal to twice the square of half the line, and twice the square of the line between the points of section.

6. From a given point draw a straight line to touch a given circle.

7. Upon a given straight line describe a segment of a circle which shall contain an angle equal to a given rectilineal angle.

8. Show how to describe an equiangular and equilateral pentagon in a given circle.

9. If the sides of two triangles, about each of their angles, be proportionals, the triangles shall be equiangular.

10. If four straight lines be proportionals, the rectangle contained by the means is equal to the rectangle contained by the extremes.

11. The rectangle contained by the diagonals of a quadrilateral figure inscribed in a circle is equal to both the rectangles contained by the opposite sides.

12. Every solid angle is contained by plane angles, which together are less than four right angles.

Problems.

1. If the area of a square and a triangle be equal, the perimeter of the triangle will be greater than the perimeter of the square. Prove this. Generalise this proposition.

2. Given an angle, the side opposite to it, and the difference of the other two sides of a triangle; construct the triangle geometrically.

3. If from the three angles of a triangle lines are drawn to the middle points of the opposite sides, prove that these lines meet in a point, and show that the sum of the

squares of the lines from the common point of concourse to the angles of the triangle is equal to one-third of the sum of the squares of the sides of the triangle.

4. If from any point in a circular arc perpendiculars be drawn upon the bounding radii, the distance of their feet is a fixed quantity.

5. If two circles intersect, their common chord will bisect the common tangent of the two circles. Prove this. What analogous proposition can be established with respect to two circles which do not intersect?

6. Two circles (1) and (2) touch one another, and another circle (3) is described which touches both and includes them, having its centre in the line which passes through the centres of (1) and (2). Let a common tangent be drawn to (1) and (2), find the relation between the radii of circles which are drawn to touch (1) (3) and the tangent, and to touch (2) (3) and the tangent.

7. Of all polygons having equal perimeters and the same number of sides, the equilateral polygon has the greatest area.

8. With a given radius, describe a circle which shall touch two given circles. Show when the problem is impossible, when there is only one such circle, and when there will be two such circles.

9. Show geometrically that the rectangle contained between two straight lines is a mean proportional between their squares.

10. Two equal circles are drawn intersecting in A and B; a third circle is drawn with centre A, and radius less than A B, cutting the former circles in D and C; show that B, D, C are in the same straight line.

MENSURATION.

THREE HOURS ALLOWED.

1. The area of a triangle is 39 ft. 117·45 in., and its altitude 7·75 ft.; find the base.

2. Find by duodecimals the area of a triangle, the sides of which are 4 ft. 3 in., 5 ft. 8 in., and 7 ft. 1 in.

3. How much paper, $\frac{3}{4}$ths of a yard wide, will be required to paper a room which is 19 ft. 11 in. long, 14 ft. 7 in. wide, and 11 ft. 3 in. high? And how much will it cost at $2\frac{1}{4}$d. a yard?

4 Find the side of a square which costs £33 16s. $10\frac{1}{2}$d. paving at 10d. a yard.

5. A wall measures 100 ft. 10 in. in length, and 15 ft. 7·2 in. in height, and is $4\frac{1}{2}$ bricks thick;—how many rods of brickwork does it contain?

6. The diameter of a circular window is 3 ft. 7 in.; what will be the cost of glazing it at 1s. 6d. a foot?

7. Prove that the area of a circle $= \frac{1}{2}$ circumference $\times$ radius. What ratio does the circumference of a circle bear to its diameter?

8. The paving of a semicircular court, at 3s. 4d. a yard, costs £115 10s.; find the length of the circular part.

9. An iron cylindrical bar is 2 yards long and 6 inches in circumference; find its volume and weight; the weight of a cubic foot of the iron being 7,500 ounces.

10. Find the surface of a right cone, the base of which is 3 inches in diameter and the height 4 inches.

11. Find the volume of a pyramid when its base is a triangle.

12. Given the areas of the two ends of a frustum of a pyramid and its height, find the solid content.

13. Given that the volume of a cone is equal to one-third of the cylinder with the same base and height, prove that the volume of a sphere is two-thirds of the circumscribing cylinder.

TRIGONOMETRY.

THREE HOURS ALLOWED.

1. Find sec. A when $\frac{1 + \cos. 2A}{1 - \sin. 2A} = \tan. A$.

2. What is the ratio between 1° 25′ English and 1° 25′ French?

3. Investigate formulas for the sums and differences of the sines and cosines of two angles.

4. Find A when

(1.) $\text{Cos. } A - \cos. 2A = \sin. 3A$.
(2.) $\text{Cos. } A + \cos. (120 + A) + \cos. (120 - A) = 0$.
(3.) $\text{Sin. } 7A - \sin. A = \sin. 3A$.

5. Given the ratios of the sines of the angles of a triangle, find the angles.

6. The elevation of a tower on a horizontal plane is observed; on approaching a feet nearer, the elevation is 45°, and b feet nearer still, it is the complement of the first angle; show that the height is $\frac{ab}{a-b}$

7. A B C D is a quadrilateral inscribed in a circle; $\angle DAC = \alpha$, $\angle CAB = \beta$, $\angle DBA = \gamma$; $AB = c$, then $CD = \frac{c \sin. \alpha}{\sin. (\alpha+\beta+\gamma)}$

8. Solve the equation,

$$2 + \cot.^2 x = 3 \sec.^4 x - \tan.^2 x.$$

9. Find the radius of the circle which passes through the vertex A of the triangle A B C, and touches the base B C at its bisection D.

10. If A, B, C, be the angles of a triangle A B C, show that $\cos. \frac{1}{2}A + \cos. \frac{1}{2}B$ is greater than $\cos. \frac{1}{2}C$.

11. If the sides of a triangle be $a+b$, $a+c$, and $b+c$, its area $= \sqrt{(a+b+c)\,abc}$.

12. If a triangle be formed of the perpendiculars A D, B E, and C F, from the angles A, B, C, of the triangle A B C on the opposite sides, and if A_1 B_1 C_1 be the angles of the new triangle, A_1 being opposite A D.

$$2(a \cos. A_1 + b \cos. B_1 + c \cos. C_1) = \frac{bc}{a} + \frac{ac}{b} + \frac{ab}{c},$$

a, b, c, being the sides of the original triangle.

13. If a degree of longitude at the equator be 69 miles, what will be the length of a degree in latitude 60°?

14. The sides and angles of the polar triangle are respectively the supplements of the angles and sides of the original triangle.

15. Prove the formulas:—

(1.) $\text{Cos. } c = \cos. a. \cos. b + \sin. a. \sin. b. \cos. C$.
(2.) $\text{Cos. } a. \sin. b = \cos. b. \cos. c + \cos. A. \sin. C$.

16. Prove the theorems:—

$\text{Cos. } \frac{1}{2} c. \cos \frac{1}{2}(A + B) = \cos \frac{1}{2}(a + b) \sin. \frac{1}{2} C$.
$\text{Sin } \frac{1}{2} c. \cos. \frac{1}{2}(A - B) = \sin. \frac{1}{2}(a + b) \sin. \frac{1}{2}$

CONIC SECTIONS.

THREE HOURS ALLOWED.

Section I.—Geometrical Conics.

1. What is a Cone? Show that an ellipse, a parabola, and a hyperbola may be each projected into a circle. What lines will be projected into diameters of the circle perpendicular to each other?

2. Define a tangent. Show that in a parabola the sub-tangent is equal to twice the abscissa, whether the axes are rectangular or not.

3. Prove that the perpendicular from the focus on the tangent of a parabola intersects the tangent in the line that touches the curve at the vertex. Hence show that $SZ^2 = SP \times SA$.

4. If two chords of a parabola intersect one another the rectangles contained by these segments are as the parameters of the diameters which bisect the chords. What is the corresponding theorem in the ellipse?

5. Define an ellipse, and draw a tangent to it from any point on the curve.

6. Prove the following properties of an ellipse:—

(1) $CN \times CT = CA^2$
(2) $SP \times S'P = CD^2$

7. If QV is any ordinate to the diameter PCP′ of an ellipse, and CD is conjugate to CP, then

$$QV^2 : PV \times VP' :: CD^2 : CP^2$$

8. Prove that the difference of the focal radii of a point on the hyperbola is equal to the transverse diameter.

9. If through any two points P and P′ of a hyperbola a line is drawn intersecting the asymptotes in Q and Q′ prove that $PQ = P'Q'$. What form does this theorem take when QQ' is a tangent?

10. Define the circle of curvature and chord of curvature. What is the value of the chord of curvature passing through the focus in the parabola?

Section II.—Analytical Conics.

11. Find the equation to the line passing through (a, b) and perpendicular to $bx + ay - ab = 0$.

12. Determine the condition that three given points should be on the same straight line.

13. Find the equation to the system of circles which pass through two given points, and show analytically that the centres all lie in the straight line bisecting at right angles the line joining the two given points.

14. What is the equation of the tangent of the ellipse? and prove that that at the extremity of the latus rectum intersects the axis in the point of intersection with the directrix?

15. Prove analytically the theorems contained in 2, 3, 6, 8, 9 of the preceding section.

16. What is a locus? Prove that the locus of the point of intersection of a tangent to a rectangular hyperbola with the perpendicular on it from the centre is the curve whose equation is $r^2 = a^2 \cos. 2\,\theta$.

17. Show that the equation to the ellipse may be put under the form $x^2 + y^2 = c^2$.

(*To be continued.*)

Fine Arts.

The Sculpture Galleries of the Louvre.—Those who visit Paris this autumn will find a great change in the lower floor of the museum of the Louvre. The portion of the building known as the apartments of Anne of Austria, which have for many years been devoted to Grecian and Roman sculptures, have been completely restored and embellished, and are now approached through a fine gallery in the new Louvre, in which is a curious collection of statues and busts of Roman Emperors, principally from the Campana museum, and some other interesting antiques. Between the two galleries is a smaller one, in which a large number of specimens of sculpture, of the Roman and old French schools, are now seen to great advantage, and they possess much interest, not only in an artistic, but also in a historical point of view. The second gallery referred to is that in which the fine electrotype reproductions of Trajan's Column were recently to be seen. They have been removed, and we are not aware whether they are now exhibited. On the upper floor, the small room, which formerly contained the charming collection of engraved and jewelled crystal and other cups and ornaments now seen to great advantage in the noble Galerie d'Apollon, has been devoted to eight frescoes, by Luini, or of some artist of his school, which were purchased in Italy a short time since. Scarcely a month passes without some marked improvement in the Louvre. The galleries devoted to French art have been greatly increased during the last two years, and they will be still further extended next year, by the removal of the Salle des Etats to that part of the great gallery which joins the Tuileries.

Decoration of Railway Stations in France.—The directors of the Lyons and Mediterranean Railway have set an admirable example to other administrators of railways. They have commissioned M. Despléchins, who is also engaged on the decoration of the new Opera-house of Paris, to paint for their station four pictures, nine mètres long by five mètres in height, representing the four great towns on the line, namely, Paris, Montpellier, Marseilles, and Geneva. The large walls of many railway-stations offer a fine field for decorative painting, and it is somewhat strange that the opportunity has not been taken advantage of before.

Statue to Palissy the Potter.—A statue of Bernard Palissy has been executed for the town of Saintes, his birth-place, by M. Taluer, and the inauguration is announced to take place on the second of the coming month of August.

Statue of the Late Painter Ingres.—Out of the large number of models sent in for this competition, the Academy of the Beaux Arts of Paris has not judged any one deserving of the first prize, which would carry with it the right to execute the work, but it has awarded the second prize, of 1,000 francs, to M. Maillet; and the third, 600 francs, to MM. Falgniere, sculptor, and Boitte, architect, for their joint production.

Manufactures.

Manufacture of Paper in Italy.—The paper manufacture, which at one time was so flourishing in Italy, has, by the introduction of machinery, and the reduction in the export of rags, been to some extent superseded by foreign manufacturers. The following are the imports and exports of rags from 1862 to 1865:—

Years.	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Quintals.	Francs.	Quintals.	Francs.
1862....	10,864	217,000	85,865	1,717,000
1863....	17,895	358,000	103,787	2,076,000
1864....	12,592	253,000	71,983	1,440,000
1865....	12,205	243,000	78,814	1,576,000
Average	13,389	268,000	85,112	1,702,000

The following shows the actual state of the paper trade at the present time:—

Provinces.	Manufacturers.	Workmen.	Rags consumed.	Products Obtained.		
				Reams.	Quintals.	Value.
			quintals.			
Piedmont and Liguria	180	3,000	95,000	...	72,200	7,000,000
Lombardy	90	2,000	70,000	650,000	...	4,500,000
Venetia	50	850	20,000	...	15,000	1,400,000
Parma	7	140	2,500	40,000	...	180,000
Modena	16	200	2,034	1,700	1,413	1,490,000
Romagna, Umbria, & Marches	60	1,250	17,500	15,000	11,600	1,670,000
Tuscany	71	1,200	40,000	...	30,000	1,800,000
Neapolitan Provinces	62	...	120,000	...	80,000	10,000,000
Totals	536	8,640	367,034	706,700	210,213	28,040,000

Of the 180 manufacturers in the former kingdom of Sardinia, 106 are situated on the coast in the Ligurian provinces. These manufacturers employ about 3,000 persons, and consume 95,000 quintals of rags, and produce annually 72,200 quintals of paper of every quality. Besides the production of 15,000 quintals hand-made paper, of the value of 1,600,000frs., for which there is a great demand, as being of excellent quality for making cigarettes, there are 70 small paper-mills in the province of Genoa, producing 11,000 quintals of paper for packing. There are also three manufacturers of machine-made paper, which consume 10,040 quintals of rags, and produce 7,800 quintals of paper. One of the

most important paper-mills is that at Serravalle-Sesia, in the province of Novara; this establishment employs more than 250 workmen. There are two large paper-making machines and 15 water wheels; the production of paper is 35,000 quintals, and 45,000 quintals of rags are annually consumed at this establishment. Sienna, Lucca, and Pistoja are the principal seats of the paper manufacture in Tuscany. The paper mills of Signor Cini, at San Marcello, are, perhaps, the most important. There are two large paper machines of English make; the paper made is of endless lengths, and 1·20 metre in width (48 inches). The average yearly production is estimated at 7,000 packages of white paper, valued at 800,000frs. (£36,000). In the district of Lucca there are 57 paper-mills, with 115 vats and 126 machines, employing 950 workmen. The production is estimated at 27,085 quintals of paper of every kind, valued at 1,445,800frs., and the consumption of rags is estimated at 35,265 quintals; 12,000 quintals of paper from this province are exported to the East and America. The paper manufacture forms an important branch of industry in the Neapolitan provinces, and the water-courses of the Leri and Fibreno in the territory of Sora, Arpino, and Isola, the Rapido al St. Elia and Cassino, and the Melfe, at Atina, offer considerable advantages for the establishment of paper-mills. The hand paper-mills at Amalfi, Majuri, Vietri, and Atripalda, are also advantageously situated as regards water supply. In the nine principal establishments in the province of Sora there are 20 machines for making continuous paper. The production amounts to 50,000 quintals, for the value of 6,250,000frs. The other 53 are hand paper-mills, with 137 vats, producing upwards of 30,000 quintals of paper, which may be valued at 3,750,000frs. yearly. The consumption of rags for paper-making in the Neapolitan provinces is estimated at 120,000 quintals. Although the production of paper has diminished of late years on account of foreign competition, it still exceeds the home consumption. The average imports of this article are 10,176 quintals for the value of 2,117,000frs., and the exports amount to 21,000 quintals for the value of 4,400,000frs. Since 1862, it will be seen that the imports have gradually diminished, whilst, on the other hand, the exports have increased:—

White and Coloured Paper.

Years.	Imports.		Exports.	
	Quantity.	Value.	Quantity.	Value.
	Quintals.	Francs.	Quintals.	Francs.
1862....	11,571	2,407,000	17,024	3,540,000
1863....	11,534	2,399,000	20,674	4,300,000
1864....	9,907	2,061,000	19,926	4,145,000
1865....	7,691	1,600,000	26,761	5,556,000
Average	10,176	2,117,000	21,096	4,385,000

The same proportion exists between the imports and exports of packing and blotting papers, the average being 1,018 quintals, at the value of 77,000frs.; imports and the exports amount to 11,127 quintals, for the value of 846,000frs. The exports of pasteboards amount to 429 quintals, for the value of 60,000frs.

Commerce.

Havre Maritime Exhibition.—A large public dinner was given in the Cirque International last week, by the exhibitors in Class 7, to afford the general public an opportunity of testing their different products exhibited, served in various ways, and in the best style, by professed cooks. Farinaceous products, breads and biscuits, tapiocas, Patés d'Italie, rices, maizena, Borwick's baking powder, and other articles, proved what excellent supplies could be furnished to mariners. Dried vegetables of all kinds and others preserved fresh, such as asparagus, peas, &c., were found to be excellent. The preserved meats and fish were also of superior quality; the former included the extracts of meat of Coleman and the Australian Meat Company, with kangaroo, furnished by the last-named, which made excellent soups. Dried meats of all kinds, whether smoked, spiced, salted, or simply sun-dried, were found most savoury. Morton, of London, and other exhibitors supplied excellent salmon, herrings, lampreys, tunney, lobsters, mackarel, &c., whilst patés and saucissons aux foie gras, truffles, showed that other delicacies were to be had. Banbury beer, Hay's Scotch whisky, and West India rum were also furnished; whilst of preserved milks, choice cheeses, preserved fruits, and confectionery there was no lack. The chairman of the exhibition, and the various foreign consuls and ship-owners who were present were much pleased with the general arrangements and the quality of the articles submitted to their notice. The "menu" was, perhaps, one of the most remarkable on record, from the great variety and excellence of the dishes, made with apparently unpromising materials, while the receipts were published in full for the benefit of the company. The whole arrangements for organising and carrying out successfully this dinner were made by Messrs. J. M. Johnson and Sons, the London concessionaires for the exhibition.

Colonies.

Farming in New South Wales.—A Sydney paper of the 21st May says:—"In consequence of the continued drought, which is common to all parts of the colony, farming operations are at a complete standstill. From all quarters the news received is of anything but a cheerful nature. The farmers who lost their wheat last year in consequence of the rust, have now to anticipate the failures of their maize through the drought. Every district in the colony seems to be in the same condition. It is said that in some parts the farmers are unable to prepare their land for wheat, and that if rain does not come soon the winter will be a very gloomy one. The land is scorched, the meadows are parched, and the streets dusty, whilst in many parts the nights are cold and frosty. The squatters complain very much of the want of water and of feed for their flocks. Amongst the new expedients to which the squatters are turning thir attention, is that of boiling down horses. Some persons have started in this particular line of business, and it is said to be a very profitable trade. They obtain permission to run in all the wild horses they can find, and having secured them with much labour and difficulty, they remunerate themselves by boiling the animals down. These wild horses are often a great nuisance to the squatters, who are glad to get rid of them on these terms."

Property in the City of Melbourne.—The amount of the assessment on the rateable property within the city boundaries for the present year was £653,984. The total amount of the assessment in the seven preceding years was:—

1867	£613,655
1866	595,265
1865	569,483
1864	550,998
1863	555,708
1862	581,774
1861	652,676

There has been an increase of about 1,500 houses since 1861.

Revenue of South Australia.—In the year 1867, there was a net decrease on the general revenue amounting to £233,480, as compared with that of 1866, the total income of the two years being £716,294 and

£949,774 respectively. In 1865, the general revenue amounted to £1,089,124, and in 1864 it amounted to £775,837, so that the income of the State is dwindling away year by year, rendering our present position, especially viewed in connection with our responsibilities, one of no small concern. A good test of the condition of the community is the amount of money paid into the Custom-house on articles of general consumption. Of course, as population goes on increasing, and the Customs duties remains unchanged, the revenue derived from that source should augment in proportion to the increase in the number of consumers. But instead of an annual increase, there is an annual falling off. In 1867 the Custom-house collected £200,832; in 1866 it was £230,134; and in 1865 it was £240,183. Even in 1864 more money was derived from the Custom-house than in 1867; the large addition to the population over the space of four years failing to yield one shilling of extra revenue as duty on consumable goods. This is a great fact, and one which our readers ought not to ignore nor treat lightly. As regards the sale of Crown-lands, it is less a test of the condition of the great body of the people at any given time than of the amount of available capital in the hands of a section of the community; yet when it is remembered to how great an extent successive Governments have relied upon their territorial revenue, not only for public works and improvements, but also for meeting liabilities arising from the bonded debt, the falling off in this source of revenue is alike significant and ominous. In 1863 the sales of Crown-lands yielded £184,414; in 1864 they yielded £256,672; in 1865 they reached the immense sum of £504,677; in 1866 they realised £331,285; whereas in 1867 they sunk to £171,763. On rents of Crown-lands and assessments there was a deficiency last year of over £50,000, as compared with the returns of the year preceding, and there are other items of minor amount.

SQUATTING IN SOUTH AUSTRALIA.—A South Australian paper says:—"The 'shepherd kings' of a few years ago are tottering on their rustic thrones. The great depreciation in the value of cattle and sheep, and the superadded affliction of a depressed wool market, are telling on the squatocracy, and the troubles of some of them are culminating in a financial collapse. The names of several (and some of whom may be classed amongst the pioneers of the colony) have been upon men's tongues for the past few weeks, and as the last efforts at compromise fail, and the banker becomes finally inexorable, they one by one succumb. When squatters decline, stock and station agents are naturally found to be affected with the same complaint, and hence we hear with regret of houses who have for many years commanded the confidence and esteem of an extensive connexion being brought down in the fall of some of their principals, in whose successes or failures they were too intimately bound up."

Publications Issued.

IDYLLS OF THE KING.—By A. Tennyson (*Moxon and Company*). Chromo-lithographs of nine original drawings, by Gustave Doré, illustrating Tennyson's Poem of "Elaine," have just been issued by this firm. Although called chromo-lithographs, in strictness the term is scarcely applicable to this class of printing. The pictures are reproduced after the manner of chromo-lithographs by a series of stones, but in neutral tint of varied character of light and shade. The original drawings themselves are to be distributed to subscribers by lot, as in the Art Union.

Notes.

PRODUCTION AND CONSUMPTION. — A letter on currency, by Frederick Scheer, quoted in the *Produce Markets Review*, says:—"The progress of civilisation discloses mankind under new and unexpected aspects. Rightly considered, it would appear that all men might produce —and vast numbers do produce—a great deal more than they consume; hence the vast accumulation of property. Mutual assistance, designedly given in private or public enterprises — or, unconsciously, as in large cities or communities, further enlarges the powers of production. Consumption, on the other hand, proceeds on different principles. No individual can, in his own person, consume much more than another. No one can eat more than one dinner, and a few accessory meals in a day nor wear out more than two or three suits of clothes in a year. Beyond that, setting aside waste (not very common in civilised society), expenditure implies the maintenance of others, useless or otherwise, as the case may be. The tendency of civilisation, again, is less towards the useless than the useful maintenance of others. An African petty sovereign will have his thousands of attendants, his harem of five thousand black beauties, his herds of slaves, executioners, and the like, deemed necessary to his regal state. In wasteful expenditure he outstrips the sovereigns of more civilised nations. The wealth and influence of the latter are used for better purposes, and progressively more so. Men of station and rank now lead the way in great and useful enterprises, and devote their time and means to beneficial purposes. They have greater satisfaction, we may suppose, in erecting a bridge, or constructing a railway, than in building a palace. Such is pre-eminently the case in England. Thus we might say, that whilst production leads towards constant extension, consumption diverges in the opposite direction of curtailment. There is another feature of civilisation to be noticed, namely, the vast amount of enterprise promoted by association. These associations have a tendency towards a kind of healthy communism, allowing every man, according to his means, to partake of the profits of every kind of enterprise, and turning the community gradually into a species of mutual aid and general assurance society satisfactory to everyone, and without danger, rather replete with security to the State."

THE MONT CENIS TUNNEL.—During the first fortnight in June the progress made at the Mont Cenis tunnel was as follows:—

	Metres.
Length driven at Bardonnèche end	26·70
,, Modane ,, ...	27·45
	54·15

The position of the works up to 16th June was:—

Advancement at south end	5,045·10
,, north ,, ...	3,453·05
Total length driven to 16th June....	8,498·15
Length remaining to be driven......	3,721·85
Total length of tunnel	12,220·00

Correspondence.

DYNAMITE.—SIR,—Some brilliant experiments have been lately made at the Merstham Quarries, Redhill, with Mr. Nobel's new explosive compound, a modification of nitro-glycerine; but as fine gravel is used as one of the ingredients, it cannot be adopted for fire-arms. White gunpowder possesses all the properties said to belong to dynamite, and can be made at little more than half the cost, besides being admirably adapted for every variety of fire-arm. It is perfectly clean, leaves no deposit, and can be stored and transported with absolute safety. It requires no granulation or any expensive process in its manufacture, a common flour-mill with dresser being all that is required. When fired in the open-air it does not explode, but merely deflagrates, and,

the combustion being imperfect, some small deposit is visible; but when fired in a close chamber the combustion is so perfect that every particle is dissipated, and the barrel remains absolutely clean after any number of shots.—I am, &c., Henry W. Reveley.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 20th July, 1868.

382. Volunteers (Maximum Establishment, &c.)—Returns.
395. Tea, Coffee, &c.—Returns.
420. Malt Tax—Report.
426. Education (Ireland)—Annual Report.
435. (I.) Electric Telegraphs Bill—Minutes of Proceedings.

Public General Acts—Cap. 41 to 57.

Delivered on 21st July, 1868.

241. Bill—Expiring Laws Continuance (corrected copy).
243. „ Election Petitions and Corrupt Practices at Elections (as amended on re-commitment).
246. „ District Church Tithes Act Amendment.
247. „ Saint Mary Somerset's Church, London (as amended by the Select Committee).
421. County Financial Arrangements—Report from the Select Committee.
431. Brazil and River Plate Mails—Contract.
434. Poor Law (Strand Union)—Correspondence.

Delivered on 22nd July, 1868.

248. Bill—Registration (Ireland) (amended).
399. Thames Embankment and Horse Guards-street—Report and Plan.
402. Sale of Liquors on Sunday Bill—Special Report.
413. Vessels—Return.
430. Public Income and Expenditure—Account.
432. Scientific Instruction—Report.

Public General Acts—Cap. 58 to 63.

Delivered on 23rd July, 1868.

245. Bill—Schools and Training Factories (Ireland).
249. „ West Indies Bill—Lords Amendments.
250. „ Marriages Validity (Blakedown).
441. Married Women's Property Bill—Special Report.

Education—Report of the Committee of Council.

Delivered on 24th July, 1868.

251. Bill—Burials (Ireland) (Lords Amendments).
252. „ Bankruptcy Act Amendment (Lords Amendments).
253. „ Ecclesiastical Commissioners (Lords Amendments).
378. Excise and Customs (Ireland)—Return.
412. Army—Return.
418. Naval Prize Money, &c.—Account.
424. Inhabited House Duty (Metropolis)—Return.

0·113. Parochial Assessments—Lords Report (Session 1850).

Delivered on 25th July, 1868.

303. (I.) Metropolitan Foreign Cattle Market Bill—Index to Reports.
344. (A 1.) Poor Rates and Pauperism—Return (A) (May, 1867 and 1868).
422. Wexford Lunatic Asylum—Return.
449. Civil List Pensions—List.

Technical Instruction Commission—Abstract of Evidence.

Delivered on 27th July, 1868.

439. Queen Anne's Bounty Board—Report.
459. Royal Gun Factories—Report and Evidence.

Public Petitions—Thirty-second Report.

Patents.

From Commissioners of Patents' Journal, July 24.

Grants of Provisional Protection.

Aëronautical apparatus—2162—J. Livchak.
Aluminium, producing alloys from—2137—E. H. Newby.
Armour for vessels of war, &c.—2192—G. Davies.
Barometers, &c.—2119—A. M. Clark.
Baths, zincing, construction of—1952—J. H. Johnson.
Boilers, preventing incrustation in—1801—E. P. H. Vaughan.
Boots and shoes—2151—T. J. Mayall.
Boots and shoes, ornamenting—2113—E. J. Scott.
Boots, &c., fastening for—2140—A. M. Clark.
Bottles—2105—C. F. Crailsheim.
Bricks, &c., apparatus for making—2111—J. D. Pinfold.
Bridges—2123—J. H. Johnson.
Bungs or corks—2196—T. King.
Cane juice, &c., treating—2144—A. Fryer.
Cartridges—2009—E. T. Hughes.
Carts—2121—A. F. Robertson.
Chain stoppers, marine—2055—T. Winder.
Coal, crushing and washing—2168—E. Coppée.
Coke furnaces—2152—E. Coppée.
Driving bands, joining—2156—B. P. Walker.
Driving bands, treating—2153—F. Veith.
Dyeing—2148—G. Davies.
Fabric, manufacturing a new—2117—E. Pavy.
Fabrics and yarns, dyeing—2078—W. R. Lake.
File-cutting machines—2200—H. Garside.
Fire-grates and fenders—2158—G. Morton.
Flax, &c., dressing—1979—T. C. Hide.
Fluid meters—2079—S. Hannah.
Furnace grates—2133—J. Head.
Furnaces for calcining ores, &c.—2129—J. B. Brown.
Furnaces, &c.—2115—D. Hall.
Grain, &c., drying—2176—W. Creasy.
Horse collars, &c.—2180—T. Nuttall.
Hot-air engines—2190—J. D. Churchill.
Kilns—2097—W. Daglish.
Liquid meters—2103—W. Brookes.
Liquids, evaporating and condensing—2166—W. Brookes.
Locomotive engines—2145—G. Davies.
Locomotive engines, &c.—2107—A. Alexander.
Looms—2110—W. Dean and R. Andrew.
Metals, shaping—1871—A. M. Clark.
Mills for grinding or mixing colours—2208—G. R. Mather.
Motive-power, economising—2027—D. M. Giacometti.
Motive-power, obtaining and applying—1713—A. M. Clark.
Neck-ties, &c.—2106—A. Taylor.
Pavements, wooden—2186—E. T. Hughes.
Preserves, &c., receptacles for—2131—M. Henry.
Printing or endorsing, apparatus for—2204—G. B. Puricelli.
Railway waggons and trucks—2109—H. H. Henson.
Railways—2210—W. R. Lake.
Railways, communication between guards, passengers, &c., on—2127—G. Bennett and J. Woodcock.
Saddle pads, &c.—2147—J. H. Whitehead.
Sewing machines—2143—P. Jensen.
Ships' compasses—2135—A. Albini.
Slate, &c., apparatus for cutting—2198—J. D. Brunton.
Steam engines—2101—W. Brookes.
Stereotype plates—2150—G. R. Wilson.
Swimming apparatus—2178—J. Mabson.
Syringes—2202—J. N. Willis, jun., and S. Judd, jun.
Tanning matters, refuse, utilising for dyeing purposes—2042—E. Mucklow.
Telegraph cables—2160—T. J. Mayall.
Telegraphic apparatus—1840—M. Theiler.
Thrashing machines—2001—J. Bonnall.
Tickets, &c., apparatus for containing and delivering—2172—M. Bebro.
Tobacco pipes—2125—A. Kane.
Tobacco, twisting—2099—R. Ward.
Toy guns—2083—H. Jewitt.
Water, preventing waste from pipes, &c.—2174—J. Chandler.
Yarn and thread, treating—2194—T. Travis, W. H. Prince, and J. Tomlinson.

Invention with Complete Specification Filed.

Silk, &c., cleaning and finishing—2286—T. Kohn.

Patents Sealed.

261. C. W. Dixon.	374. J. Lewis & R. & E. Alston.
274. A. Middlemist.	440. N. C. Szerelmey.
276. J. J. Hicks.	450. A. M. Clark.
285. W. Tranter.	452. H. Schlotter.
290. W. H. Crispin.	480. H. B. Condy.
298. J. Brown.	490. F. Tolhausen.
311. D. Law and J. Wharrie.	553. W. R. Lake.
315. S. M. Martin & S. A. Varley.	664. W. E. Newton.
333. A. M. Clark.	1090. M. Hawthornthwaite and T. Abbott.
335. E. Fleet.	1162. A. V. Newton.
341. J. Mitchell, jun., and G. T. Graham.	1351. J. Dewar.
345. J. Livesey.	1363. R. Cocker.
354. A. M. Clark.	1628. J. Mitchell.
361. M. A. Wilson.	1736. B. Burton.

From Commissioners of Patents' Journal, July 28.

Patents Sealed.

310. W. Tasker.	426. T. Walker.
318. J. H. Johnson.	475. R. Young.
321. J. Radcliffe.	525. J. Walker.
325. W. Hartnell & S. Guthrie.	665. W. E. Newton.
326. E. T. Mainwaring.	667. J. H. Bass.
327. T. Rowan.	769. A. V. Newton.
340. H. Chapman.	913. J. M. Elre.
343. G. L. Scott.	942. L. Encausse.
344. S. E. Howell.	1309. H. Howse.
348. G. Clarke.	1485. A. C. Henderson.
353. A. Clark & A. Van Winkle.	1535. A. M. Dix.
382. T. Scott and R. Mowat.	1615. G. Price.
384. J. Webster.	1662. C. Barnard.
388. R. D. McKellen.	1761. T. Greenwood.
396. H. Moore and J. Hamilton.	1763. J. R. Hambling.
408. G. F. Bradbury and T. Chadwick.	1947. W. Leonard.

Patents on which the Stamp Duty of £50 has been paid.

1921. R. A. Brooman.	1975. J. Ramsbottom.
2002. W. W. Burdon.	2093. W. Betts.

Patents on which the Stamp Duty of £100 has been Paid.

1830. R. Thatcher.	1879. J. H. Johnson.
1846. R. Thompson.	1902. J. M. Hart.
1899. T. S. Cressey.	

Journal of the Society of Arts.

FRIDAY, AUGUST 7, 1868.

Announcements by the Council.

Council Meeting.

July 27th.

Lord Henry Gordon Lennox, M.P., was unanimously elected Chairman of the Council for the ensuing year.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

"On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture II., delivered Monday, January 27.

Comparative Digestibility of Foods—Functions of Different Foods.

(*Continued from page* 657.)

Functions of Fat.—The hydrocarbons which go by the name of fat, differ from other hydrocarbons, as sugar and starch, in the circumstance that the oxygen is never in sufficient quantity to satisfy the affinity of the hydrogen; and, therefore, fat is more energetic as a respiratory or heat-producing agent. Its power, indeed, in this respect, is just twice and a-half as great as that of starch or sugar; for 10 grains of it will, by combining with oxygen, develop sufficient heat to raise 23·21bs. of water one degree of Fahrenheit; and according to the deductions of both Joule and Meyer, this is equivalent to the power of raising 17,923lbs. one foot high. In cold countries, where animal warmth is required, food rich in fat is always preferred; and the fat bacon of the English labourer contributes in no small degree to the production of mechanical force.

But besides this, fat serves important functions in the processes of digestion, assimilation, and nutrition. According to Lehmann, it is one of the most active agents in the metamorphosis of animal matter; and this is seen not merely in the solution of nitrogenous articles of food during digestion, but also in the conversion of nutrient plastic substances into cells and masses of fibre. Elsässer long since observed that during the process of artificial digestion, the solution of nitrogenous foods was considerably accelerated by means of fat; and Lehmann has since determined, by actual experiment on dogs, that albuminous substances deprived of fat remain longer in the stomach, and require more time for their metamorphosis than the same substances impregnated with fat. It is probable, indeed, that the digestive power of the pancreatic fluid is due in great measure to the presence of fat; and that the subsequent chymification of food, and its absorption into the blood, is greatly assisted by it. There is also good reason for believing that it is largely concerned in the formation of bile, and that the biliary acids are conjugated fatty compounds. This may account for the well-known action of fat bacon, and other such foods in promoting the secretion of bile.

The digestive power of fat is certainly considerable; and it is no less active in the subsequent conversion of nitrogenous matters into cells and tissues, and perhaps also in effecting their retrograde decay. Colourless blood corpuscles receive perhaps the first impulse of their formation from the metamorphosis of fat; and thus it may be an important aid in the genesis of blood. It would appear, too, from the latest investigations of physiologists that it plays an equally important part in every kind of cell development. Acherson showed, as far back as 1840, that albumen always coagulates from its solution around a fat globule, and this is seen in the little fatty particles of milk, which have a covering like a cell-wall of consolidated casein. Hunefield, Nasse, and others, have further shown that the nucleoli of cells invariably consist of fat, and that recently-formed plasma always contains more fat than the mature cell. The conclusion, therefore, is that it takes an active part in all the processes by which the nutrient constituents of food are converted into the solid substrata of organs; and so energetic are its powers in this respect, that when the nitrogenous matters of the fluids are not in sufficient quantity to form cells with the fat, it borrows the material from muscular or other tissues, and thus produces a fatty degeneration of the part. This is observed in the muscular structures of over-fed animals, in the

tissues of drunkards, who take a large amount of fat-forming food, and in the livers of geese that are crammed with a farinaceous diet.

And not only is it concerned in the formation of new tissue, but it also pervades, and finally disintegrates, the older structures, especially when the vitality of them is low. In this manner it helps in the solution and subsequent removal from the animal body of decayed and morbid products of the protein type.

Again, its presence in large quantity in the tubules of nerves, and in the ganglionic centres, would indicate that it performs some highly important functions in nervous action.

And lastly, the distribution of it in the tissues, and the accumulation of it around certain organs, serve to fill up the vacuities of the body, to give rotundity to the form, to equalize external pressure, to diminish the friction of parts, to give suppleness to the tissues, and by its bad conducting property to retain the animal warmth. Fat, therefore, must always enter largely into the composition of our food, for other hydrocarbons, though capable of transformation into fat, cannot entirely take its place.

3rd. *Starches and saccharine substances.*—These are well called hydrates of carbon, for the oxygen and hydrogen contained in them are nearly always in the proportion to form water. The carbon, therefore, is alone capable of oxydation, and according to Liebig their functions are entirely calorific or respiratory; but, like other heat-producing agents, they must also have mechanical power, for everything that will raise the temperature of a pound of water one degree of Fahrenheit will, by another modification of its action, raise 772lbs. a foot high. The energies, however, of this class of substances are not nearly so great as with fats, for in the last case, as I have said, there is much available hydrogen, as well as carbon, for oxydation. The diagram which is before you will make this clear.

Calorific and Motive Powers of 10 Grains of the Substance in its Natural State.

	Lbs. of water raised 1° Fahr.	Lbs. lifted one foot high.
Grape sugar	8·4	6,477
Lump sugar	8·6	6,617
Arrowroot	10·0	7,731
Butter	18·6	14,358
Beef-fat	20·9	16,131

So that, in round numbers, the calorific power of fat is about twice as great as that of starch and sugar, and when dry it is twice and a-half as great.

But these substances have other duties to perform besides the development of animal heat, which is, in fact, the final product of their oxydation, for on becoming changed into glucose by digestion they take the form of various acid compounds, as lactic acid, which occurs in the stomach and in the juice of flesh; butyric, formic, and acetic acids, which are found in the perspiration. The exact functions of these acids are not known to us, although, as I have already explained, the presence of lactic acid in the stomach is essential to the digestion of nitrogenous matters; and perhaps also its occurrence in the juice of flesh is for a similar object—namely, the solution of effete tissues.

Starches and sugars are also concerned in the production of fat. This was once the subject of an animated discussion by Liebig and Dumas, whose views of it were in complete antagonism; but the experiments of Boussingault, Persoz, Lawes, and others, on the feeding of animals have proved beyond all question that fat may be derived from the hydrates of carbon, and that therefore the views of Liebig were correct. Common experience, indeed, has fully taught us that foods which are rich in farinaceous matters and sugar are very capable of producing fat.

4th. The *saline* or *mineral* constituents of food are largely concerned in the metamorphosis of matter; and, perhaps, this is their sole function. It is a specialty of these substances to give a soluble form to the plastic constituents of food, and of the animal tissues. They are, therefore, concerned in the phenomena of digestion, absorption, sanguification, assimilation, disintegration, and secretion. In truth they are the chief, if not the only, media for the transference of organic matter from place to place in the animal body—being on one hand the purveyors of nutrient materials into the system, and on the other the carriers of effete substances out of it; besides which, it is very probable that they are the agents whereby liquid colloidal forms of nutriment are changed into solid or pectous, as in the formation of solid tissues from the blood. In the case of digestion and absorption the plastic elements of our food, as albumen, fibrin, gelatin, &c., are not of themselves capable of dialysis, or of passing through the walls of the alimentary canal; and, therefore, absorption must be assisted by some physical agent. This agent is the highly diffusive acids and salts which are secreted so freely into the stomach during digestion; and it is very probable that they not only effect a solution of the proteinaceous matter of food, but, by converting it into peptones, as Lehmann expresses it, they also change the molecular form of the material, and make it pass from an unabsorbable colloid into a highly diffusive crystalloid. If, indeed, it be, as Mr. Graham supposes, that a colloid molecule is but a group of smaller crystalloids, the action of the saline and acid constituents of the gastric juice might be to break up the larger colloid molecule, and thus give it the property of diffusion and absorption. An opposite condition of things would occur in the alkaline blood, whereby the colloid molecule would regain its structure, and lose its diffusive tendency; but, coming to the tissues, where an acid condition of the fluids again exists, it once more changes its molecular structure, and quits the blood to serve the purposes of nutrition. The exact nature of the phenomena that occur when the liquid nutrient matter which thus escapes is changed into solid tissue is unknown to us; but there is good reason for believing that it is no more than a molecular movement effected by the agency of saline matter. In the case of certain structures which contain more than a common amount of mineral salts, this is unquestionably so, for it occurs in the consolidation of the spiculæ of sponges, the calcareous tissues of polypes, the hard dermal structures of the radiata, mollusca, crustacea, &c., and in the calcareous deposits of bone, teeth, tegumentary scales, egg-shells, &c., of the vertebrata. In all these instances the secreted matter must first have been crystalloidal, or it could not have been secreted; it then takes the form of a liquid colloid or jelly; and finally, by a further molecular movement, it passes into the condition of a pectous solid—the saline constituents, according to their nature and proportion, determining the degrees of hardness.

Again, the removal of effete matters and worn-out tissues is undoubtedly effected by the agency of saline substances; for, during the processes of oxydation, acid compounds are produced, which, by acting chemically on the saline constituents of the animal fluids, give them a solutive power on plastic matters, and thus enable them to remove the debris of worn-out tissue.

As to special functions of the several saline constituents of food, little can be said; but it is a remarkable fact that the *alkaline or basic phosphate of soda* is invariably found in the blood, while *acid phosphate of potash* is the chief constituent of the juice of flesh. Most likely the former is concerned in preserving the liquid colloidal condition of albumen and fibrin, and so keeping them from being lost by secretion, while the latter is engaged in an opposite duty. The alkalinity of the blood also helps in the oxydation of organic matters; and as the basic phosphate of soda is endowed, like an alkaline carbonate, with the power of absorbing carbonic acid, it is the chief agent whereby this compound is removed from the system. This is a remarkable property, and is one

of the chief uses of basic phosphate of soda in the blood. In point of fact, when it is not there in sufficient quantity to perform this function, it is replaced by an alkaline carbonate. We find this to be so in the blood of herbivorous animals, where the proportions of the two salts are the reverse of what they are in man and carnivora. Some notion may be formed of the relative importance of the saline matters of the blood by reference to this diagram from Liebig.

Percentage Composition of the Mineral Matters of Blood.

	Man.	Pig.	Dog.	Fowl.	Sheep.	Ox.
Phosphoric Acid	31·79	36 50	36·82	47·26	14·80	14·04
Alkalies	65·66	49·80	55·24	48·41	55·79	60·00
Alkaline Earths	3·33	3·80	2·07	2·22	4·87	3·64
Mineral Acids and Oxide of Iron........................	9·22	9·90	5·87	2·11	24·54	22·32
Total	100·00	100·00	100·00	100·00	100·00	100·00

And in those cases where the phosphoric acid is deficient, it is replaced by carbonic acid. In man, for example, the quantity of combined carbonic acid in the ashes of the blood is only 3·78 per cent., whereas in the calf it is 9·85, and in the sheep 19·47 per cent., so that in all cases the alkalinity of the blood remains the same.

The *salts of potash* in the juice of flesh have, no doubt, an equally important duty to perform, although of an opposite character; for while the alkaline phosphate of soda in the blood prevents the transudation of nutrient matter, the acid phosphate of potash in the muscular fluid promotes it; and thus it is concerned in nutrition and in the solution of worn-out tissues.

Earthy phosphates, especially *phosphate of lime*, are, perhaps, the agents for the consolidation of tissue; for not only are they present in the hard structures of the body, as the bones and teeth, but they also enter into the composition of flesh.

And not less important in the morphological functions of the animal body is the presence of *common salt*. It is a large constituent of every one of the secretions, and forms about half the total weight of the saline matters of the blood. Unlike the phosphates, however, it does not enter into the composition of tissue, but seems to be only a medium of absorption and secretion; and so necessary is it for this purpose, that it is not possible to alter, to any large extent, its proportion in the blood. If we drink water containing but little common salt in solution, it does not permanently dilute the blood, but passes off immediately by the kidneys; and if we try to increase the amount in the blood by drinking solutions of salt, as sea water, it refuses to be absorbed. This normal proportion of it in the blood is evidently a physiological necessity, which the conditions for diffusion imperatively demand. It is a curious fact, also, that common salt has the faculty of forming crystallizable compounds with most of the unorganised and effete constituents of the body. May it not, therefore, be an important agent of diffusion, and be thus concerned in the phenomena of absorption and secretion; for as colloidal matters—albumen and fibrin—cannot pass through the walls of the intestines, or the blood-vessels, it may well be that through the agency of common salt and the free acid of the gastric and muscular juices, they temporarily assume a crystalloidal condition, and are thus absorbed or secreted.

The constant presence of common salt in the secretions, and the necessity for it in due proportion in the blood, indicate the importance of a proper supply of it with the food. We perceive this in the instinct of animals, and in our own craving for it when it does not exist in sufficient quantity in the food. Animals, in fact, will travel long distances, and brave the greatest dangers, to obtain it. Men will barter gold for it; indeed, among the Gallas, and on the coast of Sierra Leone, brothers will sell their sisters, husbands their wives, and parents their children, for salt. In the district of Accra, on the Gold Coast of Africa, a handful of salt is the most valuable thing upon earth after gold, and will purchase a slave or two. Mungo Park tells us that with the Mandingoes and Bambaras the use of salt is such a luxury, that to say of a man "he flavours his food with salt" is to imply that he is rich; and children will suck a piece of rock-salt as if it were sugar.

The experiments of Boussingault have shown that, although salt mixed with the fodder of animals does not much affect the quantity of flesh, fat, or milk obtained from them, yet it seriously affects their appearance and general condition; for animals deprived of salt, other than that contained naturally in the food, soon get heavy and dull in their temperament, and have a rough and staring coat. Reulin states that animals which do not find it in their food or drink, become less prolific, and the breed rapidly diminishes in number. This is confirmed by Dr. Le Saine, who says, in his prize-essay on salt, that it increases the fertility of the male and the fecundity of the female, and it doubles the power of nourishing the fœtus. During the period of suckling, also, salt given to the mother renders the milk more abundant and more nutritious. It likewise accelerates growth, and gives a finer condition to the skin; and the flesh of animals fed with it is better flavoured, and more easily digested, than that of animals which do not partake of it. In barbarous times, the most horrible of punishments, entailing certain death, was the feeding of culprits on food without salt; and in the experiments of the French Academicians, flesh deprived of its saline constituents by being washed with water, lost its nutritive power, and animals fed on it soon died of starvation. Even after a few days, with such a diet, the instincts of the animals told them it was worthless as food; indeed, for all purposes of nutrition, it was, as Liebig says, no better than the eating of stones, and the utmost torments of hunger were hardly sufficient to induce them to continue the diet. There was plenty of nitrogenous matter in the food, but there was no medium for its solution and absorption, and hence it was useless.

The *oxides of iron*, and their homologues, the *oxides of manganese*, are largely concerned in the processes of sanguification and oxydation. They enter into the composition of the globules of the blood—manganese being the chief mineral constituent of the corpuscles of white-blooded animals, and iron of red. In fact, the colouring-matter of the blood discs (cruorin), as well as that of the muscles (myochrome), is a compound of iron and albumen (globulin), which has a remarkable property of absorbing oxygen when exposed to the air, and of giving it out again in the presence of reducing agents. In the one case it acquires an arterial tint, and in the other a venous; and the spectrum informs us that these two conditions of it are easily assumed—one by the presence of atmospheric oxygen, and the other by decaying organic matter. It is hardly to be doubted that these are the conditions of it in blood—the bright red oxydized cruorin being the form of it in arterial blood, and the dark reduced variety of it in venous. The functions, therefore, of both cruorin and myochrome are entirely of a respiratory nature; for, in the former case it is the medium whereby oxygen is absorbed from the air in the lungs, and is carried with the blood-discs throughout the body, and in the latter it may be the agent of interstitial oxydation.

Lastly, there is a mineral constituent of our food, *silica*, which enters into the composition of all the tegumentary appendages. Its presence is not of so much importance to us as to the lower animals, whose warmth is retained by a natural covering of hair, or wool, or feathers. In the case of birds, indeed, the quantity of silica in the feathers is very considerable, and Gorup-Besanez has described its physiological relations.

As to the proportions of mineral substances required in the food, it is difficult to speak. Dr. Edward Smith says that an adult man requires daily from 32 to 79

grains of phosphoric acid; from 51 to 175 grains of chlorine (equal to from 85 to 291 grains of common salt); from 27 to 107 grains of potash; from 80 to 171 of soda; from 2·3 to 6·3 of lime; and from 2·5 to 3 of magnesia. According to Mr. Lawes, a very small portion of these salts is retained in the system; for in fattening pigs he found that of every 11 lbs. of mineral matter contained in the food only twelve ounces were stored up in the body, and this was chiefly the earthy phosphates, all the rest being either unabsorbed, or else used in the work of absorption, assimilation, and secretion. In most cases, therefore, there is sufficient saline matter, excepting common salt, in all ordinary food; but for all this, the presence of it in the water we drink is not an unimportant question. Four-fifths of the earth's surface are composed of calcareous strata, which yield water that is more or less rich in carbonate and sulphate of lime; and it may well be that this is a wise provision for the supply of these salts to the animal system. As Mr. Johnston has truly observed in his "Chemistry of Common Life," "The bright sparkling hard waters which gush out in frequent springs from our chalk and other lime-stone rocks are relished to drink, not merely because they are grateful to the eye, but because there is something exhilarating in the excess of carbonic acid they contain and give off as they pass through the warm mouth and throat; and because the lime they hold in solution removes acid matters from the stomach, and thus acts as a grateful medicine to the system. To abandon the use of such a water, and to drink daily in its stead one entirely free from mineral matter, so far from improving the health, may injure it;" in fact the water of a country may determine the diet of its inhabitants. The soft waters of the lakes of Scotland, for example, may have had something to do with the choice of brown meal; and but for the calcareous waters of Ireland the potato could not have become a national food.

And now, before I leave this part of the subject, it is right that I should say a few words respecting the functions of certain beverages (as *tea*, *coffee*, and *fermented liquors*), which have been more or less in use in all ages, as if from an untaught physiological instinct. Vegetable infusions, containing the same active principles—namely, astringent matter, volatile oil, and a crystallizable body rich in nitrogen, have been resorted to for some undefined purpose by the natives of every climate; indeed, to use the words of Mr. Johnston, "the practice has prevailed equally in tropical and in arctic regions. In Central America, the Indian of native blood, and the Creole of mixed European race, indulge alike in their ancient chocolate. In Southern America the tea of Paraguay is an almost universal beverage. The native North American tribes have their Apallachian tea, their Oswega tea, their Labrador tea, and many others. From Florida to Georgia in the United States, and over all the West India Islands, the naturalised European races sip their favourite coffee; while over the Northern States of the Union, and in the British provinces, the tea of China is in daily and constant use.

"All Europe, too, has chosen its prevailing beverage; Spain and Italy delight in chocolate; France and Germany, and Sweden and Turkey, in coffee; Russia, Holland, and England, in tea—whilst poor Ireland makes its warm drink of the husks of the cocoa, the refuse of the chocolate-mills of Italy and Spain.

"All Asia feels the same want, and in different ways has long gratified it. Coffee, indigenous in Arabia or the adjoining countries, has followed the banner of the Prophet, wherever in Asia or Africa his false faith has triumphed. Tea, a native of China, has spread spontaneously over the hill country of the Himalayas, the table lands of Tartary and Thibet, and the plains of Siberia; has climbed the Altais, overspread all Russia, and is equally despotic in Moscow as in St. Petersburg. In Sumatra, the coffee-leaf yields the favourite tea of the dark-skinned population; while Central Africa boasts of the Abyssinian chaat as the indigenous warm drink of its Ethiopian people. Everywhere, in fact, unintoxicating and non-narcotic beverages are in general use among tribes of every colour, beneath every sun, and in every condition of life. The custom, therefore, must meet some universal want of our nature, some physiological function which science has not yet explained; and, considering that these beverages contain essentially the same chemical compounds, it is remarkable that they should have been selected from the whole range of the vegetable kingdom." As Mr. Johnston truly observes, "What constitutional cravings common to us all have prompted to such singularly uniform results! Through how vast an amount of unrecorded individual experiences must these results have been arrived at!"

The principal constituents of these vegetable substances are:—

1st. A *volatile oil*, on which their aroma depends, and which rarely amounts to one part in 150. 2nd. An *astringent acid*, of the nature of *tannic acid* in tea, and called *caffeic acid* in coffee, which give them their bitter styptic taste; it amounts to from 13 to 18 per cent. in tea, and to about 5 per cent. in coffee; and 3rd. A crystallised nitrogenous substance of an alkaline nature called *Theine* or *Caffeine*, and *Theobromine*. The average amounts of this alkaloid in different vegetable substances, according to Dr. Stenhouse, is here recorded:—

	Theine or Caffeine per cent.
Guarana or Brazilian cocoa, from *Guarana officinalis*	5·07
Good black tea	2·13
Black tea from Kemaon, E. I.	1·97
Dried coffee leaves	1·26
Maté or Paraguay tea from *Ilex Paraguayensis*	1·20
Various samples of coffee-beans from 0·8 to	1·00

The physiological properties of this substance, and of its homologue, theobromine, are not clearly discoverable. Mulder states that they are not the agents concerned in the peculiar action of tea and coffee. Liebig, however, points to the fact that with the addition of oxygen and the elements of water, they can yield taurine, which is the nitrogenised constituent of bile; and he asks whether they may not be concerned in the production of bile. Theine, he also states, is related to kreatinine—that remarkable compound, produced in the vital process, and occurring in the muscular system of animals; and to glycocol, which we may suppose to exist in gelatine coupled with another compound. In fact, according to him, there are no drinks which in their complexity and in the nature of certain constituents, have more resemblance to soup than tea or coffee; and it is very probable, he says, that the use of them as a part of food depends on the exciting and vivifying action which they have in common with soup. Reasoning in this way it may be said that theine or caffeine, and theobromine are closely related in their composition to nervous tissue, and that therefore they are suited for the repair and renovation of the exhausted brain. Experiments made by Lehmann, in 1854, with infusion of roasted coffee, and with caffeine, went to show that their chief influence on the human body was to retard the waste of tissues; that when, for example, an infusion of three-quarters of an ounce of roasted coffee was taken daily for a fortnight, the amount of urea and phosphoric acid excreted by the kidneys was less by one-third than when the same food was taken without the coffee. The empyreumatic oil was found to exert a stimulating action on the nervous system, and when taken in excess caused excitement and wakefulness. It also operated on the skin by producing a gentle perspiration, and it removed the sensation of hunger. The conclusion from these experiments was, that both tea and coffee exhilarate the nervous system, and, by lessening waste, enable the food to go further in its nutritive

action; that with a given quantity of food, more work could be performed when these beverages were taken than otherwise; and that in old, infirm persons, where the desire for tea is so strong, the waste and decay of the system was lessened. It operates, in fact, as a sort of lubricant of the animal system, and by oiling the machinery, enables it to work easier and longer.

The more recent experiments of Dr. Edward Smith are not exactly to the same purpose; for, in his opinion, tea promotes rather than checks the chemico-vital functions of the body, for directly after it is taken, the quantity of carbonic acid emitted from the lungs, and the quantity of air inspired are increased; and there is greater depth and freedom of respiration. In this way, he thinks it promotes the transformation of starchy and fatty food; besides which, it increases the action of the skin, and by inducing perspiration lessens the heat of the body. Coffee, he says, has an opposite effect, for it lessens the action of the skin, and promotes that of the bowels; and its influence on the respiratory processes is somewhat less than that of tea.

It is manifest from all this, that we have yet to learn what are the special actions of these beverages; and why it is that they have been used in all times, and in all countries, as a means of supplying some natural want which science is unable to discover—that everywhere, the poor and the needy, the aged and the infirm, will make a sacrifice of even nutritious food for some such beverage as tea and coffee—that not less than 500 millions of the human race should make use of an infusion of tea; that more than 100 millions should drink coffee; about 50 millions cocoa; and not less than 10 millions of the inhabitants of Peru, Paraguay, and the Brazils, should use an infusion of maté or guarana. In this country alone there is over 100 millions of pounds of tea consumed annually, and perhaps, about half as much of coffee. All this looks like the influence of some deep-seated necessity, which our philosophy is unable to fathom.

And with regard to the use of *fermented liquors*, there is the same universal indication of their serving a profound physiological purpose, and supplying a common want. It is no argument that, because these things have been abused they serve no purpose in man's economy. On the contrary, the fact of their use in all time, and that no saccharine liquid, or juice of ripe fruit, can be exposed to the air without spontaneous and almost immediate fermentation, are striking evidences of a useful purpose. They may not enter into the composition of tissues, but they may stimulate the energies of the living frame, and rouse them into increased activity. It is not merely the brick-work and marble, so to speak, of the human body, nor yet the concrete movements of the machine, that have to be sustained, for there are rarer forms of matter, and higher manifestations of force, concerned in man's existence; and his resort to such beverages as these may be for something more than the nourishment of the system, or even the mere raising of his spirit above the common concerns of this work-o-day world.

That *alcohol* stimulates the action of the nervous system there is no doubt, and it is equally certain that it increases the respiratory changes. Dr. Edward Smith is of opinion that it also lessens the action of the muscles which are subject to volition, and increases, in a certain degree, the action of those which are independent of it, as the heart and respiratory muscles. He finds, too, that it diminishes the functions of the skin, and by thus lessening the waste of animal heat, it has a conservative tendency. The effects of alcohol are, however, much modified by the substances with which it is associated in different alcoholic liquids—*beers* and *ale*, for example, act on the respiratory functions by reason of the saccharine and nitrogenous matters they contain; *wine* also, as well as *cider* and *perry*, have a similar action, and in proportion to their saccharine and acid constituents; *brandy* and *gin* lessen the respiratory changes, and the latter acts on the kidneys by reason of the volatile oil it contains; *whiskey* is uncertain in its effect on the lungs; while *rum*, like *beer* and *ale*, is a true restorative, as it sustains and increases the vital powers; and he says that the old fashioned combination of *rum* and *milk* is the most powerful restorative with which he is acquainted.

Leibig is of opinion that alcohol is burnt or oxydised in the system, and is therefore a calorific agent; but the researches of Lallemand, Perrin, and Duray, as well as those of Dr. Edward Smith, have demonstrated that a large portion of it passes through the system unchanged, and appears in the breath and perspiration, as well as in the urine. They, therefore, conclude that alcohol is not a food, but is a mere excitor of the nervous centres. On the other hand, Dr. Thudicum, in a rather large experiment on the students of his class (33 in number), found that of the 4,000 grammes of alcohol in the 44 bottles of wine which they drank at one sitting, only 10 grammes appeared in the urine; and assuming that about 10 grammes more were exhaled by the breath and skin, he concluded that only 0·5 per cent. of the alcohol escaped unchanged. He therefore believes that alcohol is oxydised in the body, and is a true food.

But besides this, the inquiries of Poiseuille have shown that it is a physical as well as a chemical and physiological agent, for it hinders the flow of liquids in narrow tubes, and may act in the same way on the movements of the blood in the capillary vessels. He found, for example, that when the flow of a certain quantity of water through a small tube occupied 575·8 minutes, and of the serum of blood 1048·5 minutes, the flow of the same quantity of Madeira wine under the same circumstances was 1138 minutes, of sparkling Sillery 1463, and of Jamaica rum 1832. Its functions, therefore, are manifestly of a complicated nature; in fact the whole subject is remarkably obscure, and requires the light of science to illuminate it. As in the case of tea and its allies, ages of empiricism are waiting for a philosophical interpretation.

Lastly, as to the functions of *condiments*, as *peppers*, *mustard*, *spices*, &c. They are merely stimulants of the digestive organs, promoting the flow of the saliva, the gastric juice, and other intestinal secretions; and increasing the peristaltic movements of the viscera. They thus aid in the processes of digestion; and by giving flavour to the food, they whet the appetite, and so increase the relish for it—indifferent food is thus made palatable, and its digestion accelerated.

And now, in conclusion, we may safely inquire, as a supplementary question to the functions of food, what are the mechanical and thermotic powers, as well as the fattening capabilities of various articles of diet?

Dr. Frankland has made some very careful determinations of the calorific values of different substances used as food; and remembering that every pound of water raised one degree of Fahrenheit represents a mechanical force of 772 lbs. lifted a foot high, it is easy to calculate the working energy of any substance from its thermotic power when burnt in oxygen, or when less perfectly consumed in the animal body. Arranging the results under these two heads, we shall find that the energies of different articles of diet may be expressed as in the table at top of next page.

It will be understood, of course, that to obtain these results in the animal body the materials must be completely absorbed, and fully oxydised into carbonic acid, urea, &c.

Estimated in this manner it may be said that a daily subsistence diet of two ounces of dry nitrogenous food, and 13·2 ounces of dry carbonaceous, calculated as starch; and a daily working diet of six ounces of dry nitrogenous matter, and twenty-six ounces of dry carbonaceous, have the following mechanical energies:—

	Lbs. lifted one foot high.	
	When burnt in oxygen.	When oxydised in the body.
Subsistence diet..........	6,319,783	6,307,078
Working diet............	13,349,405	13,311,290

But the actual working power of the human body does not approach this. In fact, although a man's daily labour has a very large range, as from 300,000 foot-pounds when lifting dung into a cart to 1,500,000 foot-pounds when pushing or pulling horizontally; yet, the average is not above one million foot-pounds, as will be seen from this diagram:—

Actual Energy of Ten Grains of the Material, in its Natural Condition, when completely Burnt in Oxygen, and when Oxydised into Carbonic Acid, Water, and Urea, in the Animal Body.

	Per cent. of water in Material.	Lbs. lifted one foot high.	
		When burnt in Oxygen.	When Oxydised in the body.
Butter	15	14357	14357
Cheshire cheese	24	9187	8613
Oatmeal	15	7913	7769
Wheat flour	15	7788	7591
Pea-meal	15	7778	7456
Arrowroot	18	7731	7731
Ground rice	13	7535	7424
Yolk of egg	47	6761	6532
Lump sugar	19	6616	6616
Grape sugar	20	6476	6476
Entire egg	62	4708	4507
Bread crumb	44	4409	4246
Ham	54	3915	3317
Mackerel	71	3537	3187
Lean beef	71	3098	2818
Lean veal	71	2594	2314
Guiness's stout	88	2123	2123
Potatoes	73	2002	1969
Whiting	80	1787	1563
Bass's ale	88	1530	1530
White of egg	86	1325	1138
Milk	87	1306	1241
Carrots	86	1040	1026
Cabbage	89	858	830

Kind of labour.	Amount of work in foot-pounds.	Authority.
Bricklayer's labourer carrying bricks	1,627,200	Mayhew.
Coal whipping	1,293,600	"
Ascending Faulhorn	1,074,931	Wislicenus.
Do. do.	933,746	Fick.
Treadmill	1,008,000	Mayhew.
Do.	861,156	Ed. Smith.
Turning a winch	837,760	Coulomb.
Pedestrians (20 miles a day)	792,000	Haughton.
Paving and pile-driving	788,480	Coulomb.
Porters carrying loads	732,480	"
Shot-drill punishment	694,400	Haughton.
Average	967,614	

And even when we add the calculated internal work of a man's body, as the beating of the heart and the movements of respiration, the total of it does not much exceed a million and a-half foot-pounds a-day.

	Foot-pounds.
External work or actual labour	967,614
Work of circulation (75 beats a minute)	497,880
Work of respiration (15 a minute)	98,064
Total ascertainable work per day	1,563,558

It is evident, therefore, that a large portion of our food must escape digestion and absorption; indeed, the thermotic power of the food actually consumed daily, as estimated by the carbonic acid exhaled and the urea secreted, is not more than sufficient to raise the temperature of 10,000 lbs. of water one degree of Fahrenheit. This is equal to a force of 7,720,000 lbs. lifted a foot high; so that the ascertainable work of the food is about one-fifth of its actual energy, the rest of the power being consumed in molecular movements within the animal body. Helmholtz asserts that the external work should be a fifth part of the mechanical force of the digested food; but labour must be well applied to develop this proportion of its energy.

In the steam-engine, according to Sir William Armstrong, only a tenth part of the actual power of the fuel is realised as work. The human machine is therefore more economical of its force than a steam-engine; in fact it is assumed by Heidenham and others that not less than half of the force applied to the living muscles, as it is developed in their tissue, is ultilized. But although the animal machine is so much more economical of force than the steam-engine, yet on account of the costliness of its fuel, &c., it is far more expensive. Taking, for example, a steam-engine of one-horse power (that is, a power of raising 33,000 lbs. a foot high per minute), it will require two horses in reality to do the same work for ten hours a day, or twenty-four men; and the cost would be 10d. for the steam-engine, 8s. 4d. for the two horses, and just £2 sterling for the twenty-four men.

Dr. Frankland has estimated the weight and cost of various articles of food required to be oxydised in the animal body in order to raise 140 lbs. (a rather small man) to the height of 10,000 feet, supposing that only one-fifth of the actual energy of the food is manifested as external work. Here is a part of his table:—

	Ounces required.	Cost.	
		s.	d.
Oatmeal	20·5	0	3½
Flour	21·0	0	3¾
Pea-meal	21·4	0	4½
Bread	37·5	0	4¾
Potatoes	81·1	0	5¼
Rice	21·5	0	5½
Beef-fat or dripping	8·9	0	5½
Cheshire cheese	18·5	0	11½
Cabbage	192·3	1	0¼
Butter	11·1	1	0½
Hard-boiled eggs	35·3	1	2½
Lump sugar	24·1	1	3
Milk	128·3	1	3½
Lean beef	56·5	3	6½
Guiness's stout	6¾ bottles.	5	7½
Bass's pale ale	9 do.	7	6

The motive power of fatty foods is thus shown to be far higher than that of lean meat or farinaceous substances, and this accords with experience, for the labouring classes have long since discovered that fat bacon is a good material for heavy work. Its efficacy may, in great part, depend on the ease and certainty with which it is digested and utilised in the body.

The *fattening functions* of food are liable to great variation, not merely from the quality of the food itself, but from the peculiarity of the individual consuming it. This is a matter of common observation, and is well known to the breeders of stock. Messrs. Lawes and Gilbert found in their experiments on the feeding of bullocks, sheep, and pigs, that very different quantities of food were required to produce the same increase of weight. Oxen and sheep, for example, feeding on the same diet, namely, oil-cake, hay, and turnips, consume, in one case (that of oxen), 1,109 lbs. of dry substance for every 100 lbs. of increase in the live weight, while in the other, the sheep consume only 912 lbs.; and pigs fed on

barley-meal will fatten to the same extent on 420 lbs. of the dry material. Pigs, therefore, store up about one-fourth of their food, reckoned in this way; sheep about one-ninth, and oxen only one-eleventh.

The proportions of the several constituents of the food are also very differently used by these animals; for in every 100 parts of the dry food eaten, the several amounts of nitrogenous, carbonaceous, and mineral matters are thus disposed of:—

	CONSTITUENTS OF THE DRY FOOD.	Proportions in dry food.	Proportions stored in animal.	Proportions in manure.	Proportions lost in respiration.
Oxen	Nitrogenous......	19·66	0·8	29·1	57·3
	Carbonaceous	72·86	5·2		
	Mineral..........	7·48	0·2	7·4	—
		100·00	6·2	36·5	57·3
Sheep	Nitrogenous......	19·41	0·8	25·1	60·1
	Carbonaceous	73·57	7·0		
	Mineral..........	7·02	0·2	6·8	—
		100·00	8·0	31·9	60·1
Pigs	Nitrogenous......	12·38	1·7	14·3	65·7
	Carbonaceous	85·00	15·7		
	Mineral..........	2·62	0·2	2·4	—
		100·00	17·6	16·7	65·7

So that the power of appropriation is greatest with pigs and least with oxen; in fact, of every 100 lbs. of the several constituents of the food, the following are the proportions stored up in the three classes of animals:—

	Pigs.	Sheep.	Oxen.
Of 100 Nitrogenous	13·5	4·2	4·1
Of 100 Carbonaceous	18·5	9·4	7·2
Of 100 Mineral	7·3	3·1	1·9

It will be noticed, too, that the proportions lost in respiration are very different in the three cases; for it is greatest in the pig—amounting to nearly 66 per cent. of all the food eaten, and least in the ox, 57·3 per cent. These proportions represent the vital work of the body during the processes of growth and repair.

The time also that is occupied in producing fat and muscular tissue is different with these animals, for the pig increases from 6 to 6·5 per cent. of its weight per week; the sheep not more than 1·75 per cent.; and the ox only 1 per cent. Some of this difference is, doubtless, due to the quality of the food made use of, for the pigs were fed on a nutritious and easily digestible diet—oat-meat; while the sheep and oxen made use of food with a large quantity of cellular tissue and woody fibre; and here, I may remark, that the power of utilising the inferior varieties of food is very different with different classes of animals. Man, as I have already explained, is unable to digest woody fibre, or even the harder kinds of cellulose; it is doubtful indeed whether he can digest cellulose at all. The pig also has but a limited capacity for this kind of work; whereas oxen and sheep, and the herbivora generally, can eat woody tissues with advantage, and convert them into flesh and fat. In eating meat, therefore, we are utilising the digestive powers of other animals; and are, in fact, employing their stomachs to do for us that which we could not do for ourselves. This, as Mr. Lawes says, is proved, not merely by the testimony of common experience, but also by certain anatomical facts relating to the structure and comparative size of the stomach in different animals. In oxen, for example, the stomach weighs 51 ounces for every 100 lbs. of live weight; in sheep it weighs 39 ounces; in pigs 14 ounces; and in man only 6 ounces. It is manifest, therefore, that the food of man should be more concentrated than that of the lower animal; and that he acts wisely in eating flesh and fat, which are the very essence of food, for he thereby economises labour, and employs the assimilative powers of other creatures to bring the crudest materials into a nutritious and highly digestible form. It is true that man, in common with other animals, is able to convert starch and sugar into fat, and the lower qualities of albumen into flesh, but by so doing he expends force, for in the case of fat he locks up in it twice and a-half the potential energy of sugar and starch.

Looking broadly, therefore, at the functions of food, and regarding the animal body as a machine, in which potential energy is rendered active, it would appear that its main duty is to develop force by the oxydation of carbo-hydrogens contained in the blood, and not by the oxydation of tissue. A portion of tissue no doubt decays in the transference of its energies to other forms of action, and requires repair; but the decay is scarcely more rapid at one time than another, and is in no case, when sufficient food is supplied, the cause of mechanical labour. "In man," say Dr. Frankland, "the chief materials for muscular power are non-nitrogenous; but nitrogenous matter can also be employed for the same purpose, and hence the greatly increased evolution of nitrogen under the influence of a flesh diet, even with no increase of muscular exertion. The non-nitrogenous matters, also, which find their way into the blood, yield up all their *potential* energy as *actual* energy; whereas the nitrogenous in leaving the body as urea carry with them a portion (at least one-seventh) of their potential energy unexpended. The transference of potential energy into muscular power is necessarily accompanied by the production of heat within the body, even when the muscular power is exerted externally. This is, doubtless, the chief, and probably the only source of animal heat."

Proceedings of Institutions.

EXAMINATION PAPERS, 1868.

(*Continued from page* 659.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

NAVIGATION AND NAUTICAL ASTRONOMY.

THREE HOURS ALLOWED.

Section I.

1. Define a great and a small circle on the surface of a sphere. Investigate the relation between the circumference of a small circle and that of the large circle parallel to it.

2. Show that in any spherical triangle the sum of the three angles is greater than two and less than six right-angles; and that the difference between the sum of any two angles and the third is less than two right-angles.

3. Obtain an expression for the cosine of the angle of a spherical triangle in terms of the sides.

Section II.

1. State Napier's rules for the solution of a right-angled spherical triangle, and prove them in the case where the complement of one of the angles is the middle part.

2. Given two sides and the included angle of a spherical triangle, find the third side in a form adapted to logarithmic calculation.

3. What is meant by the spherical excess; obtain an

expression for the area of a spherical triangle, and find it when the three sides are given.

SECTION III.

1. Find the compass course and distance from A to B. Given—

Lat. A 37° 18′ N. Var. 2 pts. W. Long. A 39° 18′ E.
„ B 37° 18′ N. Dev. 10° 30′ E. „ B 48° 33′ E.

2. Find the compass course and distance from A to B. Given—

Lat. A 44° 53′ S. Var. $1\frac{1}{2}$ pts. E. Long. A 97° 18′ W.
„ B 78° 16′ S. Dev. 8° 35′ W. „ B 121° 44′ W.

3. On June 25th, at noon, a point of land in latitude 18° 13′ N., long. 133° 25′ W. bore by compass N.N.E distant 18 miles. Ship's head E., deviation 10° 40′ E., variation 1 point W. Afterwards sailed by compass as follows during the next twenty-four hours:—

K.	$\frac{1}{10}$	Courses.	Wind.	Leeway.	Deviation.
57	5	E. b. N.	W.N.W.	$1\frac{1}{2}$	3° 20′ E.
41	6	S.S.E.	N.W.b.N.	1	0° 56′ W.
48	9	S.W. b. W.	E.S.E.	2	8° 34′ W.
65	7	N.E. b. E.	S.E.	$1\frac{3}{4}$	10° 50′ E.

A current set the ship during the last four hours S.W. by compass $2\frac{1}{2}$ miles an hour. Required the latitude and longitude on June 26th at noon.

SECTION IV.

1. Define the terms *course*, *distance*, *departure*, and *rhumb-line*; and show by a diagram how *departure* is measured. Obtain equations connecting (1), *course*, *distance*, *and departure*, (2), *course*, *distance*, and *diff. lat.* (3), *course*, *diff. lat.* and *dep.*

2. Write down and prove the formula employed in Mercator's sailing. How could you construct a Mercator's chart?

3. Obtain an expression for the distance in sailing on a great circle from one point to another.

Find the distance from A to B.

Lat. A 12° 18′ S. Long. A 18° 23′ W.
„ B 33° 25′ N. „ B 44° 15′ W.

SECTION V.

1. On June 10, 1868, the observed mer. alt of Sirius (zenith N. of star) was 32° 18′ 25″. Index cor. — 3′ 40″ height of the eye above the sea 21 feet. Required the latitude.

2. On July 2, 1868, in long. 54° 25′ W. the observed mer. alt., moon's upper limb, was 54° 18′ 30″ (zenith S. of moon). Index cor. + 5′ 35″. Height of the eye, 24 feet. Required the latitude.

3. June 1, 1868, at 8h. 20m. a.m., in lat. 18° 20′ S., long. 100° 40′ W. the obs. alt. sun's L.L. was 22° 42′ 20″, when the sun bore by compass, N. 67° 18′ E. (Ship's head being W., dev. 11° 35′ W.) Index cor. — 4′ 5″, and the height of the eye 17 feet. Required the variation of the compass.

SECTION VI.

1. Define the terms *right ascension*, *declination*, *latitude*, and *longitude* of a heavenly body; *amplitude* and *azimuth*.

Show how to find the latitude of the observer by the observed meridian altitude of a heavenly body; the zenith being north of the body and the declination being south.

2. Prove the rule for finding the variation of the compass by the observed amplitude of the sun.

3. Prove the rule for finding the latitude by two observed altitudes of different heavenly bodies at the same time.

SECTION VII.

1. Jan. 15, 1868, at 6h. 15m. a.m., in lat. 60° 15′ S. long. 110° 10′ W. the obs. alt. Sun's L.L. was 18° 38′ 50″. Index cor. + 3′ 10″, height of the eye 18 feet, when the chronometer showed 1h. 32m. 30s. Required the longitude.

On Jan. 1, at noon, the chronometer was slow on Greenwich mean time 2m. 3s. ·4, and losing 8·5s. daily.

2. Sept. 1, 1868, in lat. 49° 10′ N. long. 31° 10′ W. the following observations were taken:—

	Obs. alt. α Arietis.	Obs. alt: moon's L.L.	Obs. dist. F.L.
	43° 43′ 50″	30° 36′ 30″	58° 23′ 10″
Index cor.	+ 1′ 10″	— 1′ 35″	— 1′ 45″

and the height of the eye was 15 feet. Required the longitude.

SECTION VIII.

1. Describe the sextant, and prove the rule by which it is graduated.

2. To what errors of adjustment is the sextant liable? Show how they may be remedied.

PRINCIPLES OF MECHANICS.

THREE HOURS ALLOWED.

1. What cases of equilibrium in forces acting on a particle are evidently true?

2. State the proposition commonly called the parallelogram of forces. Assuming its truth for the direction of the resultant, prove it for the magnitude.

EXAMPLE.—Two forces acting on a particle are inclined to each other at an angle of 30°, one force being equal to four pounds, and the other to six; find the magnitude of their resultant.

3. Enunciate the experimental laws of friction considered (1) statically, (2) dynamically.

EXAMPLE 1.—A copper cubical box, half full of water, is placed on an oak table, which is slowly tilted up; determine whether it will slide or topple over. (Coefficient of friction=·62.)

EXAMPLE 2.—If a plane whose inclination to the horizon is 30°, be so rough as just to support a body, find the least force that will drag the body up it, the weight being supposed equal to a ton.

4. Investigate the condition of equilibrium of two forces acting in any direction at the extremities of a lever.

EXAMPLE.—A lever 12 feet long will balance at two feet from one end, but when a weight of 50lbs. is hung from the other end it balances at two feet from that end; find the weight of the beam.

5. Define the centre of gravity of a body. Show how to find from elementary principles the centre of gravity of any regular figures which you may select.

EXAMPLE.—A triangle has 3, 4, 5 for its sides; find the distance of the centre of gravity from each side.

6. State the laws of motion. How does Attwood's machine experimentally prove them?

7. Prove that if a body be urged by a constant and uniform force, the space which it describes from the beginning of the motion is equal to half the product of the force and the square of the time.

EXAMPLE.—Two weights of 97 and 96 lbs. hang over a fixed pulley; find the space descended by the heavier weight in 8 seconds.

EXAMPLE.—A stone, thrown at an angle of elevation of 45° from the top of a tower, fell in four seconds at a distance of 60 feet from the base; find the height of the tower.

9. Explain the phrase "Modulus of a Machine."

EXAMPLE.—The diameter of the piston of an engine is 80 inches, the mean pressure of the steam is 12 lbs. per square inch, the length of the stroke is 10 feet, the number of strokes is 11 per minute. How many cubic feet of water will it raise per minute from a depth of 250 fathoms, its modulus being ·6?

10. What is meant by impulsive action? What is the fundamental principle in the solution of problems upon this action? If two inelastic bodies impinge, prove the formula for their common motion after impact.

EXAMPLE.—A sphere weighing 2lbs., and moving with a velocity of 20 feet per second, meets another weighing 5lbs., and moving with a velocity of 5 feet per second. Determine their common velocity after impact.

11. Define the terms "radius of gyration," "moment of inertia."

EXAMPLE.—Find the moment of inertia of a sphere revolving around a diameter.

12. Define *vis viva*, and state upon what its utilty depends. Investigate the motion of a ball inside a cylinder rolling on a horizontal plane.

13. Describe any recently invented instruments for measuring and registering the pressure of the wind. Explain clearly in what way the wind turns the sails of a windmill, and describe the best form and proportion of the sails.

(*To be continued.*)

OPENING OF THE THAMES EMBANKMENT FOOTWAY.

The Thames Embankment has become a reality, and on Thursday, the 30th July, and from that day henceforth, Londoners will be able practically to appreciate the advantages of what is declared, not altogether without reason, to be the finest metropolitan thoroughfare in the world. Months, indeed, will yet elapse before the Thames Embankment will be open to vehicles, but persons on foot can now avail themselves of it, and the flow of passengers that set in the moment the barriers were thrown down sufficiently proved that the new thoroughfare will not be neglected by the public. Of opening ceremonial there was nothing, or next to nothing; indeed, the authorities consider the admittance of pedestrians to the embankment as indicating nothing but a stage towards the completion of the work, and they were not disposed to raise the event into undue importance. At half-past eleven o'clock a body of some two or three hundred invited visitors assembled at the north pier of Westminster-bridge, and there awaited the arrival of Lord John Manners, the Right Hon. W. Cowper, Sir J. Thwaites, Mr. Tite, M.P., Lord Ebury, the Marquis Townshend, the Lord Mayor, Alderman Salomons, M.P., Alderman Lawrence, M.P., Colonel Hogg, M.P., Mr. Powell, M.P., and other gentlemen interested, personally or officially, in the undertaking. A sort of straggling procession was then formed, the visitors walking along the embankment, and stopping here and there to admire the strength and the solidity of the embankment, the various piers, the lions' heads, the bends and turns of the line of masonry, and whatever else caught their eye. The day was hot, and a blazing sun bathed the white stonework in a painful glare of light; and the visitors were unanimous in the opinion that no time should be lost in planting trees along the river side, for the purpose of affording shelter from the rays of the summer sun. Apart from this drawback there was cause for nothing but congratulation at the noble undertaking that is now so near its completion. It is every way a work worthy of a great nation, and will endure as a lasting monument of the commerce, the wealth, and the public spirit of the first capital of the world. People who think it a sign of superior wisdom to go into raptures over the Haussmannisation of Paris may be recommended to pay a visit to this undertaking, the like of which no city on the Continent can show. It would be a long story were we to dwell upon the engineering difficulties that have been overcome; and, besides, engineering difficulties in this age seem to be only made to be overcome. But it is worth observing that the Thames Embankment, and in connection with it the metropolitan main drainage works—two of the most gigantic civic undertakings ever undertaken—have been accomplished at a cost that is comparatively moderate in itself, and that has certainly pressed with no very serious weight on the inhabitants of London. The memories of men are short in this high-pressured age, and a nuisance is no sooner removed than it is straightway forgotten. But we may be allowed to remind ungrateful Londoners that the Thames, which is already a healthful, and may soon be a pleasant and silver stream, was, not many years ago, the fertile source of fever and cholera, and every summer the cry went forth—"What is to be done with it? How shall we purify it?" That problem has been solved. The river has been cleansed. A promenade along its banks is an agreeable summer excursion. Members of Parliament, on these hot July evenings, have clustered by the score on their river terrace, and Londoners generally will soon discover that the Thames Embankment is, or may be made, by providing trees, seats, &c., the coolest and most agreeable thoroughfare in London. But this could never have been felt, and the embankment itself could never have been constructed, if the ancient foulness of the river had remained. As it is, the breath of Father Thames is pure and sweet, and his votaries inhale it with pleasure. His waters are not altogether so limpid and clear as they might be; but we live in hope of better days even in that respect. The ugliness of this our "city of exigency" is so generally taken for granted, that one feels some diffidence in saying that the scene on the river yesterday had points of comeliness and beauty about it. But even at the risk of being accused of enthusiasm, we will venture to observe that, in spite of the "severe simplicity" of the opening ceremonial, there was something in the general aspect presented from the river side upon which the eye could linger with pleasure. That vast heap of buildings, that enormous congregation of tower and dome, and spire and chimney, as it spreads before you is in itself a sight that would strike eyes unaccustomed to it; and in the clear morning air of yesterday the picture was presented with unusual distinctness. The tide was high, the traffic on the river but little, so that the whole stretch of the embankment masonry was visible at a glance, in the full beauty of its bold sweeps and graceful outline. We predict that when the embankment is completed it will be not only an airy and convenient, but also a very picturesque thoroughfare.

The idea of embanking the Thames is no modern one. The names of Sir Frederick Trench and Mr. Martin, the painter, stand prominently forward amongst the earliest promoters of a general embankment of the Thames through the metropolis, the former having upwards of 40 years since suggested an embankment, with a roadway upon it, extending on the Middlesex shore between London and Westminster bridges, the latter having prepared a similar plan combining with his design a scheme for the interception of the sewage from the river. Subsequently, in 1840, Mr. James Walker prepared a plan for the Corporation, followed by Mr. Page and others at various subsequent dates. The line laid down by Mr. Walker, which differs but slightly from that of other promoters, has been approved and recommended by various Parliamentary committees and Royal commissions, until at length it received the sanction of Parliament. The frontage line to which a solid embankment should be carried out was fixed, and handed over in the form of an act to the Metropolitan Board of Works in 1862. The line of, and scheme for, the embankment of the south side of the Thames originated with the Metropolitan Board of Works, and an act for its construction was obtained in 1863. The designs for the Thames embankments, as now constructed, both on the north and south sides of the river, are entirely original, having been prepared for the board by their engineer, and approved and adopted by them. Those for the north side were completed, the contracts let, and the works commenced in February, 1864. The works for the south side were commenced in September, 1865. The northern embankment, which extends between Westminster and Blackfriars bridges is let in three contracts, the aggregate length being 6,640 feet, and the cost of the works, as tendered for, £875,500. The southern embankment extends from Westminster-bridge up the river towards Vauxhall-bridge, and a portion of the works consists in widening and a part in narrowing the river. The total cost of this contract is £309,000, the length of the roadway from Westminster-bridge to Vauxhall being 5,000 feet, and its width 60 feet. The footway from

Westminster to Lambeth-bridge in front of St. Thomas's Hospital was opened to the public in May last, and has been very much used by them since that date. The paved footway next the river, from Westminster-bridge to the Temple on the northern embankment, is 20 feet wide, with approaches to Villiers-street, Wellington-street, and Essex-street, Strand. The roadway will be 100 feet wide, including both footpaths, but it is not to be formed until after the Metropolitan District Railway Company shall have completed their railway, which will for a considerable length pass under the new roadway. The embankment road will be continued by a new street which is about to be formed from Blackfriars-bridge to the Mansion-house. About 37 acres of land have been reclaimed from the mud banks of the river by the embankment, and will be laid out in approaches, ornamental grounds and gardens, as soon as the railway works have sufficiently advanced to admit of the execution of such works. It is expected that the embankment and railway will be completed within a year from the present time. The engineer observes that causes of delay have hitherto arisen to which it may be unnecessary more particularly now to refer, but which the Metropolitan Board of Works have been unable to control. These have considerably retarded the progress of the work, but it is hoped that they have now all been surmounted, and that the works yet to be constructed will progress vigorously and satisfactorily.

When the visitors had finished their perambulations over the embankment, some guns were, upon a signal from Sir John Thwaites, fired, by way of informing the public that henceforth and for ever the thoroughfare is open to them, and the party of guests then proceeded, in two steamboats, down the river to North Woolwich, and thence by rail to Barking, to inspect the new Abbey Mills Pumping Station. As these works are extremely curious, a brief description of them will not be uninteresting. A prominent feature of the design for the main drainage of London is the attempt which has been made, as far as possible, to remove the sewage by gravitation, and thus to reduce the pumping to a minimum. It is, however, impossible for sewage to fall by gravitation for a distance of ten or twelve miles from districts which are lower than, or near the level of, the river, and yet at their outfall to be delivered at the level of high water without the aid of pumping. Thus it happens that all the sewage on the south side of the Thames, and the sewage of a portion of the north side, has to be lifted, and for this purpose there are four pumping stations, two on each side of the river. Of those on the south side, one is situate at Deptford Creek, of 500 nominal horse-power, and the other at the Crossness outfall, also of 500 nominal horse-power; the latter was opened by the Prince of Wales in April, 1865. Of those on the north side, the largest and most important is the Abbey Mills Station near to Bow, in the north-east district of London, which was viewed and in full operation yesterday. It is of 1,140 nominal horse-power. The fourth will be the smallest station, being of 240 nominal horse-power only, and situated at Pimlico. Its work is at present performed by a temporary engine. The permanent station awaits the formation of that part of the low level sewer which is to be constructed under the Chelsea Thames Embankment, the Act for which has just received the Royal assent. The Abbey Mills pumps lift the sewage of Acton, Hammersmith, Fulham, Shepherd's Bush, Kensington, Brompton, Pimlico, Westminster, the City, Whitechapel, Stepney, Mile-end, Wapping, Limehouse, Bow, and Poplar, representing an area of 25 square miles, a height of 36 feet from the low level to the high level sewers, whence it will flow on by the side of the high level gravitating sewers to the northern or Barking outfall, and thus it is there are no pumps at the northern as at the southern outfall. This station covers an area of seven acres, divided into two portions by the northern outfall sewer, which passes diagonally across it on an embankment raised about seventeen feet above the surface. A chance visitor to Barking—if chance visitors can ever be supposed to find their way to that singularly uninviting neighbourhood—would be astonished at finding that that smart but queer-looking building—something between an orphan school and a reformatory—was the Abbey Mills sewage pumping station. It is built in the form of a cross. The external parts are highly decorated, coloured bricks, encaustic tiles, stone dressings, and carved work being freely used. The engine-house and boiler-houses form one building, the former being, as we have said, in the shape of a cross, and the latter forming two wings to the north-eastern arm of the cross. The extreme dimensions of the building, taken across two of the arms, is 142 feet 6 inches, the width of each arm being 47 feet 6 inches. Each of the two boiler-houses measures 100 feet in length by 62 feet in width; and there is a workshop situate between the two, measuring 49 feet 6 inches by 33 feet. The engine-house consists of four storeys in height, two of which are below and two above the surface of the ground; the height of the two lower storeys being 38 feet and that of the two above ground, measured from the engine-room floor to the apex of the roof, being 62 feet. In the centre, or intersection of the four arms of the cross, the building is covered by a cupola of an ornamental character, rising to a height of 110 feet from the engine-room floor. The chimney shafts, of which there are two, one on each side of the engine-house, are 209 feet in height and eight feet internal diameter throughout. They correspond in style with the main building, and are similarly enriched with coloured bricks and stone dressings, and are capped at the top by an ornamental cast-iron roof, pierced with openings for the egress of the smoke. The foundations of brickwork and concrete extend to a depth of 35 feet below the finished surface. The engines are eight in number, each of 142-horse power, and are arranged in pairs, each arm of the building containing one pair placed parallel to each other lengthwise of the arms, having the fly-wheels at the entrance end, and the cylinders at the inner end of the arm, so that the eight steam cylinders are arranged symmetrically round the centre of the building under the dome. The diameter of steam cylinder is 4 feet 6 inches, and the length of stroke 9 feet; the diameter of the sewage pumps, of which there are two to each engine, being 3 feet 10½ inches, and their stroke 4 feet 6 inches. The maximum quantity of sewage and rainfall which it is estimated these engines will have to lift is 15,000 cubic feet per minute. The sewage is brought into the pump well, which forms the lowest storey of the building, from the low level sewer, but, before admission, is strained of any extraneous matters which may be brought down with it, and which would either not pass or be detrimental to the pump valves, by means of cages of wrought-iron bars, which are placed in chambers in front of the engine-house, and which are capable of being lifted and emptied when full. The building containing the machinery and appliances for this purpose stands in front of the centre of the engine-house, and from the chambers beneath it are three sewers conveying the sewage, after being strained, to the pump wells in three of the arms of the engine-house. From the sewage well the water is lifted through rectangular cast-iron pipes, situate at the sides of the building, into the sewage pumps, and it is from them forced through cast-iron cylinders 6 feet in diameter, running along the centres of three of the arms of the building, and below the engine-room floor into an air vessel in the centre of the building, whence the sewage lifted by the six engines is forced through a similar cast-iron cylinder 10 feet in diameter, carried along the centre of the fourth arm of the building, and into which the sewage from the pumps situate in this arm is also discharged, the whole being forced through a cast-iron cylinder 10 feet 6 inches in diameter, carried from the engine-house through the yard into the outfall sewer, arrangements being made at

its junction therewith for regulating the discharge. The reservoir for the storage and purification of the water for the use of the boilers and for condensing purposes is situate on the opposite side of the embankment of the northern outfall sewer. It is constructed mainly of concrete, is 18½ feet in depth, and covers an area of about one acre, which is divided into three compartments, each compartment being used in turn as a settling pond, and containing about one million gallons.

It would be too much to suppose that one out of twenty of the visitors to the pumping-station yesterday was capable of appreciating the marvellous mechanical contrivances that he saw in operation; but they witnessed enough to impress them with a deep sense of the rare ability and skill with which Mr. Bazalgette and his assistants have accomplished the task set before them. The least instructed among us cannot but remember that, as the engineer-in-chief modestly states, the waters of the Thames during the present summer, though one of unprecedented heat and drought, have been entirely free from smell, and its banks from those accumulations of sewage deposit which formerly rendered them so offensive and dangerous. This great result is patent to us all; and the elaborate machinery by which it is accomplished impresses the mind with a sense of deep wonder and admiration. You stand in the centre of the building, around you eight huge beams are working up and down, eight immense wheels revolving round and round. Day and night the incessant work proceeds; and every minute ten, or it may be fifteen thousand cubic feet of London rainfall and sewage is being lifted.

The inspection of the machinery was followed by a luncheon, in a tent that had been raised for the occasion. Sir J. Thwaites was in the chair. The repast, liberally furnished by the Board of Works, having been done full justice to, some toasts suitable to the occasion followed. "The Health of the Chairman" was proposed by Lord J. Manners. Lord Ebury's name was associated with the toast of "The House of Lords," and Lord J. Manners with that of "The House of Commons." Mr. Bazalgette had his health very cordially drunk, and Mr. Tite also had to acknowledge a similar compliment.—*Standard.*

Manufactures.

British Factories.—According to the latest official return (1862), there were in the United Kingdom 6,378 textile factories, of which 5,652 were situated in England and Wales, 568 in Scotland, and 158 in Ireland. There were in these factories 36,450,000 spindles, 490,866 power looms, 230,546 power loom weavers, and 2,163 gigs; the total amount of power being 375,292 horses steam and 29,339 water. The hands employed in these were 775,534, of whom 467,261 were females. The different factories were thus distributed:—

	England and Wales.	Scotland.	Ireland.
Cotton	2,715	163	9
Woollen	1,456	184	39
Worsted	512	17	3
Flax	136	163	100
Hemp	3	2	—
Jute	4	27	5
Hosiery	65	4	—
Silk	761	8	2
Total	5,652	568	158

Commerce.

Coal Production of Calais.—From 1851 to the end of 1866, 10,000,000 tons have been obtained from these mines; 6,500,000 tons have been raised since 1862, in which year the communication was completed with the canals and lines of railways in the north of France. In 1866, the total quantity obtained was 1,621,400 tons, or about one-seventh of the total produce of France. Each of the five mines of Lens, Counières, Noeux, Grenay, and Dourgis (the oldest), contributes about 100,000 tons annually; Lens in particular nearly 400,000 tons. These five give two-thirds of the whole produce of the district. The remaining twelve mines are of modern date, and are less favourably situated with respect to canal or railway communication. As regards the quality of this coal, it is certainly more suited to manufactories than to household purposes. Nevertheless it furnishes seven-tenths of the total consumption of coal in the department, which is about 925,000 tons. Independently of a population of 750,000, the numerous manufactories in this part of France have naturally benefited largely from the proximity of these coal fields. These manufactories consist of 76 sugar mills, 22 distilleries, 18 silk and flax mills, &c. The price of this coal, even in the neighbourhood of the pits, is maintained at from 18 to 20 francs per ton, a high price considering what is paid in England in similar localities. This, however, is explained by the fact that there is no fear of competition with the English coal, the price of which would be nearly, if not quite, double that of the French coal in the neighbourhood of Douai, &c.

Export of Yeast.—Although we receive a good deal of dried yeast from Hamburg and other quarters, there is a large demand for English yeast in France. Last year it was shipped chiefly by way of Calais, instead of by Boulogne and Dunkerque as hitherto. This yeast is forwarded to the distilleries of Lille, Seclin, Dondi, and Valenciennes. It appears that French yeast is much inferior to the English, and in addition is double the price. When we consider that there are upwards of 38,000 brewers in the United Kingdom, the trade in yeast must form an important item of home consumption.

Colonies.

Melbourne Agricultural Statistics.—The wheat crop last year was 3,489,893 bushels, a decrease of 1,151,312 bushels on the yield of the previous year, and affording little more than five bushels per head to our population, while the decrease in the oat crop was not far short of 60,000 tons. Only 41,355 acres additional were brought under tillage in 1867, against 84,799 acres in the previous year.

Preserved Meat.—A tank of meat preserved by the Victorian Company has been examined. It has been lying in store at Melbourne for about three months, and was about being shipped to England. The tank contained about two tons of mutton. The carcases of the sheep had been boned, slightly salted and spiced, rolled in linen cloths, and then packed in the tank. The meat was thoroughly tested, and pronounced to be in excellent order, and a most marketable article. The portions of the carcases prepared in this way were cut through and tasted, and the flavour was delicious. It is said that meat thus cured can be landed in London markets at such a price as to give the shopkeepers a fair profit if retailed at 5d. per lb.

Woollen Manufacture.—The first auction sale in the colony of Victoria of locally-made woollen cloth took place a day or two ago, at Geelong, when 7,400 yards of cloth made at the Geelong Woollen Company's works were offered for competition. There was a large attendance of the trade from Melbourne, Geelong, and Ballarat. There were altogether 315 lots offered for sale. The bidding was spirited, and as much as 16s. a yard was realized for some lots. The prices ranged from 5s. 3d. to 9s. for single widths, and from 13s. to 16s. for six quarters. This is a great deal higher than the English cost, or

probably than the cloth is intrinsically worth. The quality and material are said to be very fair and creditable for a first production. Altogether nearly £3,000 was realised.

Publications Issued.

Dessins Originaux des Grands Maitres. Photographs by M. Adolphe Braun, of Dornach, Haut Rhin. A highly-interesting portfolio of photographic reproductions in pigment printing of designs by the old masters, belonging to the various museums in Europe. The work includes nine hundred designs from the Louvre, eleven hundred pieces from the Albertine of Vienna, one hundred and fifty pages from the collection of the Grand Duke of Saxe Weimar, and several hundred drawings from the little-known Uffizi Collection, at Florence. M. Braun has lately produced, at Milan, copies of the Ambrosienne entire, with the eighty drawings by Leonardo de Vinci, and the cartoon of Raphael's "School of Athens;" at Venice he has reproduced more than three hundred of the designs in the Academy of the Beaux Arts; at Florence he has photographed the most remarkable examples of sculpture, ancient and modern. M. Braun announces that he intends shortly to explore the artistic treasures of England.

Artistes et Rapins. By Louis Leroy, Le Chevelier, Paris. An amusing satire on the peculiarities of the world of art, by a clever writer.

Forthcoming Publications.

Dictionnaire Général des Artistes de l'Ecole Française depuis l'origine des arts du dessin jusqu'à l'année 1868 inclusivement (architectes, peintres, sculpteurs, graveurs et lithographes). Par Emile Bellier de la Chavignerie. A work just announced to appear, from the pen of a practised critic. Every French artist whose works have been three times admitted by an exhibition jury, is admitted into the dictionary, and the principal critics and writers on art are also included.

Notes.

Chinese Museum.—A large number of Chinese works and curiosities have been imported into France of late years, and the Louvre now includes a Chinese museum; an immense number of specimens are also distributed over the various palaces; and it is said that the Empress has determined to have them all collected at Fontainebleau, where a Chinese museum already exists.

Passenger Traffic with France.—The passenger traffic at Calais in 1867, as might have been expected from the circumstance of the Paris Exhibition, was greater than in any previous year, reaching nearly 200,000 persons, against 125,532 in 1866. It is, however, worthy of remark that whereas in 1862, the year of the London Exhibition, 30,586 more passengers passed through Boulogne than through Calais, in 1867 about 47,000 more passengers passed by Calais than by Boulogne. The number of passengers who passed through the other parts in 1867 was, Boulogne, 153,000; Dieppe, 88,000; and Havre, 16,177.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 28th July, 1868.

367. East India (Rangoon and Western China)—Despatch.
443. Tea Licenses—Return.
451. Foreign Cattle—Return.
Post-office—Thirteenth Report of the Postmaster-General.

Delivered on 29th July, 1868.

254. Bill—Public Schools (Lords Amendments).
255. „ Sale of Poisons and Pharmacy Act Amendment (Lords Reason for disagreeing to one of the Amendments made by the Commons).
454. Natal—Judgments.
Railways (Ireland)—Sections, &c.
Fisheries (Ireland)—Report of Special Commissioners.
Treaty of Navigation (England and Austria).

Patents.

From Commissioners of Patents' Journal, July 31.

Grants of Provisional Protection.

Advertising apparatus, &c.—1008—H. A. Bonneville.
Anchors, fishing—2191—F. R. A. Glover.
Boilers, &c., joints in—2181—W. R. Oswald.
Bookbinding apparatus—2217—J. Cope and J. Bradbrook.
Book slides—2209—G., G. W., and J. Betjemann.
Caps or bonnets—2197—R. Mackie.
Carriages—2092—J. Randall and W. R. Crabb.
Cartridge shells and heads—2062—A. H. Brandon.
Chaff-cutters—2165—J. Prest, W. Mather, and W. Doherty.
Chimney tops and ventilators—2149—J. Thomson.
Drawings in crayon, &c., fixing on paper—2171—E. Rouget.
Driving bands, &c.—2167—A. J. Le Blanc.
Fabrics, &c., bleaching—2214—J. Bastow.
Feathers, artificial flowers, &c., ornamenting—2161—C. D. Abel.
Fire-arms—2169—T. Kerr.
Fire-arms, breech-loading—2222—W. Payton.
Fish slices, &c.—2215—E. F. Kittoe.
Forts, &c., constructing—2155—T. R. Crampton.
Furnace bars, moving—2226—H. Lawrence.
Gas tubing, &c., india-rubber—2159—T. J. Mayall.
Hemp, &c., spinning—2064—A. H. Brandon.
India-rubber, gutta-percha, &c.—2175—T. J. Mayall.
Iron floors and ceilings, filling the spaces between the beams of—2188—G. Davies.
Iron, &c.—2207—A. Munro and W. B. Adamson.
Lamps—2232—J. H. Johnson.
Locks—2199—C. E. Brooman.
Looms—2183—A. M. Clark.
Looms—2242—J. C. Ramsden.
Mills for grinding bones, &c.—2216—J. Booth.
Phosphates of lime, treating—2157—A. P. Price.
Photography—2201—E. Edwards.
Presses for the expression of oil, &c.—2234—T. Cook.
Pumps, &c.—2195—J. S. Nibbs.
Railway carriages, &c.—2218—T. Wood.
Railway rails, old, utilising—2187—C. E. Brooman.
Salts of ammonia—2136—A. McNeil and W. Wheaton.
Ships, propelling—2213—J. and J. M. H. Taylor.
Shirt fronts—2236—J. L. Macfarlane.
Studs and buttons—2189—J. Jefferys.
Sulphate of lead—2116—J. B. Gregson.
Wool, &c., dyeing—2203—W. J. Hanson.

Inventions with Complete Specifications Filed.

Glue—2368—W. R. Lake.
Zinc, separating from the argentiferous alloys obtained in the separation of silver from argentiferous lead by means of zinc—2340—C. D. Abel.

Patents Sealed.

314. C. Riley.	407. J. T. White.
355. D. Murray.	463. G. Seamer.
360. J. and W. Weems.	578. L. M. Becker.
362. J. Combe and J. Barbour.	600. S. Firth.
363. J. M. Domenech and F. P. Jonte.	603. R. Heathfield.
366. C. Richardson.	646. J. Perrett.
372. R. A. Jones.	1293. W. Gorse.
387. T. W. Walker.	1767. H. Haines.

From Commissioners of Patents' Journal, August 4.

Patents Sealed.

390. R. J. Jones.	532. J. and J. Hinks.
392. M. P. W. Boulton.	533. A. M. Clark.
398. J. Hay.	582. M. A. F. Mennons.
401. A. E. Borgen.	686. C. Sanderson.
410. C. Brakell.	829. J. Wallis.
411. W. Tongue.	959. E. D. Johnson.
419. W. Hann.	973. S. Holmes.
427. P. Rothwell.	1229. A. and L. Braham.
431. W. Richardson.	1793. W. R. Lake.
433. J. Key and E. Hoskins.	1827. D. Foster.
476. R. C. Ross.	1943. W. R. Lake.
505. J. S. Raworth.	

Patents on which the Stamp Duty of £50 has been Paid.

1964. E. Sabel.	1980. A. V. Newton.
1962. F. A. Abel.	2138. G. Howard.
1977. J. Lawson and E. G. Fitton.	2034. H. C. Baudet.

Patent on which the Stamp Duty of £100 has been Paid.

1884. C. E. Amos and J. Francis.

Journal of the Society of Arts.

FRIDAY, AUGUST 14, 1868.

Announcements by the Council.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans. Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

PROGRAMME OF EXAMINATIONS FOR 1869.

PRELIMINARY NOTICE.

I. The Examinations described herein have been established for the benefit of the members and students of Institutions in Union with the Society of Arts. Such persons are commonly mechanics, artisans, soldiers,* labourers, clerks, tradesmen and farmers in a small way of business, apprentices, sons and daughters of tradesmen and farmers, assistants in shops, and others, of various occupations, who are not graduates, undergraduates, nor students of a University, nor following nor intending to follow a learned profession, nor enjoying nor having enjoyed a liberal education. To all such members and students in the Institutions, and to other persons of the like condition, male and female, the Examinations, certificates, and prizes, described in this programme, are open on the general conditions stated herein. Persons, however, who are, or have been, professional teachers or pupil teachers; persons who either are enjoying or have enjoyed a liberal education, or who occupy a higher position in society than those above described, may obtain certificates, but cannot compete for the prizes, of which particulars are given on pages 683 and 684.

II. The certificates are not competed for. They are awarded as records of positive, not comparative, attainment. The prizes are competed for.

III. For the conditions on which persons of a higher grade in society may be examined and receive certificates, but not compete for prizes, see paragraph 4 (D).

IV. The Candidates for Examination have not to go to a distance from their homes. The Examinations are held in all places in the United Kingdom where a Local Educational Board connected with the Society of Arts is willing to make the requisite arrangements.

V. For a list of the Local Boards already formed, see page 685.

VI. For instructions as to the formation of Local Boards and their duties, see page 676.

The EXAMINATIONS are—

(1.) The Previous Examination by District Unions and Local Boards for ascertaining the fitness of Candidates to present themselves at the final Examination.

(2.) The Final Examination by the Society of Arts' Board of Examiners, under the supervision of the Local Boards.

PREVIOUS EXAMINATIONS BY DISTRICT UNIONS AND LOCAL BOARDS.

1. The object of these examinations is to "sift" the Candidates for the Final Examinations, so as to keep back (1) those who are not fairly grounded in the elements of education—spelling, writing, and arithmetic—and (2) those who are not fairly acquainted with the subject or subjects in which they desire to be examined by the Society of Arts, and are therefore unlikely to succeed in that Examination. The sifting in the above-named elementary subjects may be effected at the discretion of

* The following circular memorandum (Gen. No. 331), addressed to the army at home, has been issued :—" Miscellaneous 1 (1865).—The Field-Marshal Commanding-in-Chief, desires it to be notified that there will be no objection to soldiers, their wives, and families, being permitted to present themselves for instruction and examination at the Educational Institutes in connection with the Society of Arts, on the understanding that they are not on that account to be exempt from any military duty, nor, except in special cases, to be out of barracks after watch-setting or tattoo.—By command of his Royal Highness the Field Marshal Commanding-in-Chief, James Yorke Scarlett, Adj. Gen.—Horse Guards, S.W., 11th March, 1866.

the Local Boards; they should examine their Candidates in spelling and writing by dictating to them a passage from an English author for them to write down; in arithmetic by setting them moderately easy questions to work out in the usual manner. The best mode of sifting the Candidates in the special subjects in which they desire to be examined by the Society of Arts is for the Local Boards to examine them therein by means of printed (or written) questions and written answers; but, where a Local Board finds itself without the means of conveniently holding such an Examination in any special subject, such Board may satisfy itself in any other mode, and state simply that it has satisfied itself, that the Candidate is fit to be examined by the Central Board in that subject.

2. The Previous Examinations must be held sufficiently early in the year to enable the proper returns to be made, as explained in par. 6.

FINAL EXAMINATION BY THE SOCIETY OF ARTS.

3. No candidate can be admitted to the Final Examination unless duly returned by a District Union or Local Board as having passed a Previous Examination.

4. Every admitted Candidate must be at least 16 years of age.

(A.) Members of, or students of classes in, Institutions in Union with the Society of Arts, are examined .. .. Free.

(B.) Members of, or students of classes in, Small Institutions,* not in Union with the Society of Arts, but subscribing one guinea a year for admission to the Examinations alone, are examined .. .. Free.

(C.) Members of, or students of classes in, "Small Institutions"* not in Union with the Society of Arts, but connected with it through a District Union or Local Board, are examined on payment of a fee of .. .. 2s. 6d.

N.B.—It will be understood that Candidates coming under the heads *(A)*, *(B)*, or *(C)* must not be of a higher class in society than those described in par. I. of the Preliminary Notice.

(D.) Persons of a higher class of society than those described in paragraph I. (Preliminary Notice), cannot compete for prizes, but may be examined for certificates on payment of a fee of .. .. 5s.

5. The Council in every case require the Local Boards to certify whether a Candidate should pay this higher fee; and it is earnestly hoped that in any instance where a Local Board has reason to believe that a Candidate is or has been a teacher, or that he or his parents occupy such a position in society, or are in such easy pecuniary circumstances as to disqualify him, according to the regulations, for competing for a prize, they will at once, in case of certainty, return him as not competing for a prize, or in case of doubt, communicate with the Secretary of the Society of Arts.

6. A copy of Form No. 2 will be forwarded to the Secretary of each Local Board, and must be filled up and returned to the Secretary of the Society of Arts before the 18th of March. The requisite number of forms No. 4 will then be forwarded, and these, when filled up, must be returned not later than the 3rd of April. Each of these forms, when returned, will be numbered at the office of the Society of Arts, and a card for each candidate, with his name and his number, will afterwards be forwarded to the Secretary of the Local Board for distribution, together with copies of the time-table.

7. The printed papers of questions in the various subjects will be afterwards forwarded to the Secretary of the Local Board; details as to the mode in which the Final Examination is to be conducted are contained in the Letter of Instructions (Form No. 6), and members of the Local Boards should make themselves thoroughly acquainted with them.

8. When the Candidates' papers have been submitted to the judgment of the Society's Examiners, certificates of three grades will be awarded, and the names of the Candidates who obtain prizes and certificates will be afterwards published in the *Journal of the Society of Arts.*

9. A Candidate who has obtained from the Society a certificate of the 1st class in any subject cannot again be examined in the same subject; but a Candidate who has obtained a certificate of the 2nd or 3rd class may, on the recommendation of the Local Board, be examined in the same subject, in a subsequent year, without again passing the Previous Examination.

10. A Candidate who, having obtained a certificate in any subject, desires to be examined in some other subject, in a subsequent year, may be "passed" by the Local Board, after an examination in that subject, without re-examination in the elementary subjects; but, in all cases, the name must be returned in the proper form.

11. Particulars of the subjects for the Final Examination are given below.

12. The Time-table has been drawn up to meet the general convenience of the Candidates; and *no variation* of it can *possibly* be allowed, so that, in choosing the subjects in which they desire to be examined, Candidates must take notice of the arrangements of this Time-table, as they *cannot* be examined in *two* subjects which are set down for the same evening. The days and hours of Examination must be *strictly* adhered to.

13. The Examiners will reject all ill-written, ill-spelt, ill-composed, or ungrammatical papers that may be laid before them.

Time-Table for 1869.

Tuesday, 27th April, From 7 to 10 p.m.	Wednesday. 28th April, From 7 to 10 p.m.	Thursday. 29th April, From 7 to 10 p.m.	Friday. 30th April, From 7 to 10 p.m.
Arithmetic.	Book-keeping.	Metrical System.	Geometry.
Trigonometry.	Navigation.	Mensuration.	Principles of Mechanics.
Magnetism and Electricity.	Conic Sections.	Algebra.	Botany.
Light and Heat.	Chemistry.	Practical Mechanics.	Geography.
Mining and Metallurgy.	Theory of Music.	Political Economy.	Latin.
Practical Geometry.	Domestic Economy.	French.	Logic & Mental Science.
German.	English History.	†English Literature.	Spanish.
Floriculture.	Italian.	Fruit and Vegetable Culture.	Animal Physiology.
Musical Composition. (Tonic Sol-fa.)	Civil Government.	Freehand Drawing.	Mechanical Drawing.

† Two papers of one hour and a half each in this subject are considered as one.

LOCAL EDUCATIONAL BOARDS.

14. Local Boards may be formed wherever the managers of Institutions, or other persons, may be prepared to cooperate with the Society of Arts.

15. Each Local Board must consist of at least three members, and must have a Chairman and a Secretary. The district for which the Board is to act should be defined, and the composition of the Board must be such as to command the respect and confidence of the neighbourhood. No member or officer of a Local Board can be admitted to examination.

16. The duties of Local Boards may be defined as follows:—

(A.) To give publicity to the system of Examinations by the circulation of the programmes, hand-bills, &c. (copies of these will be furnished *gratis* on application), and to give encouragement and advice to those young persons who are likely to become candidates.

(B.) To hold the Previous Examinations.

(C.) To superintend the Final Examinations.

* Small Institutions are defined as those which have an income of less than £75 a year.

17. Local Boards make no payment to the Society, unless they exercise the power of admitting candidates who are not members of any Institution in Union with the Society of Arts (see par. 4 *C.*) ; in which case a subscription of one guinea a year must be paid.

18. A detailed list of each Local Board (giving the exact address of the Secretary) must be submitted to the Council of the Society of Arts before the 1st of February, 1869, when the general list of such Boards will be published; and where a Local Board comprises so large a district that, for the convenience of the candidates, Branch Local Boards have to be formed, lists of these must also be given. All changes in the composition of the Boards must be notified to the Society of Arts.

19. N.B.—Local Boards may also usefully direct their attention to the holding of Preparatory Examinations in Elementary Subjects, either upon the system described at page 687, or upon any other system that they may prefer.

SUBJECTS FOR THE FINAL EXAMINATION IN 1869.

⁂ In consequence of less than six Candidates having been Examined at the last Examination in the following subjects:—Conic Sections, Navigation and Nautical Astronomy, Mining and Metallurgy, and Italian, the Council have determined that no Examination can be held in any of these subjects in 1869, unless they receive intimation, before the 1st February, that at least six Candidates are preparing to present themselves for Examination in such subjects.

20. In the following paragraphs will be found brief outlines of the subjects in which candidates may be examined, and their attention is especially drawn to this part of the Programme. In many instances the Examiner has set down certain Text-books ; but, in most cases, a candidate may exercise his own judgment as to what Text-book he uses; real knowledge, however or wherever acquired, will be accepted by the Examiners. In the following subjects, however, Political Economy, Civil Government, English History, English Literature, Logic, Latin and Roman History, French, German, Italian and Spanish, the course of study is necessarily prescribed with more or less exactness.

I.—Arithmetic.

Examiner.—Rev. Alexander Wilson, M.A., National Society, London.

21. Practice—Simple and Compound Proportion—Interest—Discount—Insurance—Vulgar and Decimal Fractions ; with the principles of a Decimal Notation in money on the basis of a pound unit.

22. The questions framed from the preceding syllabus will consist mainly of practical problems, and the Examiner will take into account not only the correctness of the answers, but also the excellence of the methods by which they are worked out, and the clearness and neatness of the working, *which must always be shown.*

23. Text Books :—Any of the modern treatises on Arithmetic, such as Hunter's Text Book *(National Society)*, Colenso *(Longmans)*, or Barnard Smith *(Macmillan)*.

II.—Principles and Practice of the Metric System.

Examiner—W. Fletcher Barrett, Esq., Lecturer on Physical Science at the International College.

24. Candidates will be required to have some knowledge of the history and philosophy of the Metric System; why the metre was selected as the basis; the places and possessions where this system is already in use; reasons for the general adoption of the Metric System. They will have to be acquainted with the manner in which the units of weight, capacity, and surface are derived from the metre; and should be able readily to convert the multiples and divisions of the fundamental units into English equivalents. Problems will be given on the application of the Metric System to the calculation of the volumes and weights of liquid or solid masses, the dimensions and specific gravity of which are stated; and also on the determination of the relative and absolute weight of any gas in any given vessel.

25. Candidates may obtain special information on this subject by reading chapter 8 in Dr. Hofmann's "Modern Chemistry" (*Walton and Maberly*), or consulting the publications of the International Decimal Association.

III.—Book-keeping by Double Entry.

Examiners.—John Ball, Esq., of the firm of Messrs. Quilter and Ball, and Robert G. C. Hamilton, Esq., Principal Accountant to the Committee of Council on Education.

26. Candidates should be prepared to answer questions as to the nature and use of the different books usually kept in a merchant's office ; to journalise a series of transactions from a waste book, and having posted the entries to the ledger, to balance the accounts, to prove the correctness of the postings by a trial balance, and finally to exhibit an account of profit and loss, and a balance sheet.

27. Text Books:—Rudimentary Book-keeping *(Weale's Series)*. Kelly's Elements of Book-keeping *(Simpkins and Co.)*. Examination-Questions in Book-keeping by Double Entry, by the Rev. J. Hunter, M.A. *(Longmans)*.

IV.—Algebra.

Examiner.—Rev. T. P. Hudson, M.A., Fellow and Tutor of Trinity College, Cambridge.

28. Elementary Operations and Fractions. Simple and Quadratic Equations and Problems leading to them. Involution and Evolution. Surds. Arithmetical, Geometrical, and Harmonic Series. Combinations and Permutations. Binomial Theorem. Scales of Notation. Interest and Annuities. Elementary Theory of Probabilities.

29. Text Books :—Todhunter's Algebra (*Macmillan*), Colenso's Algebra (*Longmans*), Lund's or any other modern treatise on Algebra.

30. The Examiner, referring to last year's papers, says :—"It would in my opinion be advisable that the candidates in future examinations should be cautioned against sending up mere results without giving the working by which they are obtained."

V.—Geometry.

Examiner.—Rev. B. Morgan Cowie, M.A., Professor of Geometry at Gresham College ; one of H.M. Inspectors of Schools.

31. To obtain a first-class certificate, at least six problems and four propositions must be correctly done ; to obtain a second-class, at least four problems and six propositions.

32. Text Books :—Euclid, Books I., II., III., IV., VI., XI., as far as Prop. 21. Potts' smaller edition (*Parker*). Green's Euclid's Plane Geometry, practically applied, is a useful help to those who are studying by themselves (*Heywood*, Manchester ; *Simpkin, Marshall, and Co.*, London).

VI.—Mensuration.

Examiner.—John Sykes, M.A., Assistant-Secretary to the Committee of Council on Education.

33. The calculation of the areas and circumferences of plane figures bounded by arcs of circles or right lines, and solid contents of cones, cylinders, spheres, &c. Candidates will be expected to be familiar with the different rules for measuring and estimating artificers' work, such as joiners', bricklayers', masons', and plumbers' work, and to be able to prepare estimates of such work from given quantities.

34. Text Books :—Lund's Mensuration, Part III. of his Elements of Geometry and Mensuration. Tate's Mensuration. Young's Treatise on Mensuration (*Simms and M'Intyre*).

35. The Examiner, in speaking of last year's work, says :—"The paper has been very well done by most of

the candidates, if we except the questions on the mensuration of solids. Very few have shown themselves to be 'familiar with the different rules for measuring and estimating artificers' work.' "

VII.—Trigonometry.

Examiner.—Rev. T. G. Hall, M.A., Professor of Mathematics in King's College, London.

36. In Plane Trigonometry, the formulas for the trigonometrical functions of angles, the numerical solution of plane triangles, the use of logarithmic tables, and angular and exponential series.

37. Text Books:—Snowball's or Todhunter's Trigonometry, Trigonometry for Schools (*Christian Knowledge Society*), or any other of the modern treatises on Trigonometry. Mathematical Tables (Chambers' Series).

VIII.—Conic Sections.

Examiner.—Rev. Bartholomew Price, M.A., F.R.S., Sedleian Professor of Natural Philosophy in the University of Oxford.

38. The properties of the three curves treated geometrically; also as deduced from the cone. The principles of projection, orthogonal and central, applied to derive the properties of the conic sections from those of the circle.

39. Analytical conics, including the equations of the straight line, the circle, the three conic sections, and the general equation of the second degree.

40. Text Books:—Drew's Conic Sections (*Macmillan*). Taylor's Conic Sections (*Macmillan*). Salmon's Conic Sections (*Longmans*). Todhunter's Conic Sections (*Macmillan*). Puckle's Conic Sections (*Macmillan*)

*** Candidates intending to be examined in this subject should request the Secretary of their Local Board to communicate such intention to the Secretary of the Society of Arts, before the 1st February. (See notice at page 677).

IX.—Navigation and Nautical Astronomy.

Examiner.—Rev. Joseph Woolley, LL.D., Director of Education for the Admiralty, and Inspector-General, Royal School of Naval Architecture and Marine Engineering, South Kensington Museum.

41. A good knowledge of Plane and Spherical Trigonometry, of the definitions and terms used in Nautical Astronomy and of the various measurements of time and their mutual conversions will be required, as well as skill in the use of logarithmic tables, and neatness, order, and accuracy in the numercial solutions of problems.

42. The candidate should understand the construction of charts; the nature and laws of circular storms; great circle sailing, &c.; the methods of determining the latitude, longitude, variation of the compass, and error and rate of a chronometer by astronomical observations, with the demonstrations of the formulæ employed; the use of nautical astronomical instruments, &c.

43. Text Books:—The Nautical Almanac (*Murray*). Riddle's Navigation and Nautical Astronomy (*Law*, Essex-street).

44. N.B.—Candidates in this subject should be allowed the use of the Nautical Almanac for the current year and Tables *during the Examination.*

*** Candidates intending to be examined in this subject should request the Secretary of their Local Board to communicate such intention to the Secretary of the Society of Arts, before the 1st February. (See notice at page 677.)

X.—Principles of Mechanics.

Examiner.—Rev. Jonathan Bates, M.A., late Fellow of Gonville an Caius College, Cambridge.

45. The properties of matter, solid, fluid, and gaseous.

46. Statics: The composition, resolution, and equilibrium of pressures acting on a material particle, and on constrained particles; machines; attractions.

47. Dynamics: The laws of motion; impact, projectiles; constrained motion; central forces; oscillation.

48. Rigid Dynamics: Motion of a rigid body about a point;—of a free rigid body;—of a system of rigid bodies.

49. Hydrostatics: Pressures of fluids; equilibrium of floating bodies; specific gravity; elastic fluids; machines; temperature and heat; steam; evaporation.

50. Hydrodynamics: Motion and resistance of fluids in tubes, &c.; waves and tides.

51. Pneumatics: Mechanical properties of air; the barometer, and other machines illustrating the mechanical properties of air.

52. Text Books:—Todhunter's Statics, or Parkinson's Mechanics. Goodwin's Mathematics. Miller's, Phear's, or Besant's Hydrostatics. Webster's Theory of Fluids. The treatises on these subjects in Orr's Circle of the Sciences. Golding Bird's Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks of Natural Philosophy. Tate's Examples in Mechanics. Baker's Statics and Dynamics (*Weale's Series*). Twisden's Practical Mechanics. Rankine's Applied Mechanics. Rankine's Steam Engine and other Prime Movers.

53. The Examiner, in his report on the work last year, says:—"I regret to observe that many of the candidates have scarcely appreciated the gravity of the examination, for they are either apparently unfit to pass it, or have not bestowed sufficient study in order to master the first principles of the subject on which questions, for the most part of no very high order, but suited to test a respectable acquaintance, have been submitted to them."

XI.—Practical Mechanics.

Examiner—T. M. Goodeve, Esq., Professor of Mechanics at the Royal Military Academy, Woolwich.

54. The applications of the principles of Mechanism to Simple Machines. The Steam Engine.

55. Text Books:—Bourne's Catechism of the Steam Engine (*Longmans*). Scott Russell on the Steam Engine. Nasmyth's Elements of Mechanism, with remarks on Tools and Machinery (*Weale*). Goodeve's Elements of Mechanism, second edition (*Longmans*).

XII.—Magnetism and Electricity.

Examiner.—Charles Brooke, Esq., M.A., F.R.S., Pres. M.S.

56. Construction and Properties of Magnets; Magnetic Instruments; Terrestrial Magnetism; the Mariner's Compass and its deviations in iron ships; Diamagnetism.

57. Franklinic Electricity; Voltaic Electricity; Electro-metallurgy; Electro-dynamics; Electro-telegraphy; Thermo-Electricity; Organic Electricity.

58. Text Books:—Elements of Natural Philosophy, by C. Brooke (*Churchill*). Lardner's Handbooks of Natural Philosophy (*Walton and Maberly*). Ganot, Elements of Physics (translated). Jamin, Cours de Physique, Becquerel, Traité de l'Electricité et de Magnétisme.

59. The Examiner, in his report on last year's papers, says:—"The Electric Telegraph, and especially its mechanism, being the most important practical and commercial bearing of the whole subject, has not generally met with the attention to which it is entitled."

XIII.—Light and Heat.

Examiner.—Richard Potter, Esq., A.M., late Professor of Natural Philosophy and Astronomy in University College, London.

60. What is the sense of sight?—ancient theories—modern definitions and hypotheses of the nature of light—the especial privileges of animals which possess organs of vision—the simple laws or properties of light required to be known before we can discuss the structure of the eye, and the construction of telescopes, microscopes, and other optical instruments—what are foci of pencils of rays—how formed by reflection and refraction—real and virtual foci—optical images real and virtual—how do they occur in optical instruments.

61. Why do we distinguish between Physical and Geometrical optics?—what are double refraction of light—polarization of light—interference of light—examples of these properties, how shown—phenomena of recurring

colours—examples—how are explained the colours of the soap-bubble—the colours seen on looking towards a light through the feathers of small birds—the colours of mother-of-pearl—the rainbow, &c., &c.—the laws of the interference of polarized light—to describe cases of these splendid phenomena.

62. What are the definitions of heat, radiant, latent, and sensible?—What is meant by caloric?—hypotheses of the nature of heat—capacity of bodies for heat—the temperature of bodies—how measured by instruments—descriptions of thermometers and pyrometers—the scales of thermometers—how compared—how the volumes of solids, liquids, and gases depend on their temperature—absolute zero of cold—elastic force of vapours and gases produced by heat employed in steam and air engines—winds from the unequal heat of the atmosphere. What are the connexions and analogies of heat and light?

63. Text Books:—The Library of Useful Knowledge. Brewster's Optics (Cabinet Cyclopædia). Potter's Physical Optics, the descriptive and experimental treatise or first part (*Walton and Maberly*).

XIV.—Chemistry.

Examiner.—A. W. Williamson, Esq., F.R.S., Professor of Chemistry, University College, London.

64. Preparation and properties of the chief gases, acids, bases, and salts. Laws of combining proportion by weight and by volume. Analytical processes for the detection and separation of metals, acids, &c. Preparation and distinctive properties of the chief kinds of alcohol, of organic bases, fixed and volatile organic acids, sugars, woody fibre, starch, &c.

65. Candidates are expected to be able to explain chemical reactions by the use of symbols. Questions illustrative of general principles will be selected from the following, amongst other manufactures:—Metallurgy of lead, iron, and copper; bleaching, dyeing, soap-boiling, tanning; the manufacture of coal-gas, sulphuric acid, soda-ash, &c.

66. Text books:—Miller's Elements of Chemistry, Williamson's Chemistry for Students.

XV.—Mining and Metallurgy.

Examiner.—J. Arthur Phillips, Esq., Civil Engineer, Graduate of the Imperial School of Mines of France, &c.

67. Candidates should be able to identify with facility the ores of the more common metals, and be acquainted with their chemical composition. They should also be familiar with the forms of occurrence of the various metallic ores, and the usual methods employed for their extraction and subsequent purification by crushing, stamping, washing, &c. Underground surveying, the principles of ventilation, particularly as applicable to collieries; a knowledge of furnace assaying, and a general acquaintance with the metallurgy of the more important metals are also required.

68. First-class certificates can be given to those only who have either acquired some practical knowledge of mining, or who possess a special acquaintance with the metallurgy of at least one of the useful metals.

69. Text Books:—Dana's Mineralogy (*Trübner and Co.*, Paternoster-row.) Mitchel's Assaying (*Baillière*). Manual of Metallurgy (*Griffin*). Useful Metals and their Alloys (*Houlston and Wright*). Ure's Dictionary of Arts, Manufactures, and Mines (*Longmans*). Percy's Metallurgy (*Longmans*). Metallurgy of Iron, Truran (*Spon*). Mining and Metallurgy of Gold and Silver (*Spon*).

*** Candidates intending to be examined in this subject should request the Secretary of their Local Board to communicate such intention to the Secretary of the Society of Arts, before the 1st February. (See notice at page 677.)

XVI.—Botany.

Examiner.—Daniel Oliver, Esq., F.R.S. F.L.S., Keeper of the Herbarium at the Royal Gardens, Kew, and Professor of Botany in University College, London.

70. Sect. I.—The Structure of Plants and Vegetable Physiology. The Functions of the Various Organs, and their Morphological Relations. The Nature of the Principal Tissues. The meaning of Botanical Terms. The application of Structural and Physiological Facts to Practical Purposes.

71. Sect. II.—Systematic Botany. The general Principles upon which the Classification of Plants is based. The distinctive characters of the principal British Natural Orders of Plants. Naming Common Wild Flowers at Sight. The sources of the most important Economic Vegetable Products:—Timbers, Fibres, Fruits, Drugs, &c.

72. Sect. III.—Descriptive Botany. The Art of Describing Plants correctly in Scientific Language.*

73. Text Books:—Lindley's School Botany (*Bradbury and Evans*). Oliver's Lessons in Elementary Botany (*Macmillan*). Lindley's Theory and Practice of Horticulture (*Longmans*). Oliver's Guide to the Kew Museums (pamphlet) (*L. Reeve and Co.*).

74. Candidates will be expected to return three correct answers to questions in Section I., three in Section II., and at least two of the plants must be described and referred to their respective natural orders in Section III.

75. Students are very strongly recommended to the frequent practice of describing plants; at first on forms or "schedules," as given in Professor Oliver's "Lessons," page 59, and, when sufficiently advanced, in detail, as in the examples given at page 298 of the same work, and in Dr. Lindley's "School Botany."

XVII.—Floriculture.

Examiner.—Thomas Moore, Esq., F.L.S., Curator of the Botanic Gardens, Chelsea, and Floral Director of the Royal Horticultural Society.

76. The Flowers of the different seasons available for Garden and Greenhouse decoration: how obtainable, whether by natural or artificial means, and under what modes of treatment.

77. Special Culture:—Ferns, Orchids, Cacti, Heaths, Hardy Annuals, Bedding Plants.

78. Practical Operations:—Potting; Planting; Pruning; Training; Watering; Propagation, the various modes of, and their special adaptations.

79. Flower-garden, Pleasure-ground, and Shrubbery:—Planting, materials for, and their arrangement; Flowering plants, Foliage plants; Herbaceous plants; Rock plants; Florists' flowers. Sub-Tropical gardening. Geothermal culture. Lawns, formation and management of.

80. Influence of Cultivation on the formation and development of buds—leaf buds and blossom buds. Action of Light on Plants. Flower forcing. Soils, nature and properties of. Composts for different classes of plants.

81. Acclimatization. Improvement or ennobling of races; by Selection; by Hybridization and Cross-breeding.

82. Construction and management of houses for plant culture; Atmospheric conditions; Heat; Moisture; Shade; Ventilation; Glazing. Ward's cases.

83. Text Books:—Lindley's Theory and Practice of Horticulture *(Longmans)*. McIntosh's Book of the Garden. *(Blackwood and Sons)*. Thompson's Gardener's Assistant *(Blackie and Son)*. Thompson's Handy Book of the Flower Garden *(Blackwood and Sons)*. Glenny's Hand-book of Practical Gardening *(Houlston and Wright)*. Williams' Select Ferns *(Williams, Holloway)*.

84. The Examiner, in speaking of last year's papers, says:—"There is a manifest deficiency in regard to the correct spelling of the names of plants."

* Living plants are provided by the Society for this examination.

XVIII.—Fruit and Vegetable Culture.

Examiner.—Robert Hogg, Esq. LL.D., F.L.S.

85. Sect. I.—Fruit-Tree Culture.—Kinds of Fruits adapted for various soils and exposures. The Propagation, Pruning, and Training of Fruit-trees. The Structure and Functions of the Organs of Trees, considered in their relation to growth and reproduction. The Forcing of Fruit-trees, and their Cultivation under glass, both in and out of pots. The Theory of Ripening, and the Principles that ought to Regulate the Preservation of Fruits after they are Ripe or their subsequent Maturation. The Packing of fruit for transmission to great distances.

86. Sect. II.—Vegetable Culture.—The kinds and quantities of vegetable seeds and roots required for cropping gardens of given dimensions. The most approved mode of culture of the different kinds of vegetables and salads. The preparation of fermenting materials for artificial heating. The forcing of vegetables and salads.

87. Sect. III.—General subjects.—Soils, Water, Atmospheric Air, Light and Heat, in their relation to the successful cultivation of Fruit and Vegetables. Manures and their application. The Diseases and Insects to which Fruits-trees and Vegetables are subject, and their remedies. The erection, heating, and ventilation of garden structures.

88. Text Books:—Lindley's Theory and Practice of Horticulture (*Longmans*). The Cottage Gardener's Dictionary (*Bell and Daldy*). Hogg's Fruit Manual, 3rd edition (171, *Fleet-street*). Rivers' Miniature Fruit Garden (*Longmans*). Bréhaut's Modern Peach Pruner (171, *Fleet-street*).

89. The Examiner, in his report on last year's papers, says:—"In subjects relating to culture, the answers are generally good; but in almost all cases, where those under consideration are the identification and nomenclature of the different varieties of fruits and vegetables, there is a great deficiency. I would therefore urge on candidates to study the individual characteristics of both fruits and vegetables, so that they may be able readily to distinguish one variety from another, and to acquaint themselves with the conditions under which the numerous varieties are known to succeed best."

XIX.—Animal Physiology in Relation to Health.

Examiner.—Dr. Michael Foster, Director of the Physiological Laboratory, and Teacher of Practical Physiology and Histology, University College, London.

90. The general principles of Animal Physiology, and the application of them to the preservation of health and to the wants and emergencies of daily life.

91. Text Books:—Huxley's Lessons in Elementary Physiology (*Macmillan*). Carpenter's Animal Physiology, 1859 (*Bohn*). Mapother's Lectures on Public Health (*Longmans*). Lardner's Animal Physics (*Walton and Maberly*). Translation of Milne Edwards' Manual of Zoology (*Renshaw*). Marshall's Description of the Human Body, with Atlas (*Day and Son*), for details of Anatomy. Marshall's outlines of Physiology (*Longmans*) for advanced students.

92. The Examiner, in his report on last year's papers, says:—"There was a display of technical terms, often incorrect, and very frequently quite irrelevant to the question, and there was much bad spelling."

XX.—Domestic Economy.

Examiner.—Edward Carleton Tufnell, Esq., one of Her Majesty's Inspectors of Schools.

93. Candidates will be expected to possess such a knowledge of the essential elements of Mechanical and Chemical Physics, Chemistry,* and Physiology, and of the general outlines of Natural History, as may enable them to describe the origin and properties of the articles, and the rationale of the processes indicated or suggested by the following heads, as well as to explain the practical rules which science suggests for the promotion of health and comfort, and for turning limited means to the best advantage:—

94. Dwellings for town or country; site, general design, details of parts, materials and processes of construction and decoration; fixtures and fittings; furniture, fabrics, and clothing; the philosophy of food based on the functions and requirements of the human frame, and on the chemical and hygienic properties of proximate constituents; unwholesome food; adulterations; preservation; condiments; culinary processes; refreshing, stimulating, and intoxicating beverages; fuel and other household stores; means for promoting a vigorous development of the frame, and for maintaining the healthy exercise of its functions; means of safety; the care of the sick; household management and accounts; best ways of investing savings and of providing against emergencies.

95. The questions will be comprehensively framed, so as to give to candidates a free scope for making evident the extent of their studies in the various departments of Domestic Economy. Sound practical notions of the most essential points throughout the whole range of subjects are desired, rather than a deep knowledge of a few of them.

96. Text Books:—Tegetmeier's Domestic Economy (*Home and Colonial School Society, Gray's Inn-road*). Healthy Dwellings, &c., a lecture by Henry Roberts, F.S.A. (*Ladies' Sanitary Association, 8, Pont-street, Belgrave-square.*) The Useful Arts employed in the Construction of Dwelling-houses; in the Production of Clothing and of Food (*Longmans*). Lankester's Lectures on Food, 1st and 2nd Course. Tomlinson's Warming and Ventilating (*Weale's Series*). The necessary Physical Chemical, and Physiological knowledge may be obtained from Chambers's Educational Course on the Sciences (*W. and R. Chambers*).

XXI.—Political Economy.

Examiner.—Henry Fawcett, Esq., M.A., M.P., Professor of Political Economy in the University of Cambridge.

97. This science investigates the laws which regulate the production, the distribution, and the exchange of wealth. The subject embraces questions which concern not only the wealth of nations, but also the wealth of individuals.

98. The books recommended to be read are "Principles of Political Economy," by Mr. J. S. Mill (cheap edition); "A Manual of Political Economy," by Professor Fawcett; or "A Manual of Political Economy," by Professor Thorold Rogers. These three books are mentioned in the order of their length, Mr. Mill's book being by far the most complete treatise which exists on Political Economy.

XXII.—Civil Government and the Laws of England.

Examiner—Charles Neate, Esq., M.A., M.P., late Professor of Political Economy in the University of Oxford.

99. Candidates who aspire only to a second or third-class certificate, should study Creasy's Rise and Progress of the English Constitution (*Bentley, New Burlington-street*).

100. Candidates aspiring to a first-class certificate should also study the 3rd and 4th books of Stephens' Commentaries on the Laws of England. The earlier editions, which are often obtainable at a reduced price, may be used, so long as they are not earlier than the 3rd edition.

XXIII.—Geography.

Examiner.—Wm. Hughes, Esq., F.R.G.S., Professor of Geography in King's College, London.

101. Candidates must show a sound knowledge of Elementary Geography, physical and descriptive. Such knowledge must embrace an acquantaince with at least the outlines of the great natural features of the globe,

* The use of symbols and equivalents will be optional.

the political divisions of countries, and the localities of towns and other places of importance. This knowledge will be looked for in fuller extent with regard to the British Islands, and the various portions of the British Empire, than with regard to other countries. The recent changes in the map of Europe — especially in the cases of Germany and Italy—with the altered relationships between the various German States, may also be referred to as amongst the topics that prominently demand attention on the part of the geographical student. Australia, Canada, and Germany (the last-named with reference to the changes consequent on the war of 1866), are proposed as subjects for more especial study on the part of the intending candidates for the ensuing year's examinations. In evidence of the knowledge possessed regarding those regions, the candidate will be required to sketch, from memory, a map either of Canada, or of any single European country, that may be named by the examiner. Such sketches need not possess accuracy of detail, but should at least show the general direction of coast-lines, mountain-chains, or river-courses, with the localities and names of the principal towns.

102. Candidates who aim at the highest class of certificate should also be prepared to answer such questions upon Geography, in its relation to the Physical Sciences and the History of Mankind, as involve a general acquaintance with the subject of climate, the laws of Meteorology, the Distribution of Plants and Animals over the Globe, the leading outlines of Geology, the Ethnographic Division of the Human Race, and the commercial resources of different lands. This kind of knowledge is looked for, not in place of geographical knowledge of a more elementary kind, but as supplementary to it, and throughout based upon it.

103. Text Books:—Manual of Geography, by William Hughes (*Longmans*). Geography of British History, by William Hughes (*Longmans*). Guyot's Earth and Man (*Longmans*). Page's Introductory Text Book of Geology (*Blackwood*). The School Physical Atlas (*either Johnstone's, Philips's, or that published by the National Society*).

104. The Examiner, in his report on last year's papers, says:—"The number of failures is large. I feel sure that in many cases the failure is due not so much to mere want of sufficient preparation as to absence of a thoughtful appreciation of the real nature of the task undertaken. In the case of the greater number of failures (and in not a few of those ranked as 'third class') the candidates seemed to have supposed a mere schoolboy treatment of the subject to involve all that was required; and no preparation for any higher test than would be applied to ordinary school geography—and that of a very elementary kind—appears to have been resorted to. If the candidates were to examine more fully the conditions of the programme issued by the Society, and to pay stricter attention to its injunctions and recommendations, they would stand a better chance of successful competition for the higher honours at its disposal. I venture to suggest whether more might not be done through the medium of the preliminary examinations, in furtherance of such a purpose. I can only repeat what I have urged on former occasions—that methodised study, with the aid of good appliances, directed persistently (for at least some length of time) to a definite object, can alone lead to the desired result. Mere generalities and loose scraps of information will not suffice. Geography is nothing if it be not precise and exact in detail, as well as comprehensive in its scope."

XXIV.—English History.

Examiner.—The Rev. J. S. Brewer, M.A., Professor of Modern History in King's College, London.

105. English History and English Constitutional History.

106. Text Books:—Manual of English History, by Ross; or The Student's Hume. Creasy's English Constitution.

107. Special subject:—The Reign of Queen Anne. Lingard.

108. The Examiner, in his report on last year's papers, says:—"I regret to say that they contain more numerous instances of flagrant bad spelling than on any previous occasion. I think the different secretaries of the Institutions in Union with the Society of Arts should have their attention called to the fact that the candidates, in gathering up their papers, do not always put them together with due regard to the pagination. The consequence is that the Examiner is under the necessity of re-arranging the papers of some of the candidates, which is at times very perplexing."

XXV.—English Literature.

Examiner.—Rev. Samuel Clark, M.A., *Chairman of the Board of Examiners.*

109. Any two, but not more than two, of the authors in the following list may be taken up for examination:—Shakspeare—Julius Cæsar; Henry VIII.; The Tempest. Morris's Specimens of Early English (Clarendon Press Series), from p. 184 to p. 378. Bacon—The Essays. Milton—Paradise Lost, books I.—VIII.

110. Candidates are recommended to make a very careful study of the text of the authors they may select. The questions on each author will be divided into two sections, the first intended to test the candidate's acquaintance with the text, the second his knowledge of the subject matter, and his critical and literary information. Full marks will not be given for answers in the second section if those in the first section do not prove satisfactory. No marks will be given for anything beyond answers to the questions.

XXVI.—Logic and Mental Science.

Examiner.—J. D. Morell, Esq., LL.D., and one of Her Majesty's Inspectors of Schools.

111. Logic: Candidates will be expected to answer questions on the different processes of thought, and the symbols by which they are expressed. Every candidate must be prepared to analyse examples of reasoning, and to detect fallacies.

112. Text Books: Whateley's Elements of Logic, or Morell's Handbook of Logic.

113. A Candidate for a second or third-class Certificate will be expected to prepare, in addition, any one of the following books which he may select:—Mill's System of Logic, Book III., Of Induction; Dugald Stewart's Outlines of Moral Philosophy (McCosh's Edition); or Sir William Hamilton's Lectures on Metaphysics, Lectures xx. to xl.

114. A Candidate for a first-class Certificate will be expected to prepare any two of these works which he may select.

XXVII.—Latin and Roman History.

Examiner—Rev. F. Temple, D.D., Head Master of Rugby School.

115. Cicero; II. Philippic. Ovid Metam. Lib. v.

116. Roman History to the death of Augustus Cæsar. Text Book:—Liddell's History of Rome, in one volume.

XXVIII.—French.

Examiner.—Alphonse Mariette, Esq., M.A., Professor of French, King's College, London.

117. The Examination Paper will be divided into three parts.

118. The first will comprise grammatical questions and an extract from a modern French writer, to be translated into English. Candidates merely aiming at a 3rd class certificate should confine themselves to this first part.

119. The second part will comprise, together with a few grammatical questions, an English extract to be translated into French, and a list of idiomatic expressions to be rendered from French into English, or *vice versa.* This should be done satisfactorily by the Candidate who aims at a 2nd class certificate.

120. In the third part, Candidates for a 1st class certificate will have to translate an English extract into French (to which great importance is attached), and to answer properly (*in French*) some *elementary* questions on the two following subjects:—

1. French literature during the fifteenth century and first half of the sixteenth.

2. The History of France, from the accession of Charlemagne to the death of Louis IX. (768—1270).

121. Books recommended:—Mariette: Half-Hours of French translation (*Williams and Norgate*, London and Edinburgh). Nisard: Histoire de la Littérature Française, vol. I. (*Williams and Norgate*), or Demogrot: Histoire de la Littérature Française (*Williams and Norgate*). Duruy: Histoire de France, vol. I. (*Williams and Norgate*).

122. The Examiner, in his report on last year's papers, says:—"The translation of English into French continues the weakest part, and bears throughout the evidence of extremely superficial study. In some groups of papers, all bearing a strong family likeness, it is grievous to notice the effects of that cramming system which has lately crept into so many school-rooms, and which it is the duty of all earnest educators to denounce and discourage. I would again warn the candidates, and especially their teachers, that two or three foolscap sheets of ready-made literature and 'cut and dried' history, however accurately got up, cannot secure any great number of marks when, of all the grammatical questions in the same paper, not one is correctly answered, or when nearly every word in the translation is an offence against one or other of the most elementary rules of the language."

XXIX.—German.

Examiner.—Dr. Buchheim, Professor of German in King's College, London, Examiner in German to the University of London, etc.

123. The Examination paper will consist of four Sections. The first will contain extracts from the works recommended for reading; the second grammatical questions and idioms; the third English phrases, an extract from an English author (both to be turned into German); and the fourth, questions on the history and literature of Germany. The questions in the former will be confined to the period from 1056 to 1125; and in the latter to that from 1517 to 1624.

124. Candidates for a third-class certificate should be prepared to translate one extract at least, either from the first act of "Wilhelm Tell" or from the first two cantos of "Hermann und Dorothea," and to answer the first three grammatical questions in Section II.

125. Candidates for a second-class certificate will be expected to answer all the questions contained in Section II., besides translating one extract at least from the above-mentioned parts of "Wilhelm Tell," or "Hermann und Dorothea."

126. Candidates for a first-class certificate must translate two extracts—one from prose and another from poetry—and, in addition, satisfy the Examiner with reference to the questions contained in Sections II., III. and IV., of which the translation of an English passage into German, the historical and literary questions and the writing of a German Essay, will form an essential part.

127. Books Recommended:—Schiller's Wilhelm Tell (Act I). Goethe's Hermann und Dorothea (the two first cantos: Kalliope and Terpsichore). Schiller's Dreiszigjähriger Krieg (Book V. first half). Kohlrausch's Deutsche Geschichte (Heinrich IV. and Heinrich V.) Vilmar's Geschichte der Deutschen National Literatur (Dritte Periode).

XXX.—Italian.

Examiner.—Signor Pistrucci, Professor of Italian in King's College, London.

128. Candidates for first-class certificates will be required—(1st) To translate into English passages from some of the principal Italian poets and historians, and to answer the grammatical questions which may be added to those passages. (2nd) They will also have to translate into Italian an extract from some English author; (3rd) and turn a few familiar idioms into their equivalents, from Italian into French, and *vice versa.*

129. For second and third-class certificates candidates will translate into English some selection from Metastasio's drammi, and Foscolo or Manzoni's prose works, and answer a certain number of grammatical questions.

130. The Examiner, in his remarks on last year's work, says:—"In the papers for this year, whilst I discover some small improvement as regards grammatical rules, I find evidence still of sensible deficiency with respect to forms of expression and the construction of Italian. More extended reading is also absolutely necessary."

*** Candidates intending to be examined in this subject should request the Secretary of their Local Board to communicate such intention to the Secretary of the Society of Arts before the 1st February. (See notice at page 677.)

XXXI.—Spanish.

Examiner.—B. B. Aguirre, Esq., Lecturer on Spanish in King's College, London.

131. Candidates for a first-class certificate will have to translate an English passage into Spanish, to render into English or French several idiomatic phrases, and to write in Spanish a short essay.

132. Candidates for a second-class certificate will have to translate from English into Spanish the third part of the passage for the first-class, two letters of business, and to answer several questions upon the Spanish verbs.

133. Candidates for a third-class certificate will have to translate from Spanish into English, and to answer several grammatical questions.

134. Books recommended:—Spanish Gil Blas; Nùeva Floresta Española, por Dn. Ignacio Castellar; Trozos escojidos delos mejores hablistas espanòles, por Dn. Carlos Ochoa; Estudios filolòjios, por Dn. Manuel Martinez de Morentin.—Don Quixote translated into English by Charles Jarvis.

135. The Examiner in his remarks on last year's papers, says:—"Some improvement is evinced this year as compared with the preceding, notwithstanding some of the candidates show themselves defective in the rules of grammar in the translation from English into Spanish, which can be removed by a careful attention to syntax."

XXXII.—Freehand Drawing.

Examiner.—F. S. Cary, Esq.

136. In freehand drawing the Candidate will be required to show a practical knowledge of the principles usually applied in the imitation of natural and artificial forms, such as furniture, manufactured articles, ornament, foliage, and the human form.

XXXIII.—Practical Geometry.

Examiner.—Thomas Bradley, Esq., Professor of Practical Geometry in King's College, London, and at the Royal Military Academy, Woolwich.

137. Practical Geometry, or Geometrical Drawing, is required by the Mechanic, Engineer, Builder, and by all in any way connected with the arts of construction. The Candidates will be examined in Practical Plane Geometry, the construction of right line figures of given areas, and of those curves which are required in the arts; in Practical Solid Geometry, Elementary Problems on the line and plane, in space, and their combinations, the representation by orthographic projection of simple solids from conditions; in the principles of Development as used in the construction of Maps, &c.; and in Elementary Perspective Projection as far as it is required by the Architect.

138. Text Books:—Geometry, Plane, Solid, and Spherical (*Library of Useful Knowledge*) is especially recommended as a work to be studied on Theoretical Geometry. Elements of Geometrical Drawing, published

by the Committee of Council on Education, two parts (*Chapman and Hall*). Dr. Woolley's work on Descriptive Geometry. Heather's Descriptive Geometry. Also the following French works:—Elémens de Géométrie Descriptive, par S. F. Lacroix; Traité de Géométrie Descriptive, par Lefebure de Fourcy; Nouveau Cours raissonné de Dessin Industriel, par Armengaud, aîné, et Armengaud, jeune, et Amouroux; Bardin's Works on Descriptive Geometry.

139. The Examiner, in his remarks on the work done by the candidates last year, says: — "Even the plane geometry is greatly inferior, and the drawing not so good; but of any knowledge of the geometry of the plane and line in combination there is little indication, and there is often a reckless neglect or misconception of the conditions of the question."

XXXIV.—MECHANICAL DRAWING.

Examiner.—George Fuller, Esq., C.E., Professor of Engineering in University College, London.

140. Candidates in Mechanical Drawing will have given to them the principal dimensions of some simple pieces of machinery, and they will be required, from the dimensions given, to make drawings of the machines, showing in their plans, elevations, and sections all the details that would be required for their manufacture. Correctness of design in the details and neatness of drawing are the two essentials.

141. The Engineer and Machinist's Drawing Book (*Blackie and Son*); and, in general, all well illustrated works on machinery, will show the candidate the kind of work that will be required of him.

XXXV.—THEORY OF MUSIC.

Examiner.—John Hullah, Esq.

142. Notation, the modern modes, intervals, time signatures, the stave, transposition, modulation, terms and characters in common use.

143. The Elements of Harmony.

144. Musical History and Biography.

145. Arrangements must be made, in the Previous Examinations by the Local Boards, to test Candidates, by oral examination, in their knowledge or appreciation of the *sound* of musical sucessions and combinations. A form of the test to be used for this purpose by the Local Board at the Previous Examination, will be sent by the Council to such Local Boards as may *apply for it* in due time before the Previous Examination.

146. The Examiner, in speaking of the work done by the Candidates last year, says:—"In some of the papers there are many examples of simple processes done in a very slovenly way; *e.g.*, putting compressed into full score, showing imperfect knowledge of the theory of the stave. Some candidates still attempt the harmony and counterpoint questions, evidently without having had the slightest preparation for them."

XXXVI.—ELEMENTARY MUSICAL COMPOSITION (TONIC SOL-FA SYSTEM.)

Examiner.—G. A. Macfarren, Esq.

147. The candidate will be required to compose a tune and harmonise it (note against note) for four voices, the initial notes of the melody, the number of measures, the number and character of the cadences, and the changes of key being given.

148. A verse of poetry being given, the candidate will compose for it an air with a bass, properly accentuating the words and generally expressing their sentiment.

149. The candidate will write a short composition for four voices of a given length and to given words.

150. The exercises may be written either in the established or in the Tonic Sol-fa notation, and Candidates will be admitted, on whatever system they have studied, provided they pass the previous test, which will be prepared by the examiner, and furnished to each Local Board, on application to the Secretary of the Society of Arts.

PRIZES FOR 1869.

THE PRINCE CONSORT'S PRIZE.

151. His Royal Highness, the late President of the Society, was pleased to offer annually to the candidate who, obtaining a certificate of the first-class in the current year, shall have obtained, in that year and the three years immediately preceding it, the greatest number of such certificates,* a PRIZE OF TWENTY-FIVE GUINEAS, and this Prize Her Majesty the Queen has graciously intimated her intention to continue. This Prize cannot be taken more than once by the same candidate. It will be accompanied by a certificate from the Society of Arts, setting forth the special character of the Prize, and the various certificates for which it was granted.

GENERAL PRIZES.

*** *None of these Prizes will be awarded to a Candidate who does not obtain a Certificate of the First-class in the subject.*

1. Arithmetic (F)	First Prize, £5. Second Prize, £3.
2.†The Metrical System (F)	First Prize, £5. Second Prize, £3.
3. Book-keeping (F)	First Prize, £5. Second Prize, £3.
4. Algebra	First Prize, £5. Second Prize, £3.
5. Geometry	First Prize, £5. Second Prize, £3.
6. Mensuration	First Prize, £5. Second Prize, £3.
7. Trigonometry	First Prize, £5. Second Prize, £3.
8. Conic Sections	First Prize, £5. Second Prize, £3.
9. Navigation and Nautical Astronomy	First Prize, £5. Second Prize, £3.
10. Principles of Mechanics	First Prize, £3. Second Prize, £3.
11. Practical Mechanics	First Prize, £5. Second Prize, £3.
12. Magnetism and Electricity	First Prize, £5. Second Prize, £3.
13. Light and Heat	First Prize, £5. Second Prize, £3.
14. Chemistry	First Prize, £5. Second Prize, £3.

* In case of equality in the number of such Certificates, the Council, in making the award, will take into consideration the ability shown by such Candidates in the examinations generally.

† These Prizes are offered by the Metrical Committee of the British Association for the Advancement of Science.

15. Mining and Metallurgy	First Prize, £5. Second Prize, £3.
16.*Botany	First Prize, £5. Second Prize, £3.
17.*Floriculture	First Prize, £5. Second Prize, £3.
18.*Fruit and Vegetable Culture	First Prize, £5. Second Prize, £3.
19. Animal Physiology in relation to Health (F)	First Prize, £5. Second Prize, £3.
20.*Domestic Economy (F)......	First Prize, £5. Second Prize, £3.
21.*Political Economy (F)	First Prize, £5. Second Prize, £3.
22. Civil Government &c.	First Prize, £5. Second Prize, £3.
23.*Geography (F)	First Prize, £5. Second Prize, £3.
24. English History (F)	First Prize, £5. Second Prize, £3.
25. English Literature (F)	First Prize, £5. Second Prize, £3.
26. Logic and Mental Science ..	First Prize, £5. Second Prize, £3.
27. Latin and Roman History ..	First Prize, £5. Second Prize, £3.
28. French (F)	First Prize, £5. Second Prize, £3.
29. German (F)	First Prize, £5. Second Prize, £3.
30. Italian (F)	First Prize, £5. Second Prize, £3.
31. Spanish (F)................	First Prize, £5. Second Prize, £3.
32. Freehand Drawing (F)......	First Prize, £5. Second Prize, £3.
33. Practical Geometry (F)......	First Prize, £5. Second Prize, £3.
34. Mechanical Drawing........	First Prize, £5. Second Prize, £3.
35. Theory of Music (F)........	First Prize, £5. Second Prize, £3.
36.†Elementary Musical Composition (Tonic Sol-fa System) (F)	First Prize, £5. Second Prize, £3.

SPECIAL PRIZES.

Council Prize to Females.

152. The Council of the Society offers to the female candidate who, obtaining a certificate of the first-class in the current year, shall have obtained, in that year and the two years immediately preceding it, the greatest number of such certificates,‡ a Prize of Ten Guineas. This Prize cannot be taken more than once by the same candidate. It will be accompanied by a certificate from the Society of Arts, setting forth the special character of the Prize, and the various certificates for which it was granted.

153. The whole of the General Prizes are offered to female candidates on the same terms as to male candidates; and, in each of the subjects marked F, an additional prize of £2 is offered to the *female* candidate who gets the highest number of marks with a certificate of the first-class. This special prize may be taken with, or apart from, any other prize.

154. In addition to the First and Second Prizes in Political Economy offered by the Society of Arts, Mr. Harry Chester, a Vice-President of the Society, offers a Third Prize of £2, and three prizes of books, value £1 each, to candidates taking First-class Certificates in that subject.

155. In addition to the First and Second Prizes in Domestic Economy offered by the Society of Arts, Mr. Thomas Twining, a vice-President of the Society, offers a Third Prize of £2, and three prizes of books, value £1 each, to candidates taking First-class Certificates in that subject.

156. In addition to the Prizes in Geography, offered by the Society of Arts to candidates taking Certificates of the First-class, the President and Council of the Royal Geographical Society offer an additional prize of £5 to the candidate who, taking any grade of certificate in Geography, shall obtain the highest number of marks in that subject.

157. In addition to the Prizes in Botany, in Floriculture, and in Fruit and Vegetable Culture offered by the Society of Arts to Candidates taking Certificates of the First-class, the Council of the Royal Horticultural Society offers three additional prizes of £5, £3, and £1 respectively to the three Candidates who, taking any grade of Certificate in Botany, obtain the highest number of marks in that subject; also two additional prizes of £5 and £3 respectively to the two Candidates who, taking any grade of Certificate in Floriculture, obtain the highest number of marks in that subject; also two additional prizes of £5 and £3 respectively to the two Candidates who, taking any grade of Certificate in Fruit and Vegetable Culture, obtain the highest number of marks in that subject. These Prizes are offered only to Candidates who are *bonâ fide* professional gardeners.

158. In addition to the Prizes in Floriculture, and in Fruit and Vegetable Culture, offered by the Society of Arts to Candidates taking Certificates of the First-class, the Proprietors of the *Gardener's Chronicle* offer three additional prizes of £3, £2, and £1 respectively, to the three Candidates, being *bonâ fide* professional gardeners, who, obtaining a Second-class Certificate, at least, in Floriculture or Fruit and Vegetable Culture, shall obtain the highest number of marks in one of these subjects, and also a Second-class Certificate, at least, in Book-keeping or Mensuration.

* For Extra Prizes in these subjects see paragraphs 154, 155, 156, 157, 158.
† These Prizes are offered by the Tonic Sol-fa Association.
‡ In case of equality in the number of such Certificates, the Council, in making the award, will take into consideration the ability shown by such Candidates in the examinations generally.

LOCAL EDUCATIONAL BOARDS.

The following is a List of the places at which Local Boards have already been formed, with the names of the Secretaries, from whom intending Candidates and others may obtain information relative to the Examinations:—

Local Boards.	Secretaries.
Aberdeen	Mr. Jas. Sinclair, Mechanics' Institution, Aberdeen.
Accrington	Mr. Miles N. Lightburne
Acomb, near York	Mr. T. Copley, Acomb.
Alderley Edge	Mr. G. W. Railton, Alderley Edge Institute.
Aldershot and Farnham District	Mr. Barrow Rule, M.C.P., Principal of the Classical and Mathematical School, Aldershot.
Alton	Mr. J. Bryant.
Ashford	Mr. T. Nesbit, 11, Dover-place, Ashford.
Ashton-under-Lyne	Mr. George Hay, Mechanics' Institute.
Bacup	Mr. J. Pilling, Bacup Mechanics' Institute.
Banbridge (Ireland) Literary and Mutual Improvement Society	Mr. Hugh McMullan, jun., Dromore-street.
Banbury	Mr. John H. Beale, Banbury.
Beeston (Leeds)	Mr. W. Standeven.
Belfast Literary Institute	Rev. W. C. McCullagh.
„ Science School	Mr. James McNeil, Belfast Academy.
Bessbrook (Newry)	Mr. Wm. J. Wonfor, Bessbrook.
Bewdley	Mr. J. Birtwistle.
Bilston	Hon. and Rev. A. Anson, St. Leonards, Bilston.
Birmingham and Midland Institute	Mr. Edwin Smith, Institute, Birmingham.
Bishop's Stortford	Mr. F. Woodham Nash, B.A., Sion House, Birchanger, Bishop's Stortford.
Blackburn	Messrs. Thomas Hand and H. Harrison, Mechanics' Institution.
Blandford	Mr. J. B. Green, architect, &c., Salisbury-st., Blandford.
Bodmin	Mr. Josias Phillips, Little Berry-cottage, Bodmin
Bolton Mechanics' Institution	Mr. Joseph Barton, Mechanics' Institution.
„ School of Science and Art	Rev. Joseph Lowe, M.A., Manchester-road, Bolton.
Bradford	Mr. J. Holbrey, Mechanics' Institution, Bradford.
Bredbury and Hatherlow	Mr. T. Greenwood, Hatherlow, near Stockport.
Brighton (for Sussex)	Mr. Barclay Phillips, 75, Lansdown-place, Brighton.
Bristol (Young Men's Christian Association	Mr. W. J. Morgan.
Bromley (Kent)	Mr. W. W. Baxter, Literary Institute.
Brompton (Kent) St. Mark's Science School	Mr. G. H. Gifford, 2, Lenem-place, Skinner-street, New Brompton, Kent.
Bromsgrove	Mr. W. Holyoake.
Burnley Mechanics' Institution	Mr. J. H. Scott, Mechanics' Institute.
„ Church Literary Institute	Mr. J. Wright Ashworth.
Burrage road (Plumstead) Evening Classes	Mr. Josiah Hammond.
Bury (Lancashire)	Mr. T. W. Probert, Manchester-road, Bury.
Bury St. Edmund's	Mr. John Jackson, Head Master of the Commercial School, Bury St. Edmund's.
Canterbury	Rev. E. H. Cross, 16, St. George's-terrace.
Carlisle (Mechanics' Institute)	Mrs. Jane Williamson, Mechanics' Institute, Carlisle.
„ (Working Men's Reading Room)	Mr. J. Short, Lord-street School.
Chapeltown, near Bolton	Mr. M. Howarth, Victoria Mills, Chapeltown, Bolton.
Chatham (St. Mary's Science School)	Mr. R. W. Coldwell, St. Mary's School-house, Military-road, Chatham.
Chelmsford	Mr. W. Cutts, Chelmsford.
Cheltenham Working Men's Club	Mr. W. Dugdale.
Chorley (Lancashire)	Mr. S. Blakeley, Mechanics' Institute.
Christchurch	Mr. W. Judd, F.C.S., High-street.
Clitheroe	Mr. J. Gornall, Moor-lane, Clitheroe.
Compstall, near Stockport	Mr. John Fernley, Literary Institute.
Cork (Young Men's Society)	Mr. W. C. Daly, 19, Leitrim-street.
Crewe	Mr. J. E. Cubbons, Mechanics' Institute, Crewe.
Dean Mills	Mr. W. Taylor.
Denton and Haughton	Mr. John Collins, Broom-lane, Haughton, Denton, Manchester.
Deptford	Mr. T. Earland, 2, Wellington-grove, Greenwich-rd., S.E.
Derby	Mr. H. M. Holmes, Hon. Local Sec. to the Society of Arts, London-road, Derby.
Devonport	Mr. W. Mogg and Mr. Samuel Chapple, Mechanics' Institute, Devonport.
Droitwich	Mr. Jeacock.
Droylsden	Mr. James Blackburn, Educational Institute.
Dudley	Mr. Williams, Bluecoat School.
Earlstown	Mr. Charles Shaw, Earlstown, Newton-le-Willows.
East Lancashire Union of Mechanics' Institutions, Burnley	Mr. John Sutherland, Post-office, Burnley.
Eccleshill	Mr. Isaac Bakes, Mech. Inst., Eccleshill.
Ebley	Mr. H. Webb.
Edinburgh, Watt Institute and School of Art	Mr. F. W. Bedford, D.C.L., Heriot's Hospital, Edinburgh (*Hon. Sec.*), and Mr. W. T. McCulloch (*Sec.*)
Evesham	Rev. M. Wood.
Failsworth	Mr. John Brierly.
Farsley, near Leeds	Mr. Arthur Kirk.
Faversham	Mr. Samuel G. Johnson, Town Clerk, Faversham.
Freetown (Glossop)	Mr. Thomas Haigh, Charlestown-road, Glossop.
Galgate	Mr. William Parkinson, Railway-cottage, Galgate, Lancaster.
Garforth (Leeds)	Mr. Arthur Woodhead.
Gilford (Ireland) Young Men's Mutual Improvement Society	Dr. Henry McBride, M.D., Gilford, County Down, Ireland
Glasgow Athenæum	Mr. John Allen, 13, Queen-street, Glasgow.

Glasgow Institution	Mr. John Craig, F.E.I.S., Glasgow Institute, 280, George-street, Glasgow.
,, Mechanics' Institution	Messrs. J. K. Dempster, and R. Bulloch, Mechanics' Institution, Glasgow.
,, Popular Evening Classes, Andersonian University	Mr. George Martin, 11, Great Western-road, Glasgow.
,, Tonic-Sol-Fa Choral Society	Mr. W. M. Miller.
Glodwick (Oldham)	Mr. J. Green, 3, Greenacres-road, Oldham.
Gloucester Free Library	Mr. W. Jeffery.
Guisboro' (Yorkshire)	Messrs. W. Cockerlyne and J. Sanderson, Mechanics' Institution.
Halifax Mechanics' Institution	Mr. James Watson, Mechanics' Institution, Halifax.
,, Working Men's College	Mr. Geo. Gibb, Haley-hill, Halifax.
Hanley Castle	Mr. A. Shewell.
Haslingden	Dr. J. Binns.
Hastings and St. Leonards	Mr. J. Savery, 12, York-buildings, Hastings.
Haughton Dale	Mr. J. T. Fallows, Haughton Dale Works, Denton, Manchester.
Hertford	Mr. J. L. Foster, and Rev. J. Davey, Hales's Grammar School, Hertford.
Heywood	Mr. G. Fairbrother, Mechanics' Inst., Heywood.
Holbeck (Leeds)	Mr. E. B. Wade.
Holywell Green (near Halifax)	Mr. John Gledhill.
Huddersfield	Mr. Joseph Bate, Mechanics' Institution. Huddersfield.
Hull	Mr. P. Blackmore, 2, Charlotte-street, Hull.
Hulme (Working Men's Institute	Mr. G. T. Letch, Working-Men's Institute, City-road, Hulme.
Hunslet (Leeds)	Mr. John C. Nicholson, White House-place.
Hyde	Mr. W. Gee, Mechanics' Institute, Hyde.
Ipswich	Mr. Edwin Barrett, 31, Cornhill, and Mr. Herbert Wright, Mechanics' Institution, Ipswich.
Kidderminster Church of England Mutual Improvement Society	Rev. W. Packe.
Kidderminster M.I.	Mr. H. Fawcett.
King's Lynn	Mr. T. Burton, Checker-street.
Kinver	Mr. T. Bolton, Hyde House, Stourbridge.
Lancashire and Cheshire Union of Institutes (Central Board)	Mr. Thomas Lawton, 3, St. James's-chambers, South King-street, Manchester.
Lancaster	Mr. T. H. Dalzell, Mechanics' Institute.
Leeds, Church Institute	Rev. J. F. Wood.
,, Mechanics' Institution	Mr. J. O. Dayson.
,, Young Men's Christian Association	Mr. W. H. Smith, Young Men's Christian Association, Leeds.
Lichfield	Rev. Thomas Dainty, Lichfield.
Liverpool Institute	Mr. Charles Sharp, the Institute, Liverpool.
Lomeshaye Even. School	Mr. Leonard Clement.
London, Bayswater	Mr. C. Baker, 15, St. Petersburg-place, Bayswater, W.

London, Beauvoir College Evening Classes	Mr. A. Chipperfield, Drapers' Hall, Throgmorton-street, E.C.
,, Birkbeck Literary and Scientific Institution	Mr. G. M. Norris, 29, Southampton-buildings, Chancery-lane, W.C.
,, City of London College	Mr. H. W. Hansen, City of London College, Leadenhall-street, E.C.
,, Hackney	Mr. H. Grey, Working Men's Inst., Triangle, Hackney, N.E.
,, Lambeth	Mr. T. Heller, Hercules'-buildings, Lambeth, S.W.
,, Royal Polytechnic Institution Classes	Mr. James Cousens, Royal Polytechnic Institution.
,, St. Stephen's, Westminster	Mr. J. Cawood, St. Stephen's School, Westminster.
,, St. Thomas, Charterhouse Evening Classes	Mr. G. Phillipson, St. Thomas' Charterhouse School, E.C.
,, Stepney Deanery	Rev. J. R. Holmes, 10, Montague-place, Poplar, E.
Louth	Mr. Benjamin Crow, Mechanics' Institution, Louth
Macclesfield	Mr. W. Jeffery, Park-green, Macclesfield.
Malvern	Dr. Marsden.
Manchester M.I.	The Secretary of the Institution.
Marple	Mr. W. Walmsley, Hollin's Mill, Marple, Manchester.
Middlesbro'-on-Tees	Mr. W. Taylor, Mechanics' Institute, Middlesbro'-on-Tees.
Mossley	Mr. James Holt, Mechanics' Inst., Mossley, near Manchester.
Newcastle-on-Tyne Church of England Institute	Mr. M. J. Forster, Maple-terrace, Newcastle-on-Tyne.
New Mills, near Stockport	Mr. Edward Godward, Working Men's Institute.
New Swindon	Mr. J. H. Preece, Mech. Inst.
Oldbury	Rev. H. B. Bowlby, Oldbury.
Oldham Lyceum	Mr. W. Noton.
Ossett (Wakefield)	Mr. J. W. Greenwood.
Over-Darwen	Mr. E. Neville.
Padiham, Church of England Evening School	Rev. P. Warburton.
Paisley	Mr. Charles Dalton Wason, St. George's School, Paisley.
Parsonstown, Ireland	Mr. Edward Morrison.
Patricroft (Manchester)	Mr. J. Hewitt, Mechanics' Institution.
Pembroke Dock	Mr. J. T. Cock, B.A.
Poole	Mr. John T. Norton, West-street, Poole.
Portsmouth	Mr. A. R. Robinson, 198, Lake-road, Landport.
Preston	Mr. James Dunn, Avenham Institute, Preston.
Ramsbottom	Mr. Enos Fenton, Public Institute, Ramsbottom, near Bury (Lanc.)
Rawtenstall	Mr. W. Kemp, Mechanics' Institute.
Redditch	Mr. V. Milward.
Richmond (Surrey)	Mr. F. G. Trevor, The Hermitage, Richmond, S.W.
Rotherham	Mr. W. Unwin, Rotherham.
Rugby	Mr. F. E. Kitchener, M.A.
Rusholme, Public Hall and Library	Mr. E. Wilde.

Sheerness Dockyard......	Mr. J. Henry.
St. Helen's (Lancashire)	Mr. W. B. Stubbs, 20, Baldwin-street, St. Helen's.
Salford	Mr. J. Plant, F.G.S., Working Men's College, Salford.
Scarborough	Messrs. Thos. Shields and C. H. Moxey, Mechanics' Inst.
Slough	Mr. H. W. Ward, Alpha-street.
Smethwick....................	Mr. F. Talbot, Messrs. Chance's Library, Smethwick.
South Staffordshire Educational Association ...	Mr. F. Talbot, Messrs. Chance's Library, Smethwick.
Southampton................	Mr. W. Johnson, Caprera Cottage, Bevois Mount, Southampton.
Southport	Dr. Craven, Athenæum, Southport.
Staleybridge	Mr. J. W. Wood, Mech. Inst., Staleybridge.
Stockport	Mr. M. Potts, Mech. Inst.
Stockton-on-Tees	Mr. T. H. Ainsworth.
Stourbridge	Rev. H. Sherrard, Stourbridge.
" Associated Institutes...	Rev. D. Maginnis.
Stroud..........................	Mr. S. S. Dickinson.
Thirsk..........................	Mr. R. D. Carter, Thirsk.
Tintwistle (near Manchester)	Mr. George Pickford.
Tottington (Bury)	Mr. J. Kenyon, Tottington Institute.
Wakefield	Mr. F. Stafford, Mechanics' Institution, Wakefield.
Walsall	Mr. J. Webb, Free Grammar School.
Waterford	Mr. James Budd, 5, King-st., Waterford.
Wednesbury	Rev. J. Winter.
Wellingborough	Mr. Thomas S. Curtis, Wellingborough.
Werneth (Oldham)	Mr. F. H. Chadderton, Mechanics' Institute, Werneth.
West Bromwich (1)	Rev. F. P. Hutton, Gold's Hill, West Bromwich.
West Bromwich (2)	Rev. J. Whewell, West Bromwich.
West Hartlepool	Messrs. E. Cory and J. P. Fea.
West Riding (Yorkshire), Educational Board ...	Mr. H. H. Sales, Mechanics' Institution, Leeds.
Whaleybridge	Mr. A. H. Colles, Whaleybridge, near Stockport.
Whitby	Mr. W. G. Chiesman.
Willenhall....................	Mr. J. C. Tildesley, Willenhall.
Wolverhampton	Mr. J. N. Langley, Mowbray House, Wolverhampton.
Woolwich Arsenal	Mr. W. D. Keeble, Royal Laboratory, Woolwich.
" St. Thomas' Parochial Schools	Mr. J. H. Norman.
" Western Mission School Science Class	Mr. Louis J. Ruegg, 18, Bowater-crescent, Woolwich, S.E.
Worcester Catholic Institute	Rev. W. Waterworth.
" Bridport Free Church Mutual Improvement Association	Mr. E. J. Lewis.
Worcestershire Union of Educational Institutes	Rev. G. D. Boyle, Kidderminster, and Mr. F. Marcus, Worcester.
York	Mr. R. Hall, 8, Feasgate, York.

ELEMENTARY EXAMINATIONS.

The Society of Arts, ever since the establishment of its system of Examinations, has (while abstaining on its own part from examining students in elementary subjects) recommended the District Unions and Local Boards in connection with it to hold Examinations of this character as preparatory to the Final Examinations of the Society. In order to aid them in doing this, and at the same time to promote, as far as possible, a uniformity of standard all over the country, the following definite scheme of elementary examinations is recommended for the use of the District Unions and Local Boards. It is in two grades, and the candidates should be allowed to select either grade at their discretion.

Lower Grade.

1. Every candidate must be examined in the first four rules of Arithmetic, simple and compound.
2. Female candidates must also be examined in plain needlework.
3. Male candidates must also be examined in one at least of the three following subjects:—
   - A. A general knowledge of the Gospel History.
   - B. The rudiments of English History.
   - C. The rudiments of the Geography of England.
4. Fairly good writing and spelling, with good reading of a simple narrative will also be required.
5. A satisfactory examination will entitle the candidate to a certificate (of the Lower Grade) from the District Union or Local Board.

Higher Grade.

1. Every candidate must be examined in Arithmetic, including the Rule of Three, Decimal and Vulgar Fractions.
2. Every female candidate must also show proficiency in needlework.
3. Male candidates must also be examined in *one* at least of the four following subjects:—
   - A. The facts of St. John's Gospel and the Acts of the Apostles.
   - B. A general knowledge of English History, and especially of the reign of Queen Anne.
   - C. The Geography of Great Britain and Ireland.
   - D. English Grammar.
4. Candidates will be expected to write fairly, spell correctly, and express themselves grammatically.
5. A satisfactory examination will entitle the candidate to a certificate (of the Higher Grade) from the District Union or Local Board.

No candidates under 12 years of age should be admitted to either grade of these examinations.

The Secretary of any District Union or Local Board in connection with the Society of Arts, desiring to adopt this scheme of Elementary Examinations, must apply to the Secretary of the Society of Arts before the *10th of February*, stating the number of *male* and *female* Candidates respectively desiring to be examined in *each grade*. Examination Papers* in the above subjects will then be forwarded to him, which of course must be kept secret from the Candidates until the time of the Examinations.

These Examinations (where papers supplied by the

* The uniform Examination Papers afford a common standard of examination; and, to promote uniformity in the application of that standard, special copies of the Examination Papers, with the number of marks to be awarded for a complete answer to each question, will be printed for the use of the local examiners. Thus, suppose that in a paper there are twelve questions, and that the aggregate number of marks assigned to the paper is 120; the number of marks placed opposite to each of the questions will depend upon their relative difficulty, and the proportion of these marks given by the examiner for the answer of any candidate will depend upon its accuracy and completeness. Supposing a perfect answer to a question to be set down as worth 20 marks, an examiner may award 20, 15, 12, or any less number, according to the merit of the answer. Thus the candidates all over the country, though their papers be tested by different examiners, will be placed as nearly as possible upon an equal footing. No candidate should receive a certificate who does not obtain at least 30 marks in *each* paper, the whole paper being worth 120 marks. It is desirable that the same person should examine *all* the candidates in any one subject at any centre.

Society of Arts are used) must, in 1869, be held on the 16th, 17th, and 18th March, after four o'clock, p.m., as follows:—

Tuesday, 16th March, After 4 p.m.	Wednesday, 17th March, After 4 p.m.	Thursday, 18th March, After 4 p.m.
Arithmetic.	English History. Geography.	Gospel History. English Grammar.

The District Unions and Local Boards will understand that, whether in the Elementary Examination the papers supplied by the Society of Arts, or entirely different papers are used, the Local Boards or their own Examiners must look through the Candidates' answers and award the certificates. When this has been done, a return in the following form must be made to the Secretary of the Society of Arts, who, in those cases where the Society's elementary papers have been used, will then forward the proper number of blank Forms of Certificate to be filled up by the Local Board:—

Elementary Examinations, 1869.

Name of Board or District Union. ______________

No. of Centres ____________

	Higher Grade.		Lower Grade.	
	Examined.	Passed.	Examined.	Passed.
Males				
Females				
Totals				

It is particularly requested that this form may be filled up and returned to the Secretary of the Society of Arts in every case, as it is important that the full number of Candidates examined in the Elementary Examinations should be accurately known and stated.

Any Candidate who has obtained a certificate of the Higher or Lower Grade in these Preparatory Examinations in Elementary Subjects may, at the discretion of the Local Boards, if not less than sixteen years of age, be "passed" to the Final Examination of the Society of Arts in any of the special subjects in which his or her knowledge has also been properly tested.

The Council of the Society of Arts, while desiring thus to aid local bodies in promoting elementary education, hope they will prevent the possibility of the elementary certificates awarded by themselves being confounded with the certificates awarded by the Society of Arts.

The foregoing Programme of Examinations is published in a separate form, and may be had *gratis* on application to the Secretary of the Society of Arts.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—At the last general meeting of the Central Committee of this Union, held in Leeds, Mr. E. Huth, of Huddersfield, in the chair, it was unanimously resolved to authorise the agent to organise public meetings in all parts of the county where he may deem it desirable for the purpose of directing attention to the subject of scientific instruction, and the means whereby the aid of the Department of Science and Art may be extended to the working classes. It was also resolved to invite the Standing Committee for Science and Art of the Yorkshire Board of Education to convene a conference of schoolmasters, to discuss the introduction of scientific teaching into schools. A register of duly qualified science teachers was directed to be opened at the office of the Union.

SCIENCE AND ART DEPARTMENT EXAMINATIONS.

The results of the recent examination of the works in drawing, painting, modelling, executed in the year 1867-68, in the schools of art, night classes, and schools for the labouring poor, are as follows:—As respects schools for the children of the labouring poor, 788 schools were examined, being an increase of 200 on the number examined in 1867. 87,300 exercises, worked by 58,000 children, were examined, being an increase in the year of 17,300 exercises, and 15,106 children. As respects schools of art and night classes, the number examined in 1868 was 204, being 38 more than in 1867. 8,500 students worked 16,700 exercises, an increase during the year of 1,700 students and 4,200 worked papers. 152 of these schools and classes sent up for examination 51,000 drawings, executed by 8,000 students in the ordinary course of the year's study, an increase of 24 schools, 19,000 works, and 1,500 students. In 1867, out of 44 candidates examined for the third grade, or art teacher's certificate, 15 were successful. In February, 1868, 62 candidates were examined, and 25 succeeded in passing the required examinations. Finally, the results show a total increase, in twelve months, of 240 schools examined, 18,306 candidates, and 40,500 works and exercises.

In 1867, the number of persons receiving instruction in drawing, from teachers holding drawing certificates granted by the Science and Art Department, was:—

In public and other schools	79,411
In provisional schools of art	14,639
In metropolitan district schools of art (including those in connection with the National Art Training School)	2,702
Students in training for masters and national scholars at South Kensington ..	44
Schoolmasters and pupil-teachers........	1,651
In night classes for instruction in drawing	2,553
In private schools, grammar schools, &c.	4,529
Total	105,529

Fine Arts.

Amsterdam Fine Art Exhibition.—This important exhibition of the works of art of all nations, is announced to open on the seventh of September, and the works to be exhibited are to be sent in between the 10th and 24th of the present month of August. All communications to be made to the Commission of the Exhibition, at the Academy of the Beaux Arts, Amsterdam. There is one clause in the regulations which deserves notice; it is to the effect that no work can be received except from the producer, or accompanied by his consent in writing.

Manufactures.

New Tanning Material.—The wood of the red Quebracho has been successfully applied to tanning purposes in Buenos Ayres. Messrs. Bletscher and Com-

pany, of that city, showed, at the Paris Exhibition, a collection of leathers tanned with the powder of this wood, and were awarded a silver medal for its employment. The trial of new tanning and dyeing substances in various countries cannot be too much recommended.

Commerce.

Paraguay Tea.—Mate, or Yerba Maté, is made from the leaves of a species of holly (*Ilex paraguayensis*). These possess tonic and stimulant properties, so that they replace the true Chinese tea in South America. This plant, a native of Paraguay, constitutes large forests, termed yerbales, in the central and eastern and northern portions of the republic. The Jesuits planted great numbers of these trees round their residences, and these have continued to this day to furnish the principal article of commerce of the country. It is called by the natives "the plant," by the Spaniards "yerba," and by the Guarani, "caa." The annual production of Paraguay tea is estimated at $4\frac{1}{2}$ to $5\frac{1}{2}$ million pounds, of the value of £140,000 to £180,000.

Colonies.

Nova Scotia.—The *Mining Gazette* says:—"Nova Scotia has long felt the want of a good commercial agent in Europe, and we have much pleasure in being able to announce that Mr. Frederick Newton Gisborne has been appointed representative of the Mines Department at London."

Obituary.

M. Boucher de Crèvecœur de Perthes, a distinguished French palæontologist, died at Abbeville, in the 79th year of his age. M. de Perthes was not only an indefatigable *savant*, but a generous philanthropist; he had given liberal donations in aid of the young workwomen of eight or ten different districts of France, and he has left by will to seventeen towns a sum of four hundred pounds, the interest of which is to be given annually, by way of reward and encouragement, to the most deserving young workwoman of each town.

Notes.

The Mont Cenis Tunnel.—During the month of July the progress made at the Mont Cenis Tunnel has been 123 mètres, of which 60 mètres was the length driven on the French side at Modane, and 63 mètres at Bardonnèche, on the Italian. The position of these works up to the 31st July was as follows:—

	Mètres.
Length driven at Modane	3,528
" " Bardonnèche ..	5,119
Total length of tunnel driven......	8,647
Length remaining to be driven....	3,573
Total length of tunnel	12,220

The boring is now going on more rapidly than before, as the character of the rock through which the tunnel is being driven is softer.

Agricultural Exhibition at Santiago.—It appears that the Chilian authorities, conceiving that the date appointed for the Santiago exhibition was too early, have deferred the opening to the 1st of April, 1869. A committee has been formed amongst the principal manufacturers of Paris and neighbourhood, with the view of facilitating the exhibition of French products at Santiago.

Correspondence.

The Parcel and the Telegraph Post.—Sir,—Of the administrative principles advanced in our report to the Society on the question of the parcel post were these:—That the public, having an establishment for the collection and distribution of letters of some twelve thousand postal stations, and of twenty-five thousand persons, had the right, and ought, for economy, to utilise that great establishment for the collection and distribution of any other matters within its capacity; that the main expense of the establishment being paid—rents, salaries, &c., it was within its capacity to render much additional service, at a lower rate of additional charge than it could possibly be rendered by any separate establishment to be paid for. These principles have been adopted by the Government, and sanctioned by the Legislature in the Postal Telegraphs Act. Now the mail post-carts may carry small parcels or printed matter, and the postman may carry and deliver them on his rounds with his letters, especially to outlying villages, and places where they could not be carried, except at disproportionate and, commonly, prohibitory expense, by separate carriers, whose whole time, for the one payment of service, must be paid for. I beg to call the attention of Chambers of Commerce, and of the Institutions in Union with the Society, and the Press, to the fact that the time has now arrived when the public may claim the application of these administrative principles to the conveyance of small parcels and printed matter as complementary to the telegraph post. The price at which the post now carries trade samples and patterns, of twopence for every quarter of a pound or fraction of a quarter of a pound, is a high protectionist exaction, and that, too, fenced by troublesome regulations. There is a demoralizing war of evasions for the transmission of comparatively few articles of value, as samples. Even the charge for books, which is one half that for samples, or a penny for each quarter of a pound or fraction of a quarter of a pound, is so high as only to be resorted to in very special cases, and—comparatively to the general book circulation in the provinces—very rare cases. In respect to the many, the wage classes, the present rates of charge impose on the transmission and interchange of small things, which are of high social value, the like obstructions to those which, under the old postal system, prevailed against trading and family correspondence. A son in place in London sends to his mother, by postage stamps or money order, a portion of his wages, and she in return might send him some piece of her own work, a pair of stockings, or some socks, or a comforter, and although it is no heavier than a book, she has not the privilege of sending it at the book rate, and if she were to pretend it was a sample, the sample rate, eightpence a pound, is extortionate and prohibitory. Now, on continental examples, that of Switzerland especially, as also that of Belgium, which served as examples for the telegraphic post, I submit that we may ask of the Government to rid us of the existing trammels to the use of the post, for the service in question;—to let us have a parcel post, at two pence a pound, and a halfpenny for every quarter of a pound or fraction of a quarter of a pound, and to let us have halfpenny stamps for the purpose, since those rates will pay, as shown by continental postal examples, as shown also by private home examples of deliveries in districts at a halfpenny a pound and less. In Switzerland, say, there is to be a ball in Zurich, but a young lady finds that she has not got a proper pair of ball-shoes, and she telegraphs to her shoemaker at Geneva to send her a pair by return of post. A tradesman has a sudden demand for a small article, and he telegraphs for it to the wholesale house in Geneva or elsewhere to have it by return of post. By sending for them through the post, by letter sometimes, and by telegraph on frequent emergencies, much and increasing business is conducted with reduced amounts of stock. Of this I might give extended illus-

trations. Continental posts carry printed matter, newspapers, &c., at less than a halfpenny per sheet. In this country the cost of the distribution of penny newspapers by the newsvendors is, I believe, little more than a farthing, and for the newspapers the service may be left as it is in populous neighbourhoods; but a farthing will not pay, nor, commonly, a halfpenny either, for carrying a single paper a mile or so to any outlying place. But a halfpenny will pay well to the post which has its messengers going there. Then why should not the post be required to render the service of the delivery of printed papers for a halfpenny? Why should it be allowed to go on with a prohibitory exaction of a penny, the cost of the whole paper itself? To a scientific association like the Society of Arts, or the Association for the Promotion of Social Science, to charitable and other associations, with numerous members to whom circulars are required to be sent weekly, to electoral and commercial bodies—this exaction of the penny for every printed circular, so much beyond the real cost of the service, as shown by separate enterprises undertaking the service at less than half price, is an oppressive contravention of sound administrative and economical principles, from which we should now claim relief. There are a few grand people who yet pronounce the penny post to be a great plague, and who, sooner than that their lazy sybarite minds should have the very slightest disturbance, would stop the whole freedom of intercommunication of the many, and would, if they might, re-impose the fetters of the old prohibitory letter rates. The same species of people talk superciliously of the "plague of trade circulars." But it is a primary economical object in a manufacturing and economical community to stimulate legitimate consumption. The smallest facilities in detail for the purpose are the greatest in their aggregate results. The complete utilisation of our postal machinery in these details, for collection and distribution, is a measure of first rate public magnitude. In his evidence before the committee of the House of Commons on the telegraph post, Mr. Scudamore stated that he had been "whipped up" to the measure by his chief. Now that there is some quiet; now that Mr. Ashurst, the diligent solicitor of the Post-office, will doubtless have the task of contending with the claims of the telegraph and the railway companies compensation, we may beg of the Postmaster-General to "whip up" Mr. Scudamore again, and bring him well "up to the collar" to drag forward this measure of the parcel post, which obviously belongs to him, as complementary to the great measure of the telegraph post.—I am, &c., Edwin Chadwick.

Patents.

From Commissioners of Patents' Journal, August 7.

Grants of Provisional Protection.

Animal and vegetable substances, preserving—2329—G. A. Thibierge.
Armour plates—2308—H. F. Hambleton.
Banding cords, manufacturing—2315—T. Hart.
Bellows, self-acting—2239—R. Berson.
Boats, &c., constructing, &c.—2005—V. de Stains.
Boilers, &c.—2253—C. J. Galloway and C. H. Holt.
Boilers, &c., feeding—2292—A. M. Clark.
Brewing—2274—E. Beanes
Bronzing printed work—2333—B. G. George.
Buckets—2235—W. Turner.
Buildings, &c, constructing—2095—J. H. Banks.
Canal boats, &c., propelling—2268—W. R. Lake.
Cask-washing apparatus—2337—J. Steel.
Champagne, artificial—2278—L. Rose.
Clocks, &c.—2317—W. S. Harrison.
Cloth, &c., plaiting strips of—2111—G. Slater.
Coal, &c., apparatus for getting—1223—G. E. Donisthorpe.
Coal, &c, separating impurities from—2283—A. Homfray.
Cocoa, preparing—2314—P. Pearson.
Cotton, &c, winding warps of—2238—H. W. Ripley & T. Shackleton.
Cotton wool, &c., teeth for machines for picking—2327—W. R. Lake.
Counting machines—2276—C. P. Wilcox.
Dove-tailing machines—2299—W. T. Hamilton.
Drills for distributing corn, &c.—2233—J. Bonnall.
Earthenware, &c.—2277—T. G. Green.
Edibles and liquids, cooling and preserving—2256—J. Roberts.
Engraving machines—2246—G. Moulton.
Feathers, bleaching—2289—A. A. Wille.
Feeding bottles, caps for—2223—J. Thompson and J. G. Ingram.
Fibrous substances, spinning, &c.—2270—H. B. Barlow.
Fire-arms—2319—J. Purdey.
Fire-arms, breech-loading—2305—C. E. Brooman.
Fire-irons, &c.—2262—T. Kendrick and S. Davies.
Fluids, raising and discharging—2258—R. Meldrum.
Fuel, utilising—2325—F. H. Danchell.
Furnaces—2040—E. B. Wilson.
Furnaces—2265—J. Thomas.
Gas—2261—D. Webster.
Gas regulators—2229—W. Hollingworth and H. Halstead.
Gas regulators—2322—J. S. Bromhead and J. Whitmee.
Glass, manufacturing—2321—J. Kilner.
Glass ornament applicable to lace, &c.—2259—E. A. Cowper.
Glove fasteners—2287—T. Deschamps.
Harness, &c., links for—2244—W. R. Lake.
Hay, &c., cutting—2243—W. R. Lake.
Horses, &c., clipping—2245—S. Davis.
Hose, coupling—2295—C. W. Bradshaw.
Iron, application of, for building purposes—2284—C. Weekes.
Kilns for burning bricks, &c.—2263—C. G. Johnson.
Lamps—1858—M. Rae.
Lamps—2179—H. H. Doty.
Lamps—2285—F. Green.
Lawns, &c., trimming the edges of—1783—I. B. Guest.
Letter boxes, &c.—2309—W. Dennis.
Lightning conductors—2271—T. W. Gray.
Liquid meters—2255—A. Browne.
Loads, transporting—2281—C. Hodgson.
Lockets—2313—W. Gilbert.
Looms—2219—W. Shaw.
Looms—2331—T. Wrigley and W. E. Yates.
Manures, artificial—2297—S. Langdale.
Metallic ores and compounds, treating—2293—T. Gibb.
Mortising machines, chisel for—2231—R. Chamberlain.
Motive-power apparatus—2254—W. and W. T. Eades.
Motive-power engines—2264—J. Gill.
Panoramic pictures—2280—J. Raine.
Paper, manufacture of—2251—J. Duguid, jun.
Pictures, &c., hanging—2205—A. Oldham.
Pipe-joints—2267—F. Chomé-Steinbach.
Piston valves—2221—C. J. Galloway and C. H. Holt.
Ploughs—2311—A. Buchan.
Pneumatic apparatus—1100—A. M. and M. A. Wier.
Printers' type, &c.—2225—L. Hannart and N. A. Aubertin, jun.
Printing machines—2164—J. Holt and G. S. Coponet.
Racket bats—2304—T. A. Ward and H. Whale.
Railway carriages, heating—2220—W. B. Farwell.
Railway sleepers—2212—J. C. Leaver.
Railways—2252—W. J. C. Muir.
Railways, signalling on—2248—E. Funnell.
Rotary steam engines—2320—C. E. Brooman.
Rotatory engines and pumps—2185—W. L. G. Wright.
Safes and strong rooms—2228—C. de Bergue and J. C. Haddan.
Sash fasteners—2257—S. Deacon.
Screw propellers—2098—G. Alder.
Sewing machines—2272—W. Winter.
Ships, masting of—2241—D. Russell.
Shuttles, &c.—2260—D. Sowden and R. C. Stephenson.
Studs—2227—A. Taylor.
Threads, drying and beating—2302—L. Dulac.
Tubes or hose, flexible—2282—W. H. & A. M. Bates & H. Faulkner.
Valves—2269—T. Bonell.
Ventilators—2240—T. F. G. Wintour.
Vessels of war—2249—C. P. Stone.
Watch protectors, &c., for preventing robbery from the person—2250—A. Woollan.
Wheat, &c., decorticating—2303—S. H. Hadley.
Window blinds, &c., raising and lowering—2273—W. J. Cunningham.
Windows and window fasteners—2237—R. Whiston.
Wool, extract—2294—G. Martin.

Inventions with Complete Specifications Filed.

Meat, preserving—2440—H. A. Bonneville.
Skirts, bindings for—2434—G. T. Bousfield.

Patents Sealed.

106. W. W. Hooper.	496. H. A. Bonneville.
446. W. R. Lake.	497. H. A. Bonneville.
453. J. Tansley.	498. A. Lemasson.
456. T. Smith.	500. J. P. Lack.
458. J. W. Melling.	501. W. E. Gedge.
460. J. R. Stoney.	565. W. Weldon.
470. S. C. Lister.	655. J. R. Cooper.
478. S. B. Tucker.	663. J. Adams and H. Barrett.
479. W. Wootton.	845. F. Ryland.
485. R. George.	1261. J. Erskine.
487. W. E. Deverna.	1578. J. Dewar.

From Commissioners of Patents' Journal, August 11.

Patents on which the Stamp Duty of £50 has been Paid.

2042. A. F. Osler.	2062. H. Cartwright.
2105. J. F. Boetius.	2073. J. and H. Ingham and J. Broadley.
2190. A. V. Newton.	2074. C. O. Crosby.
2044. W. Pollock and J. Stobo.	2178. W. E. Newton.
2198. E. D. Hodgson.	

Patent on which the Stamp Duty of £100 has been Paid.

1994. H. Wilde.	1976. A. V. Newton.
1987. A. V. Newton.	1977. A. V. Newton.

Journal of the Society of Arts.

FRIDAY, AUGUST 21, 1868.

Announcements by the Council.

Examinations, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

The publication of Dr. Letheby's Course of Lectures "On Food" will be resumed next week.

Proceedings of Institutions.

EXAMINATION PAPERS, 1868.

(*Continued from page* 671.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last :—

PRACTICAL MECHANICS.

THREE HOURS ALLOWED.

1. Define a *pinion*, a *rack*, a *crown-wheel*, an *annular wheel*, the *pitch-circle* of a toothed wheel, and the *pitch* of a screw. Distinguish between a right-handed and a left-handed screw. How are screws cut in a lathe?

2. Explain the following contrivances :—(1) A *mangle-wheel;* (2) a *ratchet-wheel;* (3) a *fusee;* (4) a *heart-wheel;* (5) the *Geneva stop.*

3. Describe some method of connecting two parallel shafts by a single belt and wheelwork, so as to enable the continuous rotation of one shaft to be communicated to the other, either in the same or in opposite directions. How may the rotation of the second shaft be stopped when required?

4. Two parallel axes, which do not overlap, are so close together as to be nearly in the same line, and it is wished to communicate motion from one to the other, so that the axes shall rotate in *opposite* directions, with angular velocities in the ratio of 2 to 3. Find a train of wheels by which this may be done.

5. Explain the necessity of providing turning lathes with contrivances for varying the relative velocities of the mandril and foot-wheel, and describe some arrangement for this purpose.

6. Mention some examples of aggregate motion. Describe any form of self-acting drilling machine, whereby a drill is made to rotate rapidly and at the same time to advance slowly.

7. Explain the principle of the movement adopted in machinery for twisting strands into a rope.

8. Describe the great improvement introduced by Watt into the construction of the steam-engine. Distinguish between single-acting and double-acting engines.

9. Describe the construction of a piston. Explain the method adopted for keeping the piston and piston-rods steam-tight.

10. Describe the locomotive slide-valve, and explain its action. Why is the use of this slide-valve restricted to engines of short stroke?

11. What do you mean by *lead*, *lap*, and *cushioning?* In what way does *lap* ensure expansive working? When is *lead* necessary?

12. Explain the principle of the movement known as Watt's parallel motion.

MAGNETISM AND ELECTRICITY.

THREE HOURS ALLOWED.

1. What is the nature of magnetism, and how is it related to an electric current?

2. Describe the construction and use of the dipping-needle.

3. State the source and mode of correcting any particular kind of deviation to which a ship's compass is liable.

4. Mention any periodic phenomena by which the earth's magnetism is supposed to be influenced.

5. Explain diamagnetism, and state some substances by which this property is manifested.
6. State your views of the nature of electricity, and your reasons for entertaining them.
7. What is the difference between an electrometer and an electroscope? Describe the electrometer of Coulomb, or Thomson.
8. Explain the construction and use of a condenser.
9. By what means can you show that Franklinic and Voltaic electricities are identical?
10. Describe the construction of a Grove's cell, and explain how the current is produced.
11. Describe the process of electro-gilding.
12. Describe an "astatic" needle. Under what conditions is it actually *astatic;* and when these are not fulfilled, determine its position of equilibrium.
13. Explain the cause of electro-dynamic rotation, as exhibited in any well-known apparatus.
14. Explain the construction of an inductorium, and the means of intensifying its action.
15. Explain the magneto-electric telegraph of Henley, Siemens, or Wheatstone.
16. Describe the construction of some electro-dynamic machine, *i.e.* for obtaining motive power. What is the chief obstacle to its practical employment?
17. What is the chief cause of the retardation of signals transmitted through a submarine cable?
18. Explain the action of electricity on the nerve and muscle of a recently-killed animal.

LIGHT AND HEAT.

THREE HOURS ALLOWED.

Geometrical Optics.

1. Enunciate the law of the reflection of light at the polished surface of a body, and find the *position* of the image of a luminous point which is situated in front of a plane mirror. Apply the result just found to determine the *form* and *position* of the image of an object placed before a plane mirror, and *trace* the visual pencil by which the eye, in a given position, sees any given point in the object.
2. Find the *form* and *position* of the image of a distant object produced by a small *concave spherical* mirror. Describe the *Newtonian* reflecting telescope, and show how to find its magnifying power.
3. Describe the structure of *the eye* as far as its optical properties are concerned, and show how *inverted images* of objects are formed upon the retina. Explain why the chief refraction takes place at the cornea, and show how the law of *visual direction* explains the *erect* appearance of objects through the means of the *inverted* image upon the retina.
4. Describe the construction of the *achromatic* object lens of a telescope, showing how the *achromatism* and *aplanatism* are produced. Find the *magnifying* power of the *astronomical* refracting telescope with a single eye-lens, and also the proper position of the eye-hole.

Physical Optics.

5. Explain what is meant by the *double refraction* of light in crystalline bodies, and give examples of *uniaxal* and *biaxal* crystals, stating why they have received these names.
6. Show how the property of *polarization* of a beam of light is exhibited by a rhomb of calc spar, and give Malus' rule for the brightness or intensity of each of the two polarized beams when analyzed in any given plane.
7. Explain what are meant by the interference colours of *thin plates*, and give examples where they are seen. Explain how *Newton's rings* are produced; and show how the values of the luminiferous interval for different colours of light were calculated from Newton's observations of them.
8. Describe some form of a polariscope by which the interference of *polarized light* exhibited by thin natural plates of mica and selenite can be witnessed. Give the explanation of the way in which the colours are produced, and explain how the *selenite designs* are constructed.

Heat.

9. Describe the mode of constructing a *standard* mercurial thermometer, and find the formula for comparing the degrees on Fahrenheit's, the centrigrade and Reaumur's scales. When the temperatures on Fahrenheit's scale are 80 degrees and 16 degrees, what are the corresponding temperatures on the centrigrade and Reaumur's scales.
10. Explain what is meant by the *boiling point* of a liquid, and show how it varies with the height of the barometer. How are *the heights* of mountains ascertained by observing the temperature of boiling water on their summits?
11. State what is meant by the expansibility of bodies by increase of temperature. Explain how the different expansibilities of brass and steel are made available in the construction of the *compensation balance-wheel* of a chronometer. From what cause is such construction required?
12. Explain the principle and mode of action of the double-acting condensing steam-engine. What is meant by the term *using the steam expansively* in the working?

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, NORWICH, 1868.

The thirty-eighth meeting of the British Association commenced on Wednesday last with the general committee meeting, at one o'clock, when the following report of the council was read by Professor Hirst:—

"The council have received reports from the general treasurer and from the Kew committee at each of their meetings, and their reports for the past year will be laid before the general committee.

"Owing to the death of Lord Wrottesley, the chairman and most active member of the parliamentary committee, no report of this committee is presented this year.

"At their meeting on March 14th, Mr. F. Galton, general secretary, informed the council that considerations of health precluded him, to his sincere regret, from continuing to hold office. The council, in accordance with their previous practice, appointed a committee, consisting of the general secretaries and the gentlemen who had formerly filled that office, for the purpose of reporting a recommendation to the council of a successor to Mr. Galton. From this committee the council received the following report:—'Resolved, that Dr. T. Thompson, F.R.S., &c., be recommended as highly qualified for election as joint general secretary of the association.' The council recommend that Dr. T. Thompson be now elected joint general secretary.

"At the last meeting of the association the general committee referred to the council a resolution relating to the natural history collections of the British Museum, in which it was recommended to press on the Government the importance of transferring the control of these collections from the board of trustees to a single officer of Government responsible to Parliament. After deliberating on the report of a committee specially appointed to consider the question, the council sent a deputation to urge on the Government the desirability of making the proposed changes.

"Professor Martins, of Montpellier, and Professor Mannheim, of Paris, who attended the meeting of the association at Dundee, have been elected corresponding members by the council.

"The annual report of the association for last year has been issued in an improved form, and at an earlier date than usual. It is hoped that with the co-operation of the authors of reports, it may in future be published at a still earlier period, and thereby its utility much increased.

"Owing to the modifications made at the Birmingham

meeting in the arrangements of Section D, the council have had under consideration the advisability of omitting the word 'Ethnology' in the designation of Section E. They recommend that a resolution to this effect be passed by the general committee.

"The council have been informed that invitations for 1869 will be presented by deputations from Exeter, Liverpool, Edinburgh, and Brighton; and an invitation for the following year by a deputation from Bradford."

It was then announced that the following gentlemen had been nominated as presidents, vice-presidents, and secretaries of the various Sections, and they were all elected unanimously:—

Section A (Mathematical and Physical Science).—Professor Tyndall, LL.D., F.R.S., president; Admiral Manners, F.R.S., President of the Royal Astronomical Society, and Professor H. J. Stephen Smith, F.R.S., vice-presidents; Professor G. C. Foster, M.A., and R. B. Hayward, M.A., secretaries.

Section B (Chemical Science).—Professor Frankland, F.R.S., president; Professor W. A. Miller, D.C.L., F.R.S., and Warren De La Rue, Esq., F.R.S., vice-presidents; Dr. Brown, F.R.S.E., F.C.S., Dr. Russell, F.C.S., and F. Sutton, Esq., F.C.S., secretaries.

Section C (Geology).—R. A. C. Godwin-Austen, Esq., F.R.S., F.G.S., president; Professor Huxley, F.R.S., and Professor Harkness, F.R.S., vice-presidents; and G. W. Pengelley, Esq., F.R.S., and the Rev. H. Winwood, M.A., F.G.S., secretaries.

Section D (Biology).—Rev. M. J. Berkeley, M.A., F.R.S., president; W. H. Flower, Esq., F.R.S, and E. B. Taylor, Esq., F.R.S., vice-presidents; and Dr. M. Foster, H. L. Stainton, Esq., F.R.S., the Rev. H. B. Tristram, M.A., F.R.S., and Dr. E. Percival Wright, F.L.S., secretaries.

Section E (Geography and Ethnology).—Captain Richards, F.R.S., hydrographer to the Royal Navy, president; Sir Henry Rawlinson, Bart., F.R.S., vice-president; and H. W. Bates, Esq., assistant secretary to the Geographical Society, Clements R. Markham, Esq., F.R.G.S., and Thos. Wright, Esq., M.A., secretaries.

Section F (Economic Science and Statistics).—Samuel Brown, Esq., president of the Society of Actuaries, president; Sir H. Jones, Bart., vice-president; and Professor Leone Levi, F.R.S., Edward Macrory, Esq., M.A., and Frederick Purdy, Esq., F.S.S., secretaries.

Section G (Mechanical Science).—G. P. Bidder, C.E., president; C. Hutton Gregory, Esq., president of the Institution of Civil Engineers, and J. Whitworth, D.C.L., F.R.S., vice-presidents; and P. Le Neve Foster, Esq., M.A., and J. F. Iselin, Esq., M.A., secretaries.

The inaugural address of Dr. J. D. Hooker, F.R.S., the President of the year, to whom the Duke of Buccleuch resigned the chair, was delivered on Wednesday evening, in the Volunteer Drill-hall. An audience of about 1,700 persons was present. The following is an abstract of the address:—

After some opening remarks the President said:—I propose to offer you some remarks upon several matters to which the attention of your Council was directed when at Dundee, and then upon some of the great advances that have been made in botany during the last few years—this will infallibly drag me into Darwinism; after which I shall allude to some matters connected with that dawning science, the early history of mankind, a theme which will be a distinguishing collateral feature of the Norwich Association. If in all this I disappoint you, it will be my solace to hope that I may thereby break the fall of some future President, who, like myself, may have all the will, but not the time, adequately to meet your great expectations. Before commencing, however, I must allude to a circumstance which cannot but be uppermost in the minds of all habitual attendants at these annual gatherings; it is that, but for a severe accident, there would have been present here to-night the oldest surviving, and indeed the first but two, of the Presidents of the British Association; my geological friends will understand to whom I allude, as that rock of science in whom age and the heat and shocks of scientific controversy have wrought no metamorphosis, and developed no cleavage planes—a man of whom both Norwich and the Association are proud—your Canon, our father, Sedgwick. My first duty as President is the pleasant one of introducing to you the members of the International Congress of Pre-historic Archæology, who under the presidency of Sir John Lubbock, himself a master of this branch of knowledge, open their third session to-morrow in this city. The researches which specially occupy the attention of the Congress, are, perhaps, the most fascinating that ever engaged the faculties of man, and pursued as they now are in a scientific spirit, and in due subjection to scientific methods, they will command all the sympathy, and their meetings will receive all the support, that my fellow members of the British Association can afford to them. . . . . . . The next subject which I have to bring officially before you, relates to the action of a committee which your Council appointed to represent to the Secretary of State for India 'the great and urgent importance of adopting active measures to obtain reports on the physical form, manners, and customs of the indigenous populations of India, and especially of those tribes which are still in the habit of erecting megalithic monuments.' Upon consideration the committee decided that it would be better in the first instance to direct the attention of the Secretary of State to the last-mentioned tribes only, both because the whole inquiry was so vast, and because systematic efforts are now being made by the Indian Government to obtain photographs and histories of the native Indian tribes. Their efforts are, as regards the photographs obtained in India, eminently successful . . . It will, no doubt, surprise many here to be told that there exists within 300 miles of the British capital of India a tribe of semi-savages, who habitually erect dolmens, menares, cysts, and cromlechs, almost as gigantic in their proportions as, and very similar in appearance and construction to, the so-called Druidical remains of western Europe; and, what is still more curious, though described and figured nearly a quarter of a century ago by Colonel Yule, the eminent Oriental geographer, except by Sir J. Lubbock, they are scarcely alluded to in the modern literature of prehistoric monuments . . . After referring to Colonel Yule's visit to this country in 1844, and also to one made by himself, the President went on to say:—Of late, the country has been more opened up, and the establishment of a British cantonment among them renders it all the more important that the inquiry into their origin, language, beliefs, customs, &c., should be followed up without delay. This will now be done, thanks to your representations, and I cannot doubt but that it will throw great light upon that obscure and important branch of prehistoric archæology, the megalithian monuments of Western Europe. The council of the association, upon the recommendation of the Biological Section, appointed a committee to report upon the subject of the government of the natural history collections of the British Museum, which resulted in a deputation, who represented to the Prime Minister that it was desirable that these collections be placed under the control of a single officer, who should be directly responsible to a Minister of the Crown; and that this opinion was shared by an overwhelming majority of British naturalists. The reasons stated were that there appeared no reason why the national collections of natural history should be administered in a way different from that which was found applicable to the Royal Gardens and Botanical Collections at Kew, the Museum of Practical Geology, and the Royal Observatory at Greenwich; and that the interposition of any board or committee between the superintendent of the collections and the Government must interfere with the responsibility of the superintendent and the efficient control of the Minister. . . .

Much as has been written upon the uses of museums, I believe that the subject is still far from being exhausted; for in the present state of education in this country, these appear to me to afford the only means of efficiently teaching to schools the elements of zoology and physiology. I say in the present state of education, because I believe it will be many years before we have school masters and mistresses trained to teach these subjects, and many more years before either provincial or private schools will be supplied with such illustrative specimens as are essential for the teacher's purposes. Confining myself to the consideration of provincial and local museums and their requirements for educational purposes, each should contain a series of specimens illustrating the principal and some of the lesser divisions of the animal and vegetable kingdoms, so disposed in well-lighted cases as that an inquiring observer might learn therefrom the principles upon which animals and plants are classified, the relations of their organs to one another and to those of their allies, the functions of those organs, and other matters relating to their habits, uses, and place in the economy of nature. Such an arrangement has not been carried out in any museum known to me, though partially attained in that of Ipswich; it requires some space, many pictorial illustrations, magnified views of the smaller organs and their structure, and copious legible descriptive labels; and it should not contain a single specimen more than is wanted. The other requirements of a provincial museum are—complete collections of the plants and animals of the province, which should be kept entirely apart from the instructional series, and from everything else. The curator of the museum should be able to give elementary demonstrations (not lectures, and quite apart from any powers of lecturing that he may possess) upon this classified series, to schools and others, for which a fee should be charged and go to the support of the institution. And the museum might be available (under similar conditions of payment) for lectures and other demonstrations. . . . . . . In respect of its natural history collections the position of the British Museum appears to me to be a disadvantageous one; it is surrounded by miles of streets, including some of the principal metropolitan thoroughfares, which pour clouds of dust and the products of coal combustion into its area day and night; and I know few more disappointing sights, to me, than its badly-lit interior presents on a hot and crowded public holiday, when whole families from London and its outskirts flock to the building. Then young and old may be seen gasping for fresh air in its galleries, with no alternative but the hotter and dustier streets to resort to. How different it would be were these collections removed to the townward end of one of the great parks! where spacious and well-lit galleries could be built, among trees, grass, and fountains; and where whole families need not any more be cooped up for the day in the building, but avail themselves of the fresh air and its accessories at the same time as they profit by the collection! . . . .
The greatest botanical discoveries made during the last ten years have been physiological, and I here allude especially to the series of papers on the fertilisation of plants, which we owe to Mr. Darwin. You are aware that this distinguished naturalist, after accumulating stores of facts in geology and zoology during his circumnavigation of the globe with Captain Fitzroy, espoused the doctrine of the continuous evolution of life, and by applying to it the principles of natural selection, evolved his theory of the origin of species. Instead of publishing these views as soon as conceived, he devoted 20 more years to further observation, study, and experiment, with the view of maturing or subverting them. Mr. Darwin's recent two volumes "On Animals and Plants under Domestication," is a catacomb of data, observations, and experiments, such as assuredly no one but himself could produce. It is hard to say whether it is most remarkable for the number and value of the new facts it discloses, or for its array of small, forgotten, or overlooked observations, neglected by some naturalists, and discarded by others, which, under his mind and eye, prove to be of first-rate scientific importance. An eminent surgeon and physiologist (Mr. James Paget) has remarked to me *apropos* of these volumes, that they exemplify, in a most remarkable manner, that power of utilising the waste materials of other scientific men's laboratories which is a very characteristic feature of their author. As one of those *pièces justificatifs* of his previous work, "The Origin of Species," which have been waited for so long and impatiently, these volumes will probably have more than their due influence; for the serried ranks of facts in support of his theories which they present may well awe many a timid naturalist into bolting more obnoxious doctrines than that of natural selection. It is in this work that Mr. Darwin expounds his new hypothesis of pangenesis, which certainly correlates to, and may prove to contain the rationale of all the phenomena of reproduction and inheritance. You are aware that every plant or animal commences its more or less independent life as a single cell from which is developed an organism more or less closely similar to its parents. One of the most striking examples I can think of is afforded by a species of begonia, the stalks, leaves, and other parts of which are superficially studded with loosely attached cells. Any one of these cells, if referred to favourable conditions, will produce a perfect plant, similar to its parent. You may say that these cells have inherited the potentiality to do so, but this is not all, for every plant thus produced in like manner develops on its stalks and leaves myriads of similar cells, endowed with the same property of becoming such in new plants; and so on, apparently interminably. Therefore the original cell that left the grandparent, not only carried with it this so-called potentiality, but multiplied it and distributed it with undiminished power through the other cells of the plant itself produced; and so on for countless generations. What is this potentiality, and how is this power to reproduce thus propagated, so that an organism can, by single cells, multiply itself so rapidly, and within very narrow limits, so surely and so interminably? Mr. Darwin suggests an explanation, by assuming that each cell or fragment of a plant (or animal) contains myriads of atoms or geminules, each of which geminule he supposes to have been thrown off from the separate cells of the mother plant, the geminules having the power of multiplication, and of circulating throughout the plant: their future development he supposes to depend on their affinity for other partially-developed cells in due order of succession. Geminules which do not become developed, may, according to his hypothesis, be transmitted through many succeeding generations, thus enabling us to understand many remarkable cases of reversion or atavism. Thus, according to this hypothesis, not only have the normal organs of the body, the representative elements of which they consist diffused through all the other parts of the body, but the morbid states of these, as hereditary diseases, malformations, &c., all actually circulate in the body as morbid geminules. Ten years have elapsed since the publication of the "Origin of Species by Natural Selection," and it is hence not too early now to ask what progress that bold theory has made in scientific estimation. The most widely circulated of the journals that give science a prominent place on their title pages, the *Athenæum*, has, very recently, told it to every country where the English language is read, that Mr. Darwin's theory is a thing of the past; that natural selection is rapidly declining in scientific favour, and that, as regards the above two volumes on the variation of animals and plants under domestication, they "contain nothing more in support of origin by selection than a more detailed reassertion of his guesses founded on the so-called variations of pigeons." Let us examine for ourselves into the truth of these inconsiderate statements. Since the "Origin" appeared, ten years ago, it has passed through four English editions, two American, two German, two

French, several Russian, a Dutch, and an Italian; whilst of the work, on variation, which first left the publisher's house not seven months ago, two English, a German, Russian, American, and Italian edition are already in circulation. So far from natural selection being a thing of the past, it is an accepted doctrine with every philosophical naturalist, including, it will always be understood, a considerable proportion who are not prepared to admit that it accounts for all Mr. Darwin assigns to it. Reviews on the "Origin of Species" are still pouring in from the Continent, and Agassiz, in one of the addresses which he issued to his collaborateurs on their late voyage to the Amazons, directs their attention to this theory as a primary object of the expedition they were then undertaking. I need only add, that of the many eminent naturalists who have accepted it, not one has been known to abandon it; that it gains adherents steadily; and that it is *par excellence* an avowed favourite with the rising school of naturalists; perhaps, indeed, too much so, for the young are apt to accept such theories as articles of faith, and the creed of the student is also too likely to become the shibboleth of the future professor. On the score of geology, the objectors rely chiefly on the assumed perfection of the geological record; and since almost all who believe in its imperfection, and many of the other school, accept the theories both of evolution and natural selection, wholly or in part, there is no doubt but Mr. Darwin claims the great majority of geologists. The veteran Sir Charles Lyell, after having devoted whole chapters of the first edition of his "Principles" to establishing the doctrine of special creations, abandons it in the tenth, and this, too, on the showing of a pupil; for, in the dedication of his earliest work, "The Naturalist's Voyage," to Sir C. Lyell, Mr. Darwin states that the chief part of whatever merit himself or his works possess has been derived from studying the "Principles of Geology." I know no brighter example of heroism of its kind, than this, of an author thus abandoning, late in life, a theory which he had for forty years regarded as the very foundation of a work that had given him the highest position attainable among scientific writers. Well may he be proud of a superstructure raised on the foundations of an insecure doctrine, when he finds that he can underpin it, substitute a new foundation, and after all is finished, survey his edifice, not any more secure, but more harmonious in its proportions, than it was before; for assuredly the biological chapters of the tenth edition of the "Principles" are more in harmony with the doctrine of slow changes in the history of our planet, than were their counterparts in the former editions.

. . . . A new science has dawned upon us, that is the early history of mankind. Prehistoric archæology (including, as it does, the origin of language and of art), is the latest to rise of a series of luminaries that have dispelled the mists of ages and replaced time-honoured traditions by scientific truths. Astronomy, if not the queen, yet the earliest of sciences, first snatched the torch from the hands of dogmatic teachers, tore up the letter, and cherished the spirit of the law. Geology next followed, but not for two centuries, nor indeed till this our day, did it succeed in divesting religious teaching of many cobwebs of scientific error. It has told us that animal and vegetable life preceded the appearance of man on the globe, not by days but by myriads of years; and how late this knowledge came we may gather from the fact that Mr. Lawrence, in his lectures delivered so late as 1818, says of the extinct races of animals, that "their living existence has been supposed, with considerable probability, to be of older date than the formation of the human race." And last of all, this new science proclaims man himself to have inhabited this earth for, perhaps, many thousands of years before the historic period—a result little expected less than 30 years ago, when the Rev. W. V. Harcourt, in his address to the association at Birmingham, observes that "geology points to the conclusion that the time during which mankind existed on the globe cannot materially differ from that assigned by Scripture," referring, I need not say, to the so-called Scripture chronology, which has no warrant in the Old Testament, and which gives 5874 years as the age of the inhabited globe. Pre-historic archæology now offers to lead us where man has hitherto not ventured to tread. Can we, whilst pursuing this inquiry, separate its physical from its spiritual aspect? will be the uppermost thought in the minds of many here present. To separate them, I believe, is indeed impossible, but to search out common truths that underlie both is permitted to all. It has been well said of all truth, by Mr Disraeli, that "It is the sovereign passion of mankind," and it should be emphatically so in the minds engaged in this search, where religion and science should speak peace to one another, if they are to walk hand in hand in this day and generation. A great deal has been said and written of late about the respective attitudes of religion and science, and my predecessor, the Duke of Buccleuch, dwelt on this in his address last year with great good sense and good taste, and pointed out how much the progress of knowledge depended on this attitude being mutually considerate and friendly. During the first decades of my scientific life, the word "science" was rarely within my experience heard in the pulpits of these islands. During the succeeding, when the influence of the *Reliquiæ Diluvianæ*, and the *Bridgewater Treatises* was still felt, I often heard it, and always welcomed it. Now of late years, science is more frequently named than ever, but too often with dislike or fear, rather than with trust and welcome. . . . .

Let each pursue the search for truth, the archæologist into the physical, the religious teacher into the spiritual history and condition of mankind. It will be in vain that each regards the other's pursuits from afar, and turning the object glass of his mind's telescope to his eye is content when he sees how small the other looks. To search out the whence and whither of existence is an unquenchable instinct of the human mind; to satisfy it man in every age and in every country has adopted creeds that embrace the history of his past and future, and as eagerly accepted scientific truths that support the creeds, and, but for this unquenchable instinct, I firmly believe that neither religion nor science would have advanced so far as they have in the estimation of any people. Science has never in this search hindered the religious aspirations of good and earnest men; nor have pulpit cautions, which are but ill-disguised deterrents, ever turned inquiring minds from the revelations of science. A sea of time spreads its waters between that period to which the earliest traditions of our ancestors point, and that far earlier period when man first appeared upon the globe. For his track upon the sea man vainly questions his spiritual teachers. Along its hither shore, if not across it, science now offers to pilot him. Each fresh discovery concerning prehistoric man is as a pier built on some rock its tide has exposed, and from these piers will one day spring arches that will carry him further over its deeps. Science, it is true, may never sound the depths of that sea, may never buoy its shallows, or span its narrowest creeks; but she will still build on every tide-washed rock; nor will she ever deem her mission fulfilled till she has sounded its profoundest depths and reached its further shore, or proved the one to be unfathomable and the other unattainable upon evidence not yet revealed to mankind. And if in this track one bears in mind that it is a common object of religion and science to seek to understand the infancy of his existence, that the laws of mind are not relegated to the teachers of physical science, and that the laws of matter are not within the religious teacher's province, these may then work together in harmony and goodwill. But if they would thus work in harmony both parties must beware how they fence with that most dangerous of all edged weapons, natural theology—a science falsely so called—when, not content with trustfully accepting truths hostile to any presumptive standard it may set up, it seeks

to weigh the infinite in the balance of the finite, and shifts its ground to meet the requirements of every new fact that science establishes and every old error that science exposes. Thus pursued, natural theology is to the scientific man a delusion, and to the religious man a snare, leading too often to distorted intellects and to atheism. One of our deepest thinkers, Mr. Herbert Spencer, has said:—"If religion and science are to be reconciled, the basis of the reconciliation must be this deepest, widest, and most certain of facts, that the power which the universe manifests to us is utterly inscrutable." The bond that unites the physical and spiritual history of man, and the forces which manifest themselves in the alternate victories of mind and of matter over the actions of the individual are, of all the subjects that physics and psychology have revealed to us, the most absorbing and perhaps inscrutable. In the investigation of these phenomena are wrapped up the past and the future, the whence and the whither of his existence; and after a knowledge of these the human soul still yearns, and thus passionately cries, in the words of a living poet:—

"To matter or to force
The All is not confined;
Beside the law of things
Is set the law of mind;
One speaks in rock and star,
And one within the brain,
In unison at times
And then apart again;
And both in one have wrought us hither
That we may know our whence and whither.

The sequency of law
We learn through mind alone,
We see but outward forms,
The soul the one thing known:
If she speak truth at all,
The voices must be true
That give these visible things,
These laws, their honour due;
But tell of one who brought us hither,
And holds the keys of whence and whither.

* * * * *

He in his science plans
What no known laws foretell;
The wand'ring fires and fix'd
Alike are miracle:
The common death of all,
The life renew'd above,
Are both within the scheme
Of that all-circling love;
The seeming chance that cast us hither
Accomplishes his whence and whither."

Dr. Hooker resumed his seat amid loud cheers, and a cordial vote of thanks for his address was moved by Professor Huxley, seconded by Professor Tyndall, and supported by the Mayor of Norwich, who heartily welcomed the Association to Norwich.

REGULATIONS RESPECTING FISHING IN FRANCE.

An important document on fishing, by the Minister of Agriculture and Commerce, has recently appeared, accompanied by an Imperial decree upon the subject.

A law, passed in 1865, introduced four new and important provisions into the legislation in France on this subject, namely, the creation of reserves for the reproduction of the fish, the establishment of ladders in the weirs, in order to assist the return of migratory fish, the reducing to a uniform scale the restrictions relating to the fishing-seasons in those parts of the rivers which are near the sea, and the interdiction of the sale, hawking, import and export of the several kinds during the periods of prohibition. These provisions have, it would appear, only been partially carried out. Surveys have been made with the view to the formation of reserves; the establishment of one of these reserves in the basin of the Seine has been decreed, and other decrees are promised respecting the basins of the Loire, the Garonne, and the Rhone. Ladders have been formed in the weirs of the Moselle, Dordogne, Vienne, Blavet, and other rivers, and others will be constructed as rapidly as the means at the disposal of the service will allow. Lastly, the interdiction against salmon and trout fishing has been fixed uniformly for the whole of the rivers of the empire, whether fluvial or maritime. The period of interdiction is from the 20th of October to the 31st of January in each year.

Under the authority of old ordonnances each department had its own river regulations and police enactments, and, consequently, there existed a great diversity in various places, not only with respect to the periods of interdiction, but also as to nets and tackle to be used, and other matters; and it has been determined to put an end to this condition of affairs, and to adopt the same regulations for all the watercourses of the empire, with some necessary exceptions. The uniformity of the regulations respecting the size of the meshes of nets, the tackle, and modes of taking fish, and the size below which this or that fish shall be thrown back into the water, cannot give rise to any serious objection; the only point which is likely to give rise to discussion is the period of interdiction with respect to the various kinds of fish. Uniformity in regulation would clash with the natural laws of reproduction, which vary with the climate and species; still, it appears that, as regards all the fish that live in the waters of France, a classification is desirable, corresponding with two distinct periods of spawning, that of winter for the salmonidæ, and of summer for the other species, an average interval being fixed, so as sufficiently to protect the earliest as well as the latest fry. A scheme founded on these bases was communicated to the Conseils-Généraux in 1865, and examined by them during the following year. The results were afterwards laid before a commission appointed by the Minister of Agriculture, and finally the subject was examined by the Agricultural and Industrial Section of the Conseil d'Etat.

The following are the clauses of the decree in question:—

Article 1. The taking of salmon, trout, and char is interdicted between the 20th October and the 31st of January, and that of all other kinds of fish, as well as of river crawfish, between the 15th of April and the 15th of June. The grayling, eel, and lamprey are included in these interdictions, but not other kinds which live alternately in fresh and salt water. The interdiction applies to all methods of taking fish, even by hook and line.

Art. 2. The prefects are authorised, with the advice of the Conseils-Généraux, to interdict the taking of any species of fish during either of the above-mentioned periods, in order to protect the most important kinds; but such interdiction must be submitted to the approbation of the Minister of Agriculture.

Art. 3. All interdictions must be published during the week preceding the date when they come into force.

Art. 4. Any persons carrying or selling fish caught in reservoirs or pools during the interdicted periods may be called upon to prove their origin.

Art. 5. No fish seized and sold under this decree can be again offered for sale.

Art. 6. Fishing is only permitted between sunrise and sunset. But the taking of craw-fish and eel may be authorised at other hours, may be allowed by the order of a prefect, which order must, in the case of craw-fish, mention the nature and dimensions of the nets or apparatus to be used.

Art. 7. Nets and apparatus of the legal dimensions may be left in the water at any time, but they must not be laid or lifted except during daylight.

Art. 8. Fish of smaller size than those mentioned below must not be taken, or, if taken, must be immediately thrown back into the water:—1. Salmon and eels, 25 centimetres long (10 inches). 2. Trout, char, grayling, carp, pike, barbel, bream, chub, mullet, chad, perch, roach, tench, eelpouts, and lampreys, 14 centimetres ($5\frac{1}{2}$ inches). 3. Soles,

flounders, and plaice, 10 centimetres (4 inches). 4. Craw-fish, 8 centimetres ($3\frac{1}{8}$ inches).

The length of the above-mentioned fish are to be measured from the eye to the root of the tail, and that of the craw-fish from the eye to tip of the tail when stretched out. These rules do not, however, apply to fish taken by anglers.

Art. 9. The meshes of nets, measured each way after having remained in water, and the openings of eel-pots, traps and other apparatus used in fishing, must have the following dimensions:—1. For salmon, at least 40 milimetres (rather more than $1\frac{9}{16}$ inches). 2. For the larger fish, salmon excepted, and for craw-fish, at least 27 milimetres ($1\frac{1}{16}$ inch). 3. For the small kinds, such as gudgeons, loach, minnows, bleak, and others, 10 milimetres (rather more than $\frac{3}{8}$ inch). An allowance of one-tenth is made with respect to the meshes.

Art. 10. Nets, whether fixed or floating, must not exceed in length more than two-thirds of the width of the streams in which they are used; and a number of nets must not be used, whether on the same side or different sides of a stream, without a space equal at least to three times their own length.

Art. 11. Fixed nets must be raised by the middle during thirty-six hours in each week, namely, from six o'clock on Saturday night to six in the morning of Monday, along at least one-tenth of their whole length, in such a manner as to leave at least half-a-yard clear between the lower edge of the net and the bottom of the stream.

Art. 12. All drag nets are prohibited with the exception of the *epervier*, managed by a single man. All snares are also prohibited.

Art. 13. It is prohibited also:—1. To fix any apparatus whatever in streams, so as to drive the fish into holes, whence they cannot escape, or compel them to pass through openings protected by snares or traps. 2. To fix baskets, nets, or traps against sluices, weirs, natural falls, mill-streams, or fish-ladders. 3. To fish with any tackle or apparatus, except hand rod and line, within sluices, gates, mill-streams, and fish passages or ladders, or within thirty mètres of such works or places. 4. To fish in those parts of rivers, canals, or streams, which have been accidentally reduced, either for cleansing operations or by the stoppage of works, &c.

Art. 14. Prefects are empowered, on the application of inspectors of fisheries and waterways, or of proprietors of streams, to permit, at certain times, and within certain defined limits, extraordinary means to be taken, with a view to the destruction of certain species of fish and the introduction of others of more value.

Art. 15. Prefects are empowered, with the advice of engineers and sanitary councils, to fix:—1. The duration of the steeping hemp and flax in watercourses, and to fix the localities where such steeping may be carried on with the least inconvenience as regards the fish. 2. The measures to be observed with respect to waste matters from factories and other sources, and the healthiness of fish streams.

The above regulations do not apply to the Rhine or the Bidassoa, for which there are special laws and regulations.

SOUTH STAFFORDSHIRE INDUSTRIAL AND FINE ARTS EXHIBITION.

It has been determined to hold, during the spring and summer of 1869, at Wolverhampton, an Industrial and Fine Arts Exhibition, under the auspices of the committees and supporters of the Wolverhampton School of Practical Art, and of the South Staffordshire Educational Association.

In a circular recently issued, the promoters of the undertaking say:—

"The great importance and variety of the manufactured productions of South Staffordshire, and of those portions of East Worcestershire immediately adjacent thereto, have never yet been fully realized in any exhibition, either international or local; and the proposal now made to supply this manifest defect, by a complete and strictly local exposition of the manufactured products of the entire district, after a well-arranged classification, and on a scale commensurate with its resources, cannot fail to ensure for it a deep and wide-spread interest.

"The chief objects, therefore, of the exhibition will be, to illustrate, as fully as possible, the entire natural and industrial resources and productions of the district; to collect and arrange the best obtainable specimens of ancient and modern articles, whether of home or foreign manufacture, with a view to the suggestion of useful comparisons; to stimulate the inventive faculties and the manual skill of artisans and designers; to exhibit all the best plans and designs for the applications of science and ingenuity to the working of mines, the erection and improvement of workmen's houses, of workshops, and of public buildings; and to give such a direction to the taste and general education of the locality as the exhibition of choice works of art is always so well calculated to impart.

"The exhibition will consist of an indoor and an out-door department, and will necessitate either the erection of a set of temporary annexes, in connection with some present building in the town, as, for example, the School of Art; or, in the event of the space required being too great for this site, the erection of a number of suitable sheds, on a good site, readily accessible both from the town and the district generally.

"To secure the committee from even an apprehension of ultimate loss, it is intended to establish a guarantee fund, and in order to produce as wide an interest in the undertaking as possible, it has been determined to limit each guarantor's liability to the sum of £10. It is proposed that the minimum guarantee fund shall be at least £2,000. A private canvass, conducted by two or three members of the committee, has secured already a full fourth of this amount.

"The committee have already received the most gratifying promises of help from several of the noblemen, gentlemen, and leading manufacturers of this portion of the county. From South Kensington, too, they have every expectation of the loan of a large and valuable collection of metal and other works of art, both ancient and modern, and it is with the greatest satisfaction that they are able to announce that Mr. Geo. Wallis, formerly of Wolverhampton, but now of the South Kensington Museum, has, in the kindest manner, promised to meet the committee with reference to their proposed arrangements for this exhibition, and to afford them all the advice and help which his long experience so well qualifies him to impart. It is intended to open and close the exhibition with a public ceremonial and grand musical entertainments.

"The question of awarding distinctions and rewards to manufacturers has not yet been fully entertained by the committee. It is a nice question, and one which it is important that manufacturers should themselves settle. Those, therefore, who intend exhibiting, are requested to give their opinion upon the matter. Reports by thoroughly competent men, upon the various classes of objects exhibited, will be prepared and published, under the superintendence of a special committee, as soon as possible after the close of the exhibition. Any surplus proceeds of the exhibition are to be divided between the two bodies named in the first paragraph."

The Earl of Lichfield is President; Messrs. Henry T. Barker, of Wolverhampton, and George T. Hartley, of the Oaks, Wolverhampton, are the Honorary Secretaries; and Mr. Fredk. Talbot, of Smethwick, visiting officer to the Society of Arts in the South Staffordshire district, is the Secretary, *pro tem.*"

It is intended that the exhibition should include—

1. A complete collection of the natural productions of the district.

2. A complete collection of the best examples of all articles produced in the district, classified and arranged, as far as possible, with regard to the expense and skill required in their production.

3. A loan collection from South Kensington, and from noblemen and gentlemen interested in the exhibition, of the best examples of home and foreign productions, either ancient or modern, similar to those produced in the district, and calculated to suggest any improvement in, or the extension of, any process or manufacture.

4. A collection of designs, models, or articles, produced by designers, modellers, artisans, and workmen, upon certain specified conditions, and after prescribed models.*

5. A collection of implements, tools, and machines, used in the manufacturing and mining operations of the district.

6. A collection of designs and plans for industrial establishments; for the working and ventilation of mines; for public buildings, such as town halls, markets, institutes, and schools; for groups of workmen's houses; for utilising waste lands, such as pit banks, and slag heaps; for draining and sewage purposes; geological models, sections, and maps, of the whole, or of any portions of the district.

7. An educational collection of work done by pupils of schools of art and night schools, such as drawings and designs, maps, specimens of writing and accounts, needlework, knitting, and such other productions as are suggested in the broad sheet of the South Staffordshire Educational Association, as proper to be done by apprentices and other young persons attending the night schools of the district.

8. An art gallery, consisting of illustrations of the fine arts, pictures, statues, busts, vases, portraits of men eminent in connection with the history, and especially with the history of the manufactures, of the county; with photographic illustrations, scientific and philosophical apparatus, &c.

9. Machinery in motion.

10. An out-door exhibition of grottoes, fountains, aquariums, hydraulic machines, conservatories, flowers, ferns, plants, &c.

Fine Arts.

Distribution of Fine Art Prizes in Paris.—The distribution of the awards made to artists who exhibited in the *salon* of the present year, and to the pupils of the Ecole des Beaux Arts took place in the great square room of the Louvre, with the accustomed ceremony, on the 13th inst. The meeting was presided over by Marshal Vaillant, Minister of the Imperial Household and of the Fine Arts, supported by the Count de Nieuwerkerke, Superintendent, and other officers of the department, and a large number of members of the Institute, conservators of the public collections, and artists. The main fact referred to in connexion with the late *salon* was the absence of any historical work of sufficient importance to warrant the award of the great prize in painting, which was given to a work of *genre*, as stated in a notice of the *salon* in the *Journal*. While highly applauding the value and the progress which has recently taken place in the character of such works of late years, the Minister laid great stress on the maintenance of a higher standard by the representation of great ideas on a large scale. Nine Crosses of the Legion of Honour were awarded by the Emperor, the recipients being Messieurs Nanteuil, Brisset, Anastasi, and Millet, painters; Cabet and Daumas, sculptors; and Laurens, lithographer; with two foreign painters, Verlat and Pasini. It was announced that presentations of pictures, either ordered specially, or purchased out of the funds of the Department of the Beaux Arts, had been made to churches and chapels in sixty-three departments of France, and that portraits, full or half-length, engraved portraits and busts of the Emperor and Empress, had been presented to seventy prefectures, hôtels de ville, and colonial government-houses.

Monument to Ibrahim Pacha.—The present Viceroy of Egypt has ordered a magnificent monument, fifty feet high, to be erected to the memory of his father. At the foot of a statue of the late viceroy will be four lions *couchant*, the pedestal to be ornamented with bas-reliefs in marble and bronze, and around the base will be a basin receiving ten jets of water. The commission entrusted with the arrangements consists of the Count de Nieuwerkerke, Messieurs Théophile Gautier, Paul de Saint Victor Gérôme, Muller, Charles Edmond, and Nubar Pacha. The execution of the work is entrusted to M. Thobais, architect; M. Charles Cordier, sculptor; and M. Jacquemart, modeller of animals. In spite of the protests issued against the junction of monumental statues and fountains, here we have another example of the practice.

Decorations of the New Vaudeville Theatre, Paris.—The new Vaudeville Theatre presents but a small front, only a large rounded angle of the Boulevard and the Chaussé d'Antin, but it is highly decorated. M. H. Chevalier has executed the sculpture of the pediment, which represents the "Genius of Comedy," supported by two smaller genii, with the attributes of modern comedy. M. Salmson has carved four fine caryatides, representing "Satire," "Poetry," "the Dance," and "Comedy." M. E. Hébert, two groups of children, representing "Music" and "Comedy." And in addition to these are three busts, representing Désaugiers, Collé, and Scribe, executed by M. Evrard and Mdlle. Dubois Davesnes. The interior of the theatre is being rapidly completed, and will be ready for performances in a few months.

Manufactures.

Manufactures in California.—Two large woollen mills have been in successful operation for several years; one of them has recently added works for the manufacture of all kinds of knit goods. A cotton mill, erected some two years since, has been gradually extending its business, and now manufactures 30,000 yards of shirting monthly. Last year the produce amounted to 100,000 yards of shirtings and 50,000 of brown sheeting. A small portion of the cotton used is drawn from the southern portion of the state. The California Powder Company last year manufactured 153,000 kegs of blasting and 7,300 kegs of fine powder. All the machinery required on the coast is manufactured in San Francisco and other parts of the state. A cordage factory turned out, in 1867, 2,000,000 lbs. of cordage, and manufactures the largest-sized hawsers. A wire-rope factory is doing a large business, and the proprietors have erected several suspension-bridges in the state, in a most creditable manner. Several potteries have been established within the past two or three years, and work with clay of a superior quality, found in several parts of the state. There are twelve soap factories in the city of San Francisco and neighbourhood, manufacturing the common qualities to an extent to supply the entire requirements of the northern coast. Almost every branch of manufacturing industry is represented there, and in a few years no manufactured articles of any kind whatever will be required from the Eastern States of America.

Utilisation of Water-Power.—An application has been made to the Minister of Agriculture, by an Italian engineer, Signor A. Vescovali, for permission to make

* A prize-scheme in connexion with this portion of the exhibition will, it is hoped, be forthcoming with the publication of the conditions. The committee will be very happy to receive offers of prizes from manufacturers, public bodies, or gentlemen who may feel an interest in this portion of the scheme, and also suggestions as to the kinds of articles upon the production of which the artisans of the district may be most usefully encouraged to apply their talents and leisure.

use of the water-power furnished by the waterfall of the Marmore, near Terni (Italy), by means of Hirn's system of telodynamic transmission. This system, which was exhibited at the Paris Exhibition, 1862, consists in conveying the power obtained by a water-wheel or other hydraulic motor, to any place where it may be required, by means of an endless wire rope carried on pullies. Since 1850 this system has been adopted in various parts of Europe, amongst which may be mentioned at Kaiserberg, in Alsatia, where the power is transmitted to a distance of 342 meters; at Oberursel, near Frankfort, to 984 meters; in Denmark to 1,100 meters; at Cornimont (Vosges), to 1,150 meters; at Emmendingen, to 1,200 meters; at Okhta (Russia), to 1,400 meters; and to 1,500 meters at Fontaine-La-Soret (Eure). Among the most recent applications of this system may be mentioned those of Schaffhausen (Switzerland), and Fahm (Sweden). At the first the power (obtained from an artificial fall in the Rhine) is conveyed to a distance of 1,200 meters and serves to work the machinery of several large cotton mills, a gun factory, goldsmiths' works, saw-mills, &c. At the latter place the possibility of conveying motive-power to a greater distance is practically demonstrated, the power obtained from a waterfall being conveyed to a distance of 5 kilometers to the mines of Fahm. This system Signor Vescovali proposes to adopt to supply the various industries in the Piano di Terni with an economical motive-power. The locality seems to be admirably adapted for this purpose, and by making use of the falls of the Velino, at the Marmore, which is 160 meters in height, with a minimum discharge of 40 cubic meters per second, a motive power of about 85,000 horse-power might be obtained.

Panama Hats.—The hats of Guayaquil, so very generally used and appreciated now in Europe, as they have long been in America, and known under the misnomer of Panama hats, because they are shipped through Panama, are made with the split fibre of the leaves of a plant belonging to the family of *Cyclanthus*, locally called *Bombonaxa Chidra*, &c., but known to botanists as the *Carludovico palmata*. These hats are somewhat dear, but very durable; and as they can be cleaned and bleached at a small expense, they preserve to the last the supple qualities and beauty which they had when they left the workman's hands. They are in general use in America by all classes, and on the Continent the drivers of vehicles have begun to estimate and appreciate them. Their price varies from 2s. or 3s. up to £25, according to fineness. In Europe they necessarily cost more. The finest are made with the fibre of the young unexpanded leaf, called *Toquilla*, from which is also made very fine hammocks, which are as much sought after as the hats. Lately the leaves or raw material has been in demand for export, the average quantity shipped being about 200 to 250 cwt. annually. The average export from Guayaquil alone of these so-called Panama hats has been in the past six years from 15 to 16 thousand dozens annually. There are also about 150 to 200 hammocks shipped yearly. These hats are also made in the State of Costa Rica, and in New Granada, where the palm leaf fibre is called *Murrapa*, and the split leaf *Nacuma*. The very fine hats made in this State rival those of Guayaquil. The principal places where they are made in New Granada are the provinces of Antioquia, Nina, and Socorro. The petioles of the leaf are made here into baskets, called Petacas. The fibre is dyed various colours.

Commerce.

Amber.—The dredging establishment near Schwarzort, on the Curish Haff, produced about 83,600 lbs. of amber in the course of the year 1867. In the two previous years the quantities obtained were as follows, viz.:—in 1865, 53,000 lbs.; and in 1866, 73,000 lbs. The amber trade during the year was not very flourishing. The expectation that the business with England would become more important has not been fulfilled. It is most probable that the large quantities of imitated amber which are brought to the English and Asiatic markets, and the price of which is much lower than that of the genuine article, causes the demand from Prussia to be so small.

Tea Cultivation in India.—The *Pioneer*, an Allahabad paper, summarising the report of the Commissioners appointed to inquire into the present condition and future prospects of tea cultivation in Assam, Cachar, and Sylhet, says:—"On the whole the Commissioners do ample justice to the planters, and bear testimony to the kindness and consideration with which the labourers are treated on the great majority of tea estates. They condemn the working of the system of supplying Coolie labour to the gardens through the intervention of contractors, or middle men, who have no interest in common with the planter or the Coolie, and who invariably cheat both. The protectorate system is also condemned as useless and inoperative, and supervision by medical officers recommended in its stead. The commissioners hold also that planters have been unjustly dealt with by the Public Works Department, who have employed largely the time-expired labourers who were originally imported into the districts, at immense cost, by the planters; and they recommend that government should follow the example of the tea planters, and import Coolie labour sufficient to meet the requirements of the service on public works. The question of successful cultivation, the commissioners think, may be reduced to one of labour. They see no reason to doubt that, so far as soil and climate go, tea can be grown profitably. If labour can be obtained in sufficient quantity, and at reasonable cost, and the gardens be properly and economically managed, the cultivation of the plant may, they feel confident, be carried on at a profit. The most interesting part of the report, however, is that which relates to the mortality of the Coolies in the depôts, and in transit to the tea districts; and a horrible picture it presents to our view. Compared with the death-rate among Coolies shipped at the different colonies which import Indian labourers, the death-rate of the Coolies for the tea districts in the Calcutta depôts is as 59·02 to 11·58. The reason for this vast discrepancy is attributed to the very much larger proportion of Dhangurs (the hill people of Chota Nagpore), who are recruited for the tea plantations. It has long been an admitted fact, that these people suffer much more severely, both in the depôts and on the voyage, than other Coolies, and that they die in much larger numbers. At the Mauritius depôt, from May 1st, 1860, to April 30th, 1861, the death-rate among these hill people was 141·6 per cent. per annum. In other words their average tenure of life in Calcutta was only eight months. No wonder that the commissioners, with this frightful fact before them, should have recommended the government not to allow any more Dhangurs to be recruited for the tea districts. This brings us once more to the question of the labour supply, upon which depends the future successful cultivation of Indian tea. The commissioners (wisely, we think) recommend that planters should be encouraged to send their own garden sirdars to beat up for recruits, in the districts from which they are imported; and that parties of Coolies, not exceeding fifty in each, should be permitted to make their own way to the gardens. In this way, the expense of imported labour would be much less than under the present system; there would be less danger of epidemic disease breaking out among the Coolies on the journey; the Calcutta depôts, and the over-crowding there, would be avoided altogether; and the relations between the employers and the employed would be much strengthened."

Line of Steamers between Genoa and Egypt.—A regular steam service between Genoa and Alexandria has just been established by Messrs. Rubattino and Co.

of Genoa, the owners of the Italian mail packets. The *Africa* screw steamer, of 1,200 tons, the first of the new line, sailed from Genoa on the 16th of July, for Alexandria and Port Said. The departures from Genoa are fixed for the 1st and 16th of each month.

Exports from Switzerland to the United States.—In 1867 there was a considerable decrease in the exports from Switzerland to the United States as compared with those of the previous year, the falling off principally being in silks and watches. The following are the values of the principal exports in 1866 and 1867 :—

	1866.	1867.
	Francs.	Francs.
Silk, stuffs, and ribbons	31,766,072	18,818,073
Cotton goods	5,173,296	2,038,330
Lace	3,236,138	3,154,087
Straw manufactures	1,179,705	2,432,405
Watches and parts of watches	13,093,408	10,362,418
Musical boxes	300,108	265,196
Cheese	700,130	827,647
Leather	1,098,541	1,205,428

Imports of Sulphur to Venice.—The following are the imports of sulphur to Venice in 1867 compared with those of the four previous years :—

	Quintals.	Value.
		frs.
From Sicily	25,639	435,863
„ Umbria	23,221	394,767
„ France	1,127	19,159
„ Austria	4,921	83,657
Total in 1867	54,908	933,436
„ 1866	14,762	243,556
„ 1865	26,980	472,157
„ 1864	30,933	618,660
„ 1863	31,600	632,010

Colonies.

The Island of Grenada.—The following account of the condition of this island is quoted by the *Produce Markets' Review*, from a Government report:—"There are 140 estates in cultivation, namely, 72 in sugar, 56 in cocoa, and 12 in cotton. The quantity of sugar shipped during the last five years is as follows:—

	Tons.	cwt.	qrs.	lbs.
1862	3,475	11	3	14
1863	5,116	16	0	12
1864	4,492	15	0	15
1865	3,928	0	2	24
1866	5,360	14	1	14

The sugar crop of 1866 is in excess of that manufactured in any of the years embraced in the above return, and is considerably over the annual average of the last twenty years. The prospects of the sugar planters are not, however, very encouraging, and there is every reason for apprehending that a large extent of land will shortly be thrown out of cane cultivation. There are no less than 14 sugar plantations at this present moment advertised for sale in the local newspaper; although in Grenada the negro is undoubtedly averse to work continually in the cane fields, yet, the despondency which now prevails among some of the proprietors of sugar plantations cannot be attributed to the want of a sufficient supply of labour; no less than 4,197 immigrants have been introduced into the colony since the year 1843, and, if we are to judge by the refusal of so many of the planters to re-indenture the coolies located on their estates after the completion of their industrial service of five years, we may conclude that at present the supply of labour is more than equal to the demand. The colony has now a much greater population than it ever had since the cession in 1762. In 1776, with a slave population of 48,923, the island shipped 10,400 tons of sugar, 41 tons of cotton, 815 tons of coffee, 12 tons of indigo, and 204 tons of cocoa. In 1787, with a slave population of 23,906, the shipments were 8,772 tons of sugar, 400 tons of coffee, and 921 tons of cotton. In 1828, with a slave population of 24,342, the exports were 20,172 hogsheads of sugar. And in 1831, with a population of 23,604, the exports were 11,901 hogsheads. The cost of making sugar is heavier, I believe, in Grenada than in most of the other British colonies, and the sugar produced is generally of a very inferior quality, and obtains the lowest price in the British market. Grenada, it would seem, from these circumstances, has not kept pace with her sister colonies in the improvements which of late years have been effected in nearly all of them, in the former system of cultivation and manufacture. On most of the estates the crop of 1866 was produced at a heavy pecuniary loss to the planter. From some accounts which have been submitted to me, I find that on one estate, shipping over 100 hogsheads, the cost of making each hogshead was not less than £19 14s. 1d., whilst the net proceeds were but £10 13s. 7d. per hogshead. On another estate, exporting over 160 hogsheads, the cost per hogshead was £17 17s. 2d., and the net proceeds £11 6s. 10d. per hogshead. There are, however, I am aware, some few exceptions, principally in the case of plantations managed by resident proprietors, in which the cost of manufacture has been moderate, and where the crop has, even at the late low prices, afforded a fair profit on the outlay. The small freeholders, too, find the cultivation of the cane very remunerative. There are some ten or twelve small sugar-works owned by them in the parish of St. George alone, three of which have been recently erected. On these, sugar of a good description is made, which finds a ready sale for island consumption."

New Zealand Flax.—The *Lyttelton Times* says:—"The *Phormium tenax* has long been favourably known, but it has been difficult to bring it into use owing to the difficulty in extracting the fibre from the gum. Lately the number of experiments has greatly increased, and many processes have been discovered, in many of which the fibre was injured from being submitted to chemical action. A method has just been discovered which appears to be satisfactory, and is very simple. The flax, in its native state, without any preparation, is passed over a revolving cylinder, and, as it is gradually drawn along, is beaten by a heavy weight descending with great force, a stream of water being constantly poured on it. This process has now been used, and the rope manufactured from it is well known and appreciated in the market. A company has been formed, and, with its present machinery, they can produce six tons per week, at a cost of about £12 per ton. The value of the fibre in Sydney or Melbourne is from £35 to £40 per ton."

Paper Manufacture.—The manufacture of white paper has been commenced at the Ramsden Mill (Victoria), and a considerable quantity has been turned out. The paper is of the kind on which newspapers are printed, and is of fair quality. It weighs about 75 lbs. to the ream, is of even texture, free from blotches, and has a slight tinge of cream-colour. If somewhat thinner, and better glazed, and tougher, it would be as good printing paper as could be desired.

Obituary.

Gustave Frédéric Waagen, Professor in the University of Berlin, and Director of the Berlin Gallery of the Fine Arts. Dr. Waagen was well-known in Europe

as the author of an extensive work on the galleries of various countries, including those of Great Britain; he also acted as Fine Art Commissioner for Prussia at two or three of the universal exhibitions of London and Paris.

Publications Issued.

Lathes and Turning. By W. H. Northcott. (*Longman and Co.*) The author had been expecting to see the publication announced of a book on the subjects of which the present work treats, and also the completion of Holtzapffel's unfinished but long-promised "Mechanical Manipulation." Such a volume not having appeared, the author has endeavoured to write, in as small a compass as practicable, a work which, he hopes, will be found of service to the many who desire an acquaintance with these useful arts. There has been found considerable difficulty in acquiring information—otherwise than by practice—concerning the multiplicity of operations that can be conducted by the aid of the lathe; and judging from the numerous letters and inquiries on the subject appearing in the mechanical papers, it is thought that such a work as the present was wanted; for, although there are many books on turning already in existence, they are either too old to be now of much value—too expensive to be within reach of all—or their information, being confined to but one branch of the art, is too limited to be widely useful. The present work being designed to supply in some measure the existing deficiency, the information given is correspondingly comprehensive. All branches of turning are noticed, and a good deal of practical information is given upon each. Many operations and apparatus are described which do not properly come under the head of turning, but as they are to a great extent performed by means of the lathe, and as they are also exceedingly useful, the book is probably rendered more complete by including them.

Notes.

Paris Exhibition, 1867.—The claims of certain foreign restaurants made againt the commission of the late exhibition, on account of the injury done to them by the erection of the "Concert Suffren," and other establishments, after their contracts had been made, have been recognised by the tribunals of Paris, which have accorded the following damages:—To the Swiss restaurant, 13,000 francs; to the Turkish, 14,000; to the Swedish, 17,000; to the Tunisian, 18,000; and to the Italian, 19,000 francs; in all, 81,000 francs.

Archæological and Historical Congress.—An international congress, organized by the Antiquarian Society of the Rhine, is announced to be held at Bonn, from the 14th to the 21st of September, under the honorary presidency of Prince Frederick William of Prussia, and under the direction of M. Noggerath, president of the above society, and of M. Von Quast, conservator of the historical monuments of Prussia. The regulations are the same as those of the Antwerp congress held last year; all political and religious discussion is interdicted, and the proceedings will be conducted in the German language. The congress will be divided into three sections:—Antiquities of the early ages; Pagan; and Christian antiquities. Connected with the congress will be an exhibition of works of art and curiosities, from private collections or from churches which are little known, or possess special interest. At the conclusion of the congress excursions will be made to the churches of Schwarz-Rheindorf, Heisterbach, and Cologne, and other places of interest. Persons desiring to take part in the congress are to address themselves to the President of the Society of Antiquaries of the Rhine at Bonn; the subscription is almost nominal, namely, three thalers.

Correspondence.

Wages of Cotton Workers.—Sir,—Mr. J. Bailey Denton, in his valuable paper, reported in the *Journal of the Society of Arts*, May 22nd, there states "the weekly earnings of cotton workers to average 18s. 6d." I thought that perhaps a more detailed account of the earnings of persons of all ages, employed in cotton mills in this neighbourhood, might be of service to some of the members of the Society, and shall therefore feel glad if the enclosed tables are found of any use to any of them. I shall be glad to give any other information in my power. —I am, &c., P. O. Whitehead.

Belmont, Rawtenstall.

Tables showing the average, highest, and lowest wages received by males and females, and numbers employed at various ages, in a cotton mill in the centre of Lancashire, the time worked being sixty hours:—

Males.

Age.	No.	Average.	Highest.	Lowest.
8 to 9	none			
9 to 10	6	£0 2 0	£0 3 0	£0 1 6
10 to 11	1	0 3 0	0 3 0	0 3 0
11 to 12	6	0 3 11	0 8 0	0 2 6
12 to 13	6	0 3 2	0 3 6	0 2 6
13 to 14	5	0 10 5	0 15 2	0 7 0
14 to 15	11	0 10 8½	0 17 8	0 7 0
15 to 16	6	0 11 6	0 15 0	0 9 6
16 to 17	5	0 11 10	0 17 6	0 8 6
17 to 18	7	0 11 4½	0 16 0	0 10 0
18 to 19	5	0 13 11	0 14 6	0 13 0
19 to 20	7	0 18 9	1 1 5	0 15 0
20 to 21	9	1 1 2	1 4 4	0 15 0
21 to 22	4	0 19 1½	1 1 0	0 16 0
22 to 25	18	1 3 2½	1 15 0	0 14 6
25 to 30	28	1 4 2	1 13 0	0 15 0
30 to 35	24	1 4 3½	1 15 1	0 17 0
35 to 40	11	1 5 6	1 13 6	0 16 0
40 to 50	11	1 7 7½	2 8 6	0 13 1
above 50	9	1 1 9	1 14 0	0 14 0

Females.

Age.	No.	Average.	Highest.	Lowest.
8 to 9	3	£0 1 7	£0 1 9	£0 1 6
9 to 10	1	0 2 9	0 2 9	0 2 9
10 to 11	1	0 2 9	0 2 9	0 2 9
11 to 12	3	0 2 8	0 3 0	0 2 0
12 to 13	6	0 2 11	0 3 6	0 2 0
13 to 14	6	0 8 9½	0 11 10½	0 7 0
14 to 15	14	0 11 4½	0 18 0	0 7 6
15 to 16	11	0 13 10	0 18 5	0 9 0
16 to 17	12	0 15 0	1 2 0	0 9 7
17 to 18	11	0 14 10	1 2 7	0 9 0
18 to 19	12	0 16 0¼	1 2 6	0 11 0
19 to 20	11	0 16 1	1 5 0	0 9 7
20 to 21	9	0 16 9	1 3 0	0 14 0
21 to 22	8	0 15 10½	1 6 0	0 11 0
22 to 25	35	0 15 8¼	1 6 1	0 8 6
25 to 30	31	0 16 11	1 3 8	0 11 8
30 to 35	22	0 15 7	1 1 0	0 11 3
35 to 40	10	0 17 10	1 1 1	0 15 0
40 to 50	15	0 13 7½	1 4 2	0 8 9
above 50	2	0 12 2	0 13 0	0 11 4

Included in the above there are 49 married women, the youngest 21, the oldest 47, highest wage £1 1s., lowest 9s., average 15s. 5d.

Thirteen Married Couples.

Age of man.	Age of woman.	Total earnings.
36	33	£1 16 6½
26	24	2 3 5½
33	33	2 1 4
24	28	1 19 9½
29	24	1 19 1½
27	25	2 7 8½
35	30	1 14 4
27	27	1 19 5
30	27	2 0 7
30	32	1 15 0
23	21	1 17 11
26	22	1 18 5½
24	23	1 16 4

Families and Parts of Families.

No. of Members of Family Employed.	Age of man.	Age of woman.	Ages of sons.	Ages of daughters.	Total earnings.
4	48	..	22, 20, 16	..	£4 7 0
4	..	..	9	17, 14, 12	1 8 6½
3	35	..	..	12, 11	1 14 0
3	35	..	11	13	2 0 6
4	61	..	18	19, 16	2 18 7
3	47	..	..	19, 14	2 19 9
3	53	..	..	22, 17	2 8 10
4	..	40	17, 12, 9	..	1 8 3½
5	..	..	19	18, 16, 14, 8	2 14 2
3	..	..	17	19, 15	2 14 5
3	..	..	11, 10	14	0 14 0
3	36	33	14	..	2 17 8
4	..	..	..	21, 19, 16, 14	3 0 6
3	47	..	16	18	2 16 0½

N.B.—The timo worked at present is about 40 hours per week. By the Factory Act children between the ages of 8 and 13 can work half time, all above that age can work full time.

Patents.

From Commissioners of Patents' Journal, August 14.

Grants of Provisional Protection.

Animal and vegetable substances, preserving—2384—J. Jeffreys.
Bell-pulls—2345—A. C. M. Prince.
Boilers—2346—W. R. Lake.
Boilers, water-feeding apparatus for—2406—P. N. J. Macabies.
Boilers, &c.—2424—M. Wilkin and J. Clark.
Boilers, &c., preventing incrustation in—2412—A. F. Leale.
Buildings, construction of—2386—G. Woodhouse & J. G. McMinnies.
Caloric, &c., application of—2363—T. Hydes and J. Bennett.
Cannon—2397—J. C. Haddan.
Carding engines—2402—F. A. Leigh.
Carriages, retarding and stopping—2390—T. H. Roberts & B. C. Cross.
Cinder sifter and shovel combined—2374—J. Mabson.
Colouring matters, red—2296—J. H. Johnson.
Cotton, &c., opening and cleaning—2338—J. Greenhalgh.
Cranes—2247—W. I. Ellis.
Desks for schools—2438—T. Ward.
Distillation—2396—T. Prosser.
Door springs and spring hinges—2307—H. Fear.
Drawing pens and compasses—2432—L. C. Bailey.
Dredgers—2382—H. O. Robinson.
Eggs, preparing—2367—C. A. La Mont.
Electric battery—2392—G. Davies.
Eyelets, metallic—2422—J. A. McKean.
Fabrics, cut pile—2383—S. C. Lister.
Fibres, opening and straightening—2344—R. Newton.
Filamentous matters, &c., drying—2339—C. E. Brooman.
Fire-arms, breech-loading—2377—W. R. Lake.
Flax, treating—2312—E. T. Hughes.
Flour, dressing - 2393—J. Duguid, jun.
Fluids, cooling, &c.—2408—G. D. Kittoe and P. Brotherhood.
Fluids, &c., measuring—2328—G. Smith.
Gas and vapour, manufacturing, &c.—2364—J. Webster.
Gas burners, flame spreader for—2395—J. H. Johnson.
Heat, increasing by combustion of fuel, &c.—2352—J. Lewis.
Heliographic plates for printing, obtaining—2391—G. Davies.
Ice, artificial—2357—A. M. Clark.
India-rubber, &c., substitute for—2404—A. G. Day.
Indicators of time and distance for vehicles, &c.—2354—H. A. Dufrené.
Ink, copying—2163—J. F. Cooke.
Iron and steel—2381—J. Radcliffe.
Iron and steel, cast and wrought—2334—J. H. Johnson.
Iron and steel, wrought—2177—J. Harris and V. Pendred.
Life-preserving apparatus—2353—C. J. Laurendeau.
Looms—2365—G. Hodgson, H. Bottomley, and E. Cockroft.
Looms—2366—J. Bullough.
Malt or sugar, treating saccharine solutions of—2375—E. Herring.
Metals, separating from their ores, &c.—2343—L. Wray.
Millstones, dressing—2330—R. Young.
Millstones, dressing—2394—J. Rawsthorn.
Motion, converting circular into reciprocating—2301—W. T. Hamilton.
Motive-power, obtaining and applying—2348—A. J. Thorman.
Musical instruments—2184—J. H. Johnson.
Needle wrappers—2360—W. Lewis.
Needles—2370—A. Morrall.
Paint and varnish, preparing—2376—W. R. Lake.
Paper bags and envelopes, making—2193—W. Russell.
Paper, manufacturing—2388—C. H. Roeckner.
Powder, cutting and polishing—2379—A. V. Newton.
Pumps, &c.—2398—J. and H. A. Gwynne.
Railway, portable—2342—A. V. Newton.
Railway rails—2361—H. Watts.
Railway rails—2400—C. D. Fox.
Railway rolling stock—2399—T. C. Fidler.
Sewing machines—2378—W. R. Lake.
Ships, iron or steel, sheathing with zinc, &c.—2326—N. Barnaby.
Ships' propellers, &c.—2355—A. V. Newton.
Silk velvets—2389—S. C. Lister.
Sliding door rollers—2324—R. G. Hatfield.
Smoke, preventing—2336—J. Young, R. Pollock, and J. Morrison.
Straw, &c., elevating—2170—W. Tasker, jun.
Telegraphic cables, strips of zinc, &c., for use in the manufacture of —2380—J. R. Harper.
Train intercommunication—2369—S. M. Martin and S. A. Varley.
Valves—2385—J. Wolstenholme.
Valves—2420—J. E. Outridge.
Valves, self-acting—2323—A. Bochkoltz.
Wheels, toothed, moulding—2372—J. Simpson.

Inventions with Complete Specifications Filed.

Crane and locomotive engine combined—2488—H. Dübs.
Fabrics, felted—2465—W. R. Lake.
Sewing machines—2473—N. Salamon.

Patents Sealed.

169. W. R. Lake.
503. G. V. Wisedill.
507. R. H. Rimes.
508. D. Whittaker.
509. W. Easterbrook.
511. E. Cottam.
514. J. Barlow.
517. J. Clark and T. Vicars.
521. W. H. Wilkinson.
534. C. E. Brooman.
535. W. Perkins & G. G. Tandy.
539. W. Weild.
543. T. Beeley.
544. R. Blezard.
545. J. Kirkland.
547. W. and J. Cooke.
548. E. W. Young.
549. J. J. King.
550. W. H. Steel.
558. W. S. Guinness.
560. L. B. Joseph.
561. M. Henry.
563. P. Bauer, J. Johnson, and W. Jones.
564. J. M. Kilner.
570. T. A. L. Murray.
574. W. R. Lake.
579. C. Cochrane.
585. J. Wheatley.
606. A. Stenger.
620. J. Elce.
628. F. Remy.
637. A. M. Birchall.
640. T. Lythgoe & H. Thornton.
662. W. Weldon.
688. J. Gjers.
699. J. L. Norton.
844. J. Bourne.
853. W. E. Newton.
860. G. F. Lyndon.
876. J. Clay.
894. J. H. Johnson.
1018. A. V. Newton.
1250. J. H. Johnson.
1439. H. Y. D. Scott.
1519. J. Norman.
1522. S. Moulton.
1784. J. Harman.
1860. J. Dewar.
1924. G. Davies.

From Commissioners of Patents' Journal, August 18.

Patents on which the Stamp Duty of £50 has been paid.

2064. C. West.
2096. R. A. W. Westley.
2137. R. A. Brooman.
2100. J. T. Lockey.
2135. A. and W. Young.
2165. H. Willis and G. Rice.
2256. W. Clark.
2197. J. Symonds.
2111. J. Billings.
2151. W. Soper.
2173. J. Moody.

Patent on which the Stamp Duty of £100 has been Paid.

2117. J. Cranston.
2148. S. Corbett.
2038. C. W. Kesselmeyer and T. Mellodew.

Journal of the Society of Arts.

FRIDAY, AUGUST 28, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

"ON FOOD." By DR. LETHEBY, M.A., M.B., &c.

LECTURE III., DELIVERED MONDAY, FEBRUARY 3.

Construction of Dietaries: Preparation and Culinary Treatment of Foods.

The construction of dietaries involves a variety of considerations, as—1st. The determination of the real wants of the body under different circumstances of age, sex, constitution, labour and climate; 2nd. A proper selection of food, as regards quality, nutritive power, appetizing property, digestibility, and price; 3rd. The association of foods in such wise as not to offend the appetite or burden the digestive powers; 4th. A right treatment of them by cooking, &c., so as to render them most useful to the system; and 5th. A just distribution of the daily diet in appropriate meals.

As regards the first question—namely, *the determination of the actual dietetical wants of the body*—it may be answered from two sets of facts, as those which pertain to the minimum quantities of food capable of being used without loss of health or bodily vigour, and those which relate to the amounts of carbon and nitrogen exhaled from the body during different conditions of life.

In a general way it may be said that a healthy vigorous man consumes from 700 to 800 lbs. of solid food (dry) in a year. This amounts to about 2 lbs. of dry, solid matter daily; and the quantity of water (free and combined) is about 5½ lbs. daily.

Pursuing the inquiry a little farther, we find that a man cannot live on a punishment prison diet of 1 lb. of bread a-day with water, for in three days he will lose about 3 lbs. in weight, and will show signs of commencing starvation. This diet contains 1·3 oz. of nitrogenous matter and 8·42 of carbonaceous (=1,995 grains of carbon and 90 of nitrogen). Even the poor needle-women of London can only just exist, in a state of feeble vitality, with an average diet of 1½ lbs. of bread a-day, with about 1 oz. of dripping. This contains nearly 2 oz. of nitrogenous matter, and 14·65 of carbonaceous, calculated as starch (=3,271 grains of carbon and 135 of nitrogen). And in military prisons, where as much as 3·8 oz. of nitrogenous food, and 22·2 oz. of carbonaceous (=6,925 grains of carbon and 256 of nitrogen), are supplied daily to prisoners for short terms of confinement, they frequently lose weight and give evidence of decay; so that for longer periods of imprisonment it is found necessary to increase the diet to 4·7 oz. of plastic matter, and 27·8 of respiratory (=8,647 grains of carbon, and 317 of nitrogen); in fact, according to Dr. Christison, the men confined in the prison at Perth cannot even do the work of pumping the water for the prison on a daily diet of 6 oz. of plastic matter, and 25 of respiratory (=7,239 grains of carbon and 405 of nitrogen).

Again, Dr. Edward Smith found in his inquiries into the dietaries of adult male operatives of Lancashire and Cheshire, during the cotton famine, and also into those of the low-fed operatives of England, that the daily amount of food, only barely sufficient for existence, must contain 2·84 oz. of nitrogenous matter, and 19·25 of carbonaceous (=4,300 grains of carbon and 200 of nitrogen). These are contained in 2 lbs. 3 oz. of bread, which is regarded as a famine diet. The farm labourers of England consume daily an average of 3·18 oz. of plastic matter and 26·01 of respiratory. In Scotland, Wales, and Ireland, the amounts are somewhat larger, as will be apparent from this diagram:—

AVERAGE DAILY DIET OF FARM-LABOURERS IN THE UNITED KINGDOM.

	Dry nitrogenous matter.	Dry carbonaceous matter.		Carbon.	Nitrogen.
	oz.	oz.		grs.	grs.
In England..	3·18	26·01	=	5810	228
In Wales....	4·12	31·22	=	6901	290
In Scotland..	4·76	31·34	=	6297	335
In Ireland ..	4·94	28·73	=	6195	348
Average of all	4·25	29·07	=	6477	300

These are the results of inquiries into the dietaries of many hundreds of families, the results being computed as for adults; but it is very probable, as Dr. Smith remarks, that the nourishment obtained by the labourer himself is somewhat above the average. This, in fact, is confirmed by the more extensive investigations of Dr. Lyon Playfair, who concludes, from a large series of observations, that the following may be regarded as the average proportions of the several constituents of food in the daily dietary of an adult man under different circumstances of existence:—

Daily Diets for	Flesh-former.	Fat.	Starch and Sugar.		Nitrogenous.		Carbonaceous calculated as starch.
	oz.	oz.	oz.		oz.		oz.
Subsistence only	2·0	0·5	12·0	=	2·0	+	13·2
Quietude	2·5	1·0	42·0	=	2·5	+	14·4
Moderate exercise	4·2	1·8	18·7	=	4·2	+	22·0
Active labour ..	5·5	2·5	20·0	=	5·5	+	26·0
Hard work	6·5	2·5	20·0	=	6·5	+	26·0

These conclusions accord pretty well with the determinations of Pettenkofer and Voit, who say that an

adult requires daily, when at work, 5·22oz. of nitrogenous matter and 22·38 of carbonaceous (calculated as starch). Taking, therefore, the mean of all these researches, it may be said that a man requires daily the following amounts of carbonaceous and nitrogenous matter for idleness, for ordinary labour, and for active labour:—

Daily Diets for	Nitrogenous.	Carbonaceous.		Carbon.	Nitrogen.
	oz.	oz.		grs.	grs.
Idleness	2·67	16·83	=	3,856	187
Ordinary labour	4·56	24·48	=	5,757	319
Active labour ..	5·81	24·31	=	5,837	400

By pursuing the second method of inquiry, and estimating the wants of the body from the amounts of carbon and nitrogen exhaled and secreted, it is found that the proportion of carbon evolved as carbonic acid from the lungs of a man in health varies from 6oz. to 13½oz. daily, the difference being dependent on temperature, exercise, &c. Dr. Edward Smith says that it amounts to—

7·85oz. daily while the body is quiet;
9·11oz. do. with moderate exercise;
12·9oz. do. with considerable labour.

And he considers that a healthy man of average weight (150lbs.) emits 8·57 ounces of carbon from his lungs daily. This, added to the quantity discharged from the skin and bowels, is not less than 9·6oz. daily (= 4,200 grains) or just 28 grains per lb. of the man's weight. During light labour, he says it ranges from 9·6oz. to 10·5, and during hard work from 12·5 to 14oz.

The amount of nitrogen excreted as urea, &c., in the urine is also subject to great variation, according to the diet and exercise. Dr. Parkes found in his experiments on two soldiers, that with an ordinary diet and no exercise, it amounted to 2·03 grains per lb. weight of the body (= 304 grains per 150lbs.); and that with a non-nitrogenous diet, and no exercise, it was 0·95 grains per lb. weight (= 142 grains per 150lbs.); and with the same diet and active exercise it was 2·42 grains per lb. weight (= 364 grains per 150 lbs.).

Professors Fick and Wislicenus observed that the nitrogen secreted during an ordinary diet and no exercise, was at the rate of 1·53 grains per lb. weight (= 203 grains per 150lbs.); and that it fell to a little less than one grain per lb. weight with a non-nitrogenous diet during the labour of ascending the Faulhorn.

The researches of the Rev. Dr. Haughton, of Dublin, have led him to conclude that an average-size man, performing routine work, secretes 187 grains of nitrogen as urea daily (= 1·25 grains per lb. weight); and Dr. Edward Smith has estimated it at from 0·93 to 1·4 grains per lb. weight—a fair average being 1·15 (= 173 grains per 150lbs.).

The more extensive inquiries of Playfair, Ranke, Beigel, Moos, Vogel, and others, give a daily average of 171 grains of nitrogen as urea for a healthy man at rest, and 252 grains for ordinary labour.

It may therefore be safely concluded that with an ordinary diet, an average-size man excretes daily as urea 175 grains of nitrogen; and during labour of a moderate description it amounts to about 250 grains. Adding to these the proportions of nitrogen excreted in other forms in the urine, and the quantities passed from the bowels, the total amounts are probably about 190 grains while at rest, and 300 grains when at routine work; the difference, perhaps, being more dependent on the food than on the metamorphosed tissues of the body.

It thus appears that the proportions of carbon and nitrogen excreted correspond very closely with those contained in the diets which experience has proved to be necessary for man's sustenance; for when the results are put into a tabular form they stand thus:—

Daily Requirements of the Body.

		Nitrogenous Food.	Carbonaceous Food.		Carbon.	Nitrogen.
		oz.	oz.		grs.	grs.
During idleness as determined	By dietaries	2·67	16·83	=	3,856	187
	By excretions	2·78	18·47	=	4,200	190
	Average....	2·72	17·65	=	4,028	188
Routine work as determined	By dietaries	4·56	24·48	=	5,757	319
	By excretions	4·39	19·80	=	4,813	300
	Average....	4·48	22·14	=	5,285	310

The first of these averages is represented by 2 lbs. 2 ozs. of bread, and the second by about 3¼lbs.

It appears also that the relation of the nitrogenous to the carbonaceous constituents of food should be about as 1 to 5½ or 6. These, in fact, are the proportions which Messrs. Lawes and Gilbert found to be best suited for fattening pigs. In milk, the proportions are as 1 to 3·6 (the butter being calculated as starch); and no doubt these are the right proportions for the dietaries of children. Again, it will be observed, that the relation of nitrogen to carbon is nearly as 1 to 19; whereas in milk it is about as 1 to 11. Referring to table No. 4 (p. 617) it will be noticed that the proportions in bread are as 1 to 22, and in meat as one to 13, showing that the former requires the addition of plastic matter, and the latter of respiratory.

In preparing dietaries, however, it will be best to take a rather liberal view of the question, and, therefore, I shall adopt the conclusions of Dr. Edward Smith—that even in periods of idleness a man's daily food should contain not less than 4,300 grains of carbon, with 200 of nitrogen; and a woman's at least 3,900 grains of carbon, with 180 of nitrogen—these being the proportions which, in his opinion, are necessary to avert starvation diseases; and they are represented in the case of a man's diet by 19·25 oz. of carbonaceous food, with 2·84 of nitrogenous. The diagram before you exhibits the amounts of different articles of diet capable of furnishing this quantity of nitrogenous matter, and it also shows the proportions of carbonaceous matter (calculated as starch) associated with it:—

Amounts of Food Yielding 200 Grains of Nitrogen or 2·84 oz. of Plastic Matter Necessary for a Man's Daily Diet.

Description of Food.		Carbonaceous matter in it.	Carbon in it.	
	oz.	oz.	grs.	
Skim-cheese	8·8	5·57	1,290	Carbon deficient
White fish	24·6	5·99	1,384	
Skim-milk	94·1	8·96	2,059	
Peas	12·6	9·33	2,141	
New milk	91·4	9·40	2,160	
Lean meat	18·3	11·36	2,629	
Oatmeal	22·9	17·54	4,000	
Wheat-flour	26·7	19·28	4,433	Carbon in excess
Baker's bread..........	35·6	19·28	4,433	
Indian meal	26·0	19·83	4,554	
Rye-meal	36·4	26·40	6,046	
Barley-meal	45·7	34·02	7,800	
Rice	45·7	34·02	7,800	
Bacon	32·6	38·04	8,714	

So that, whilst the first seven of these substances are deficient of carbonaceous matter (19·25 oz. being required), the last seven contain it in excess. It is, there-

fore, not difficult to construct a dietary from the several tables which I have placed before you; but perhaps it would interest you to know exactly what are the actual dietaries in use among different classes of persons; and first I will direct your attention to what Dr. Edward Smith found to be the average weekly dietaries of the low-fed operatives of England, Wales, Scotland, and Ireland.

WEEKLY DIETARIES OF LOW-FED OPERATIVES, CALCULATED AS ADULTS (DR. E. SMITH).

Class of Labourer.	Bread stuffs.	Potatoes.	Sugars.	Fats.	Meat.	Milk.	Cheese.	Tea.	Containing		Cost.
									Carbon.	Nitrogen.	
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz	Oz.	Oz.	Grs.	Grs.	s. d.
Needle-women (London)	124·0	40·0	7·3	4·5	16·3	7·0	0·5	1·3	22,900	950	2 7
Silk-weavers (Coventry)	166·5	33·7	8·5	3·6	5·3	11·6	1·0	0·3	27,028	1,104	1 11¾
Do. do. (London)......	158·4	43·8	8·8	5·5	11·9	4·3	0·3	0·6	48,288	1,165	2 8¾
Do. do. (Macclesfield) ..	138·8	26·6	6·3	3·4	3·2	41·9	0·9	0·3	27,346	1,177	1 8½
Kid glovers (Yeovil)........	140·0	84·0	4·3	7·1	18·3	18·3	10·0	0·9	28,623	1,213	2 9½
Cotton-spinners (Lancashire)	161·8	22·6	14·0	3·1	5·0	11·8	0·7	0·7	29,214	1,295	2 3
Hose weavers (Derbyshire)..	190·4	64·0	11·0	3·9	11·9	25·0	2·2	0·4	33,537	1,316	2 6¼
Shoemakers (Coventry)	179·8	56·0	10·0	5·8	15·8	18·0	3·3	0·8	31,700	1,332	2 7¾
Farm labourer (England) ..	196·0	96·0	7·4	5·5	16·0	32·0	5·5	0·5	40,673	1,594	3 0
Do. do. (Wales)	224·0	138·7	7·5	5·9	10·0	85·0	9·8	0·5	48,354	2,031	3 5½
Do. do. (Scotland) ..	204·0	204·0	5·8	4·0	10·3	124·8	2·5	0·7	48,980	2,348	3 3¾
Do. do. (Ireland)	326·4	92·0	4·8	1·3	4·5	135·0	..	0·3	43,366	2,434	1 9¾
Mean of all................	184·2	78·1	8·0	4·5	10·7	42·9	3·1	0·6	34,167	1,500	2 7¾
Average per day	26·3	11·1	1·4	0·6	1·5	6·1	0·4	0·1	4,881	214	0 4½

You will see from this table that the poor needlewomen of London are the worst fed of all the operatives in the three kingdoms, for they subsist on a weekly allowance of 102·52 oz. of carbonaceous food, with 13·49 oz. of nitrogenous (= 14·65 oz. carbonaceous, with 1·93 oz. nitrogenous daily), while the farm labourers of Ireland are, as regards the real nutritive value of their food, the best-fed of the lower operative classes. But it will also be noticed that the cost of the weekly dietary of the Irish labourer is only 1s. 9¾d. per week, while that of the needlewoman is 2s. 7d.—the latter feeding chiefly on bread, bacon, and tea, which are expensive foods, while the former consumes potatoes, milk, and Indian meal—foods which yield more nutriment for their money value than the more expensive foods of the English, Welsh, and Scotch labourers. And now we will contrast the dietaries of the poorer classes of operatives with those of better-fed persons, as soldiers, sailors, navigators, &c.; and for this purpose I shall avail myself of the accurate returns obtained and published by Dr. Lyon Playfair:—

DAILY DIETARIES OF WELL-FED OPERATIVES (PLAYFAIR).

Class of Labourer.	Flesh-former.	Fats.	Starch and Sugar.	Containing		Containing	
				Carbonaceous.	Nitrogenous.	Carbon.	Nitrogen.
	Oz.	Oz.	Oz.	Oz	Oz.	Grs.	Grs.
Fully-fed tailors....	4·61	1·37	18·47	21·64	4·61	5,136	325
Soldiers in peace ..	4·22	1·85	18·69	22 06	4 22	5,246	297
Royal Engineers (work)	5·08	2·91	22·22	29·38	5·08	6,494	358
Soldiers in war......	5·41	2·41	17·92	23·48	5·41	5,561	381
English sailor	5·00	2·57	14·39	20·40	5·00	4,834	252
French do.	5·74	1·32	23·60	26·70	5·74	6,379	405
Hard-worked weavers	5·33	1·53	21·89	25·42	5·33	6,020	375
English navvy (Crimea)	5·73	3·27	13·21	21·06	5·73	5,014	404
English navvy (Railway)......	6·8	3·82	27·81	37·08	6·84	8,295	482
Blacksmiths	6·20	2·50	23·50	29 50	6·20	6,864	437
Prize-fighters (training)	9·80	3·10	3·27	10·70	9·80	4,366	690
Mean of all	5·81	2·42	18·63	24·31	5·81	5,837	400
Do. of low-fed operatives	3·04	0·64	21·18	22·78	3·04	4,881	214

In all these cases the carbonaceous matters of the food are estimated as starch; and I may state that the soldiers' dietary, when at peace, is calculated from the rations of the English, French, Prussian, and Austrian service; and when at war, it is derived from the actual dietaries of European and American soldiers during recent wars.

It would be interesting, if time permitted, to compare these dietaries with the dietaries of hospitals, prisons, workhouses, and lunatic asylums; for we should then perceive not merely how greatly they vary in their nutritive value, but also how little attention is paid to the principles which ought to guide our public authorities in the construction of public dietaries. In the prisons of England, Scotland, and Ireland, the several dietaries for short terms of imprisonment, as well as for longer periods, and for hard labour, vary respectively to so great an extent as to furnish an inducement for the commission of crime in certain districts rather than in others, because of the richness of the prison rations; and in all cases the dietaries of prisons are so greatly in excess of those of the union, that in times of distress they offer encouragement for misdemeanour, in order that the prison may be reached in preference to the workhouse; in short, while the day's rations of an unfortunate inmate of a union contains only about 17 oz. of dry nutritious matter, that of a destitute debtor contains 19·4 oz., and that of a convict 22 oz.; moreover, a prisoner confined for more than a month, without hard labour, in the jails of England, Scotland, and Ireland, would have 18·8 oz., 22·4, and 23·9 of dry nutriment respectively; the average rations for hard work containing about 21·7 oz., 31·5, and 25·6 in the prisons of the three countries.

Dr. Edward Smith has drawn attention to the serious want of uniformity in the dietaries of the unions of his district, and has urged the workhouse authorities to improve them. He also submitted to the Privy Council tables of dietaries, which are well suited to meet the requirements of the system at the lowest money cost. Here are a few of them, which may, perhaps, prove useful to those who are engaged in the benevolent work of supplying food to the poor in times of distress; and you will perceive that at various sums, from about 2s. to 3s. a-week per adult, very substantial rations may be provided. (See table, top of next page.)

The dietaries of women should be about 1-10th less than those of men in the case of indoor operatives, but

Dietaries to Furnish as nearly as possible 30,100 Grains of Carbon and 1,400 Grains of Nitrogen per Man Weekly—Women take One-tenth Less.

Cost.	1s. 11¾d.	2s. 0½d.	2s. 3½d.	2s. 4½d.	2s. 6d.	2s. 7½d	2s 8½d.	2s. 10½d.	3s. 1½d.	3s. 3½d.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
Bread	144	128	160	160	128	160	160	160	192	160
Flour for dumplings	..	..	..	..	..	..	..	16	16	8
Oatmeal	16	32	16	32	32	16	16	16	..	8
Peas	..	..	..	..	12	6	..	..	..	..
Rice	..	..	16	..	..	..	16	..	8	8
Sugar	..	4	4	..	4	4	4	4	8	8
Treacle	..	16	8	8	8	..	8	12	8	8
Butter	..	..	..	..	2	..	..	2	..	12
Dripping	..	..	4	..	..	4	4	..	4	..
Suet	..	..	..	..	..	..	..	4	4	2
Meat without bone	8	8	..	8	8	8	16	12	8	24
Herrings	..	..	..	..	4	..	..	..	..	..
Bacon	..	..	..	8	4	8	..	..	8	..
Skimmed milk	70	140	60	70	120	120	70	120	70	100
Buttermilk	60	..	80	..	..	..	60	..	60	..
Tea	..	..	..	..	..	0·5	..	..	0·5	0·5
Coffee and chicory	..	2	2	..	1	1	2	2	1	1
	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.
Nutritive values. Carbon	28,031	29,748	33,552	34,935	32,998	33,248	36,499	36,402	41,519	36,391
Nutritive values. Nitrogen	1,409	1,291	1,511	1,548	1,859	1,609	1,674	1,638	1,768	1,620

they ought to be from 1-3rd to 1-4th less than the larger dietaries of men engaged in out-door labour.

As regards the dietaries of children, it may be stated generally that the chief part of their food should be milk. Up to the age of nine or ten months it should, if possible, be the milk of woman, which is richer in sugar than cow's milk, and much less rich in caseine; failing this, however, asses' milk is a good substitute, as it contains nearly the same amount of sugar and caseine as human milk. MM. O. Henri and Chevalier have given these as the proportions of the several constituents in 100 parts of the milk of different animals:—

	Asses' milk.	Woman's milk.	Cow's milk.	Goat's milk.	Ewes milk.
Caseine	1·81	1·52	4·48	4·02	4·50
Butter	0·11	3·55	3·13	3·32	4·20
Sugar of milk	6·08	6·50	4·77	5·28	5·00
Various salts	0·34	0·45	0·60	0·58	0·68
Total solids	8·34	12·02	12·98	13·20	14·38
Water	91·66	87·98	87·02	86·80	85·62
Total	100·00	100·00	100·00	100·00	100·00

Cow's milk, therefore, diluted with about one-third its bulk of water, and sweetened with sugar, may be given to children; and up to nine or ten months no other food should be administered, for infants have not the power of digesting farinaceous or fibrinous substances. A child may take from two to three pints of milk thus diluted daily. After ten months, and to about twenty months, farinaceous matters may be mixed in gradually increasing quantities with the milk; and they should be well cooked by first baking them, and then thoroughly dissolving them by boiling. After this age, and up to the third year, the quantity of well-cooked farinaceous matters may be still further increased, and given as puddings with a little egg. Bread and butter may also be eaten, and towards the end of the time the child will digest well-boiled potato, with a little gravy of meat. From the third to the fifth year a little meat may also be given, and at the end of the ninth year it may partake of the usual food of the family; but all along it should make use of a large proportion of milk, in the various forms of bread and milk, or milk puddings, with eggs. About the tenth year a child will require about half as much food as a woman; and at the fourteenth year it will eat quite as much as a woman; in fact, the proportion of food required by the child is much greater per pound weight of the body than that of adults, because it has to form its tissues and build up its several structures. Dr. Edward Smith calculates that the proportions of carbon and nitrogen in the daily food at different ages should be about as follows:—

Daily Proportions of Carbon and Nitrogen in the Food at Different Ages, per Pound Weight of the Body.

	Carbon.	Nitrogen.
	grs.	grs.
In infancy	69	6·78
At ten years of age	48	2·81
At sixteen do. do.	30	2·16
At adult life	23	1·04
In middle age	25	1·13

So that for its weight the infant requires three times as much carbonaceous food and six times as much nitrogenous as an adult.

The construction of dietaries for particular purposes, as for training, for developing muscular tissue, for producing fat, or for reducing it, is beyond the scope of these lectures; but it may generally be said that, as in training the object is to form muscular tissue, to give it great endurance of action, and, at the same time, to reduce the weight of the body, it is accomplished by the use of nitrogenous food, with but little fat or farinaceous matter, and as little fluid as possible—so that muscular tissue may take the place of fat and water; and by constant exercise, the endurance and strength of the muscular tissue is increased, and the proportion of water in the tissues is reduced. King, in training, is said to have taken for his breakfast two lean mutton-chops, somewhat under-done, with dry toast or stale bread, and a single cup of tea without sugar; for dinner, 1 lb. or $1\frac{1}{4}$ lb. of beef or mutton, with toast or stale bread, and very little potato or other vegetable, and half-a-pint of old ale, or a glass or two of sherry; for tea a single cup of unsweetened tea with an egg and some dry toast; and

for supper half-a-pint of oatmeal-porridge or half-a-pint of old ale. The effect of this is to produce only a short-lived state of effectiveness, for, carried a little beyond the appointed time, it leads to disease; and even after the trial, there is often, as in the case of Heenan, terrible prostration of the system, and a necessity for returning immediately to an ordinary diet.

Foremost among the foods for developing fatty tissue are fats, as fat of meat, butter, cream, &c.; next to these are farinaceous matters, as arrowroot, starches, and the various meals; and after these are sugar, alcohol, &c.; so that in an attempt to reduce the bulk of the body, all of them, but especially the first, should be but sparingly used. Conversely, however, the use of fatty and farinaceous foods has a tendency to produce fat, and so also with fermented liquids, as beer and porter—the last having a high character for its capabilities of forming milk when drunk by nursing-women.

In associating different articles of diet, so as to secure the right proportions of the several constituents of food—fat, sugar, or starch, and nitrogenous matter, we find that we may not only rely on the sound indications of science, but may also trust, and trust safely, to the unerring guidance of our instincts—provided they have not been vitiated by fashion or perverted by evil habits. Science teaches us that the best proportions for the common wants of the animal system are about 9 of fat, 22 of flesh-forming substances, and 69 of starch and sugar; and experience also shows that these are the very proportions which we are constantly striving to maintain in our daily dietaries. Borrowing largely from the graphic illustrations of Liebig and Johnston, I may state that, whenever one kind of food is wanting in any particular constituent we invariably associate it with another that contains an excess of it. Certain meats, for example, which are deficient of fat are always eaten with substances that are rich in it—bacon is associated with veal, with liver, and with fowl, or we capon the latter, and thus increase its natural fat. We use melted butter with most kinds of fish, or we fry them in oil; while the herring, the salmon, and the eel, are usually fat enough in themselves, and are dressed and eaten alone. It is with a view to similar adjustment that we mix eggs and butter with sago, tapioca, and rice; that we add oil and the yoke of an egg to salad; that we boil rice with milk, and eat cheese with maccaroni. The same instinct has determined the use of vegetables with meat, and butter with bread. Bacon and greens, or beans and bacon, like pork and peas-pudding, is a conjunction of viands which does not owe its popularity to old habit or the mere taste of the epicure; and so with a dish, common in Ireland, under the name of Kol-cannon—the potato, which is poor in gluten, and the cabbage, which is usually rich in this ingredient, are mixed together, and thus they approach the composition of wheaten bread, but both of these substances are deficient in fat; add, therefore, a little bacon or fat pork to the mixture, and you have a Kol-cannon which has all the good qualities of the best Scotch oatmeal, and to many it is more savory and palatable. Again, the mixture so usual in Ireland and Alsace, of butter-milk or curdled milk and potatoes, and the combinations of rice and fat which make the diet of eastern nations; even the little dab of butter upon the poor man's potato, and the bit of cheese that he eats with his dinner, are matters not of luxury but of necessity, and they show how by long experience we have at last learnt to adjust the proximate constituents of food, so as best to maintain the health and vigour of the body.

And then, again, *the times for taking food* and *the proper distribution of it in appropriate meals*, are questions of considerable importance, notwithstanding that they have ever been influenced by the caprices of fashion and the artificial habits of society. How much they have had to do with the modification of the human species, and even with the extinction of whole races of men, is an etiological problem of much interest.

Man in his savage condition feeds with great irregularity, for when he finds that food is plentiful he eats from morning to night, and knows no other pleasure than that of eating and drinking and sleeping; but when it is more scarce he is content with a single meal a day. In both cases, however, the quantity of food consumed is excessive. We are told by travellers that the Hottentots, the Bushmen, and the inhabitants of South Africa, who feed in this manner are enormous gluttons. "Ten of them," says Barrow, "ate, in his presence, an ox, all but the hind legs, in three days; and the three Bosjesmen that accompanied his waggon, devoured a sheep on one occasion in less than twenty-four hours." Parry, Ross, and others, have also given the most astonishing accounts of the dietetical capabilities of the Esquimaux. Captain Parry once tried the capacity of a young lad scarcely full grown, and in twenty-fours he had eaten 4lbs. 4oz. of the raw hard-frozen flesh of a sea-horse, the same quantity of it boiled, 1lb. 12 oz. of bread and bread-dust, besides a pint and a quarter of rich gravy-soup, a tumbler of strong grog, three wine-glasses of raw spirits, and nine pints of water. According to Sir John Ross, the daily rations of an Esquimaux are 20lbs. of flesh and blubber. But the most marvellous example of gluttony is given by Captain Cochrane, on the authority of the Russian Admiral Saritcheff, who was told that one of the Yakuti had consumed the hind quarter of a large ox in 24 hours, together with 20 lb. of fat, and a proportionable quantity of melted butter. To test the truth of this, he gave him a thick porridge of rice boiled down with 3 lbs. of butter, weighing together 28 lbs.:—although the glutton had already breakfasted, yet he sat down to the meal with great eagerness, and consumed the whole without stirring from the spot; and, except that his stomach betrayed more than ordinary fulness, he showed no sign of inconvenience. Captain Cochrane further adds that a good calf, weighing 200lbs., will just serve for a meal for four or five Yakuti; and that he has himself seen three of them consume a reindeer at a meal. Liebig accounts for this by saying that a nation of hunters, especially when they go naked and are exposed to great losses of temperature, must consume large quantities of respiratory food; and if it so happens that the food is in its least effective form, as lean flesh, the quantity disposed of is enormous.

Among civilised nations, and until comparatively recent times, there were but two meals a-day—namely, dinner and supper. These were the meals of the Romans—the *prandium* or dinner being for the most part a light refreshment, eaten while standing, at about nine o'clock in the morning; and it generally consisted of the cold remains of yesterday's supper. It was commonly taken without wine, and, in fact, there was so little ceremony about it, that Plautus, in his comedies, has facetiously called it *caninum prandium*. The great meal of the day was the supper, or *cœna*, which was taken about three or four o'clock in the afternoon, and to which friends were invited. This was the ceremonious meal for which the wealthy and high families of Rome exhausted the resources of luxury and art. It always consisted of three parts—the *gustus* or antipast, which was intended as a mere smack or relish to whet the appetite. Then came the main part of the feast—consisting of many courses, with a chief dish or *caput cœnæ*, and when in thrifty families it was the only dish which went the round of the frugal board, it was aptly termed the *cœna ambulans*. After this there came the second course, or *mensa secunda*, composed of fruits and pastry, like a modern dessert.

The sums of money expended by the wealthy Romans on this meal were often ruinous. Vitellius is said to have spent as much as 400 *sestertia* (about £3,228 of our money) on his daily supper; and the celebrated feast to which he invited his brother Lucius cost no less than 5,000 *sestertia*. or £40 350 sterling. It consisted, according to Suetonius, of 2,000 different dishes of fish and 7,000 of fowls, with other equally numerous meats. His daily

food, says our classical writers, was of the most rare and exquisite nature, the deserts of Libya, the shores of Spain, the waters of the Carpathian Sea, and even the coasts and forests of Britain were diligently searched for dainties to supply his table; and had he reigned long he would, says Josephus, have exhausted the great opulence of the Roman Empire. Ælius Verus, another of those worthies, was hardly less profuse in the extravagance of his suppers; for it is said that a single entertainment, to which only about a dozen guests were invited, cost above six million sesterces (6,000 *sestertia*, or nearly £48,500); and we are told by historians that his whole life was wasted in eating and drinking—being spent in the voluptuous retreats of Daphne, or else at the luxurious banquets of Antioch. So profuse, indeed, was the extravagance of those times, that to entertain an emperor at a feast was to encounter almost certain financial ruin—one dish alone at the table of Heliogabalus has been known to cost about £4,000 of our money; no wonder, therefore, that these imperial feasts were lengthened out for hours together, and that every artifice, often revolting in the extreme, was used to prolong the pleasure of eating, or that Philoxenus should have wished that he had the throat of a crane with a delicate palate all the way down.

Hardly less extravagant were the dining propensities of our own forefathers, who in every way copied too closely the luxurious habits of their Roman conquerors. In fact, no circumstance, as Mr. Wright observes, is more remarkable in ancient history than the readiness with which the people who came under the sway and influence of Rome, abandoned their nationality, and followed the luxurious habits of their rulers. Even so late as the time of Holinshed, the famous chronicler of the 16th century, the manners of the English were the subject of severe comment; for he tells us that "in number of dishes and changes of meat, the nobility of England (whose cooks are, for the most part, musical-headed Frenchmen and foreigners), do most exceed; sith there is no day in manner that passeth over their heads, wherein they have not only beef, mutton, veal, lamb, kid, pork, cony, capon, pig, or so many of them as the season yieldeth, but also some portion of the red and fallow deer, beside great variety of fish and wild fowl, and thereto sundry other delicates, wherein the sweet hand of the seafaring Portingale is not wanting; so that for a man to dine with one of them, and to taste of every dish that standeth before him, is rather to yield unto a conspiracy with a great deal of meat for the speedy suppression of natural health, than the use of a necessary meal to satisfy himself with a competent repast to sustain his body withal." He adds, too, "that gentlemen and merchants keep much about the same rate; and when they make their ordinary or voluntary feasts, it is a world to see what great provision is made of all manner of delicate meats from every quarter of the country, wherein, beside that, they are often comparable herein to the nobility of the land; so that they will seldom regard anything that the butcher usually killeth, but reject the same as not worthy to come in place. In such cases, also, *geliffes* of all colours, mixed with a variety in the representation of sundry flowers, herbs, trees, forms of beasts, fish, fowls, and fruits; and thereunto *marchpane*, wrought with no small curiosity, tarts of divers hues and sundry denominations; conserves of old fruits, foreign and home-bred; suckets, codiniacs, marmalades, sugarbread, gingerbread, florentines, wild-fowl, venison of all sorts, and sundry outlandish confections, altogether seasoned with sugar, besides infinite devices, not possible for me to remember."

The learned Caius, also, in his "Counseill against the Sweat" of the same century (1552) comments in severe terms on the gluttony of his time, saying that the reason why the disease attacks the English more than others is, that they have "so moche sweating stuffe, so many euille humoures laid up in store, fro this displeasante, feareful, and pestilent disease, cause of their euille diet, whiche destroy more meates and drynckes withoute al ordre, conveniet time, reason, or necessite, the either Scotlande, or al other countries under the sunne."

Gradually, too, as the dinner got to be later in the day, and reached noontime, there was necessity for a light early meal, or *breakfaste*, as it was called; and as the dinner became later and later still, a fourth meal was added—the *lunch* or *luncheon*, which literally meant a slice of bread. In process of time, also, with the introduction of tea and coffee into England, there came a fifth meal; but all along the dinner was the great feast of the day; and the rule in using it was pretty much as Dr. Kitchener, in his time, advised—namely, to eat until there was a sense of satiety, the stimulus of every fresh dish being but as a whip to the appetite, so that the sense of satiety might come and go a dozen times. "It is produced in us," says Christopher North, "by three platefuls of hotch-potch, and to the eyes of an ordinary observer our dinner would seem to be at an end; but no; strictly speaking, it is just going to begin. About an hour ago did we, standing on the very beautiful bridge of Perth, see that identical salmon, with his back-fin just visible above the translucent tide, arrowing up the Tay, bold as a bridegroom, and nothing doubting that he should spend his honeymoon among the gravel-beds of Kinnaird or Moulenearn, or the rocky sofas of the Tummel, or the green marble couches of the Tilt. What has now become of the sense of satiety? John—the castors!—mustard—vinegar—cayenne—catsup—peas and potatoes, with a very little butter—the biscuit called "rusk"—and the memory of the hotch-potch is as that of Babylon the Great." Sense of satiety, indeed! —"We have seen it for a moment existing on the disappearance of the hotch-potch—dying on the appearance of the Tay salmon—once more noticeable as the last plate of the noble fish melted away—extinguished suddenly by the vision of the venison—again felt for an instant, and but for an instant, for a brace and a-half of as fine grouse as ever expanded their voluptuous bosoms to be devoured by hungry love."

We smile at the accounts given of the gormandizing powers of the natives of Arctic regions and the savages of Southern Africa, but our own habits in eating and drinking are scarcely less preposterous. Look at a modern dinner; beginning with soup, and perhaps a glass of cold punch; to be followed by a piece of turbot or a slice of salmon with lobster-sauce; and while the *caput cœnæ*, the venison or South Down, is getting ready, we toy with an oyster paté or a bit of sweat-bread, and mellow it with a bumper of Madeira. No sooner is the venison or mutton disposed of, with its never-failing accompaniments of jelly and vegetables, than we set the whole of it in a ferment with champagne, and drown it with hock or sauterne. These are quickly followed by the wing and breast of a partridge, or a bit of pheasant or wild duck; and when the stomach is all on fire with excitement, we cool it for an instant with a piece of iced pudding, and then immediately lash it into a fever with undiluted alcohol, in the form of cognac or a strong liqueur; after which there comes a spoonful or so of jelly as an emollient, a morsel of ripe stilton or paté de foie-gras as a digestant, a piquante salad to whet the appetite for wine, and a glass of old port to persuade the stomach, if it can, into quietness. All these are more leisurely succeeded by the *mensa secunda*, or dessert, with its ices, its preserves, its bakemeats, its fruits, its geliffes, codiniacs, and suckets, as Holinshed would call them, and its strong drinks; to be afterwards muddled with coffee, and complicated into a rare mixture with tea, floating with the richest of cream.

As a modest example of this sort of thing, and an indication moreover of the kind of novelties yet in store for us, let me read to you the *menu* of a late dinner at the Langham, where horse-flesh was the principal *viande*. It is very appropriately prefaced with a little bit of French philosophy—"*Les préjugés sont des maladies de l'esprit humain.*"

"*Potages*—Consommé de cheval. A la purée de destrier. *Amontillado.*

"*Poissons*—Saumon à la sauce Arabe. Filets de soles à l'huile hippophagique. *Vin du Rhin.*

"*Hors-d'œuvres*—Terrines de foie maigre chevalines. Saucissons de cheval aux pistaches syriaques. *Xérès.*

"*Relevés*—Filet de Pégase rôti aux pommes de terre à la crême. Dinde aux châtaignes. Aloyau de cheval farci à la centaure aux choux de Bruxelles. Culotte de cheval braisée aux chevaux-de-frise. *Champagne sec.*

"*Entrées*—Petits pâtés a la moëlle Bucéphale. Kromeskys à la Gladiateur. Poulets garnis à l'hippogriffe. Langues de cheval à la Troyenne. *Chateau Perayne.*

"SECOND SERVICE.

"*Rots*—Canards sauvages. Pluviers. *Volney.* Mayonnaises de homard a l'huile Rosinante. Petits pois à la Française. Choux-fleurs au parmesan.

"*Entrements*—Gelée de pieds de cheval au marasquin. Zephirs sauté à l'huile chevaleresque. Gateau vetérinaire a la Ducroix. Feuillantines aux pommes des Hesperides. *St. Peray.*

"*Glaces*—Crême aux truffes. Sorbets contre-préjugés. *Liqueurs.*

"*Dessert*—Vins de fins Bordeaux. Madère. Café.

"*Buffet*—Collared horse-head. Baron of horse. Boiled withers."

Even put into plain English all this would sound remarkable, and taken, as it is said to have been, without shying or gibbing, although, perhaps with a little bolting, it must have puzzled the stomach; and, like all our modern dinners, must also have severely taxed its powers, in selecting from the complicated mess, the right proportions of fat and flesh, and farinaceous matter required for the sustenance of the body.

Nor is it right to content ourselves, like savages, with a single meal a day, as was the custom of Dr. Fordyce, the celebrated professor of chemistry of the last century. Studying the habits of carnivorous animals, and reflecting on the principles of chemistry and physiology, he came to the conclusion that man required but one meal a day for all his physiological wants, and for more than twenty years his daily dinner was as follows:—Regularly at four o'clock of an afternoon he would present himself at "Dolly's chop-house," and take his seat at the table reserved for him. Immediately on his arrival the cook would place a pound and a-half of rump-steak upon the gridiron, and while it was cooking the doctor would amuse himself with some such trifle as half a broiled capon, or a plate of fish, and a glass or two of brandy—his regular allowance being a quarter of a pint. Then came the steak with a full accompaniment of bread and potato, and it was always served with a quart tankard of strong ale. This was followed by a bottle of old port; and, when the dinner was finished, as it invariably was in an hour and a half, he walked leisurely to his rooms in Essex-street in the Strand, where he met his class and gave his lecture on chemistry.

But these are not habits of the great bulk of mankind, and although they may have been practised for a while with impunity, yet they serve not as illustrations of what ought to be done in the way of eating, but rather as examples of the wonderfully accommodating power of the stomach under the most disadvantageous circumstances; for experience teaches us that three meals a day, of the simplest quality, are best suited for our wants—breakfast to supply the want of long fasting, and to restore the waste of secretion during the night; dinner in the middle of the day, to support the system during the fatigue of ordinary labour; and a light meal at night, in the form of tea or an early supper, to carry on the functions of repair and secretion during the night. According to Dr. Edward Smith, the daily distribution of the food, supposing a physiological diet of 4,300 grains of carbon, with 200 grains of nitrogen to be taken, should be somewhat in this manner:—

	Carbon.	Nitrogen.
	grs.	grs.
For breakfast	1,500	70
For dinner	1,800	90
For supper	1,000	40
Total in the day	4,310	200

So that about one part should be eaten for supper, one and a-half for breakfast, and about two parts for dinner.

It is hardly necessary to say, that in constructing dietaries, *the foods should be associated in such a way as not to offend the appetite or burden the digestive powers;* and that they should also be varied from time to time, not merely in their kind, but also in their treatment, as in the manner of cooking and flavouring them; for the best descriptions of food will, if eaten in the same fashion day after day, occasion disgust, and be wasted. This is often the case in the badly-arranged dietaries of workhouses, and on ship-board. It was once so with the dietaries of the English army, when the same daily rations of boiled meat were provokingly served out to the men, while they listened to the tune of "Oh the roast-beef of old England." All this is easily provided for, and it is true economy to do so, by varying the food, the mode of cooking it, the manner of flavouring it, and by serving it, in the case of dinner, with different kinds of vegetables. In constructing dietaries, therefore, the main considerations are the due supply of the right proportions of nitrogenous and carbonaceous matters; for when these are not adjusted in a proper manner, the health is endangered, and the constitution may be slowly undermined. To use the words of Liebig—"there is a law of nature which regulates these things, and it is the elevated mission of science to bring this law home to our minds; it is her duty to show why man and animals require such admixture in the constituents of their food for the support of the vital functions, and what the influences are which determine, in accordance with the natural law, changes in the admixture.

"The knowledge of the law elevates man in regard to an important function which he possesses in common with the lower animals, above the level of those beings which are destitute of reason, and supplies him, in the regulation of those bodily wants which are essential to his existence and prosperity, with a protection which the lower animals do not require, because in them the commands of the instinctive law are not opposed or overpowered by the allurements of sense, or by a perverted and resisting will."

The recognition of this law, and the practical application of it to the dietaries of a community, are obviously of great advantage, for not only would they tend to increase the health and strength of the population, but they would also effect a great economy in the general use of food. That there are difficulties in the way of such an application cannot be doubted; in fact, the natural peculiarities of individuals, to say nothing of the differences of occupation, and the ever-varying quality of the food itself, are enough to create a doubt as to the possibility of its general application until the progress of science has gone far beyond its present position. Nevertheless, there are certain well-acknowledged facts at our disposal which may safely serve as a guide to practice.

The diseases which are incidental to an abuse of the law can hardly be discussed in this place, but it may be said, in general terms, that too much or too little of either of the main constituents of food will soon be followed by marked derangements of the animal body. An excess of respiratory food not only promotes the growth of fat, but actually interferes with the nourishment of muscular tissue. Those who feed largely on rice, on potatoes, or other farinaceous foods, or who indulge too freely in malt liquors, have commonly a bloated appearance, and have no faculty for sustained exertion. The brewer's

drayman, for example, is a bad subject for the ward of a hospital; and although he sometimes looks strong and muscular, yet in reality his vital power is feeble, and his tissues are fatty rather than muscular. The same is often the case with animals in the Zoological Gardens, when too large a quantity of respiratory food has been eaten, and their flesh has undergone a kind of fatty degeneration.

On the other hand, when the plastic elements of the food are in excess, the system becomes excited, too much blood is formed, and diseases of a plethoric character are induced. According to Liebig and his followers, an excess of force is developed, which manifests itself in irritability of temper, and in a savage disposition. How far this may be concerned in the frequently ungovernable conduct of our over-fed convicts may be deserving of consideration. A nation of animal *feeders*, says Liebig, is always a nation of hunters, for the use of a rich nitrogenous diet demands an expenditure of power, and a large amount of physical exertion, and this is seen in the restless disposition of all the carnivora of our menageries.

A deficiency of food, however, is quickly followed by a general breaking up of the animal frame. Plague, pestilence, and famine are always associated in the public mind; and the records of every country show how closely they are related. The medical history of Ireland is remarkable for illustrations of how much mischief may be occasioned by a general deficiency of food. Always the habitat of fever, it every now and then becomes the very hotbed of its development. Let there be but a small failure in the usual imperfect supply of food, and the lurking seeds of pestilence burst into frightful activity. The famine of the present century is but a too forcible illustration of this, for it produced epidemics which had not been witnessed in this generation, and it gave rise to scenes of devastation and misery which are not surpassed by the most appalling of the middle age. The principal form of the scourge was known as the contagious famine fever, and it spread, not merely from end to end of the country in which it had originated, but, breaking through all boundaries, it crossed the broad ocean, and made itself painfully manifest in localities where it was previously unknown. Thousands fell under the virulence of its action, for wheresoever it came it struck down a seventh of the people, and of those whom it attacked one out of nine perished. Even those who escaped the fatal influence of it were left the miserable victims of scurvy and low fever. Another example, not less striking, of the terrible consequences of what may be truly called famine, was the condition of our troops during the early part of their sojourn in the Crimea. With only just enough of food to maintain the integrity of the system at a time of repose, and at ordinary temperatures, they were called upon to make large muscular exertions, and to sustain the warmth of the system in the midst of severe cold. What could be expected but that the scourges which wait upon famine, as fever, diarrhœa, dysentery, and scurvy, should make their appearance in great force, and that the soldiers should perish by thousands. With an average strength of 24,000 men, the deaths from sickness alone, in the course of seven months, were at the rate of thirty-nine per cent., and in some cases it amounted to seventy-three. "Never before," says Colonel Tulloch, "is there record of a British army having sustained so frightful a loss in so short a time." During the Peninsula War, though the troops occasionally suffered much from sickness, the loss from that cause did not average above twelve per cent. for a whole year. Even in the ill-fated expedition to Walcheren, which threw the nation into mourning, the deaths amounted to only about $10\frac{1}{3}$ per cent. for the half-year; and here, in this great city, with all the aggravating circumstances of want, vice, infancy, old age, and disease, it did not reach two per cent. during the time that our strong men were dying by thousands. "Armies have perished by the sword, and have been overwhelmed by the elements, but never, perhaps," says Colonel Tulloch, "since the hand of the Lord smote the host of the Assyrians, and they perished in a night, has such a loss from disease been recorded as on this occasion." May the lesson of so great a calamity be wisely applied in the future.

The connection of scurvy with improper or insufficient food is a matter of medical history, and its prevention by the use of fresh vegetables, especially potatoes, is so well known that it has often been the subject of legislation. Rarely appearing in the cabin, where the dietary is good, it is a frequent visitor to the forecastle; so that half the men of our sea-going vessels are found to be suffering from the disease when they return to port. As many, indeed, as 70 per cent. of a ship's crew are not unfrequently disabled by it; and there is no saying how many of the disasters at sea are caused by the inability of the men to work the vessel in times of severe weather. The legal supplementary allowance in emigrant vessels of 8 oz. of preserved potato, 3 oz. of other preserved vegetables (carrots, turnips, onions, celery, and mint), besides pickles, and 3 oz. of lemon juice for each person weekly, is found to be a perfect prophylactic of the disease, so that the one essential cause of it is evidently a privation of vegetable food.

And not less important are the morbific results of too much or too little saline matter in the food. I have already spoken of the salutary effect of certain calcareous salts in the water we drink; but according to Dr. Grange, the presence of magnesian salts in the water of a district may have something to do with the development of those remarkable forms of disease which are known as goitre and cretinism. In France, Germany, England, Sardinia, among all classes of people, of all habits, and in every variety of climate, those diseases are endemic where the soil is composed of magnesian rock, and the water charged with magnesian salts. How far the connexion extends is a chemico-physiological problem that has yet to be determined.

(*To be continued.*)

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Norwich, 1868.

The following is a list of the Papers read in the different Sections:—

THURSDAY, AUGUST 20th.

Section A.—Mathematical and Physical Science.

Introductory address by Professor Tyndall.

W. R. Birt—Report on the Lunar Committee, with Introductory Remarks by the Chairman of the Committee.

Baron Von Mädler—On Changes of the Moon's Surface.

W. R. Birt—On the extent of the Evidence of Change on the Moon's Surface.

Father Secchi—Researches on Spectrum Analysis of the Stars.

W. Huggins—On some further results of the Spectrum Analysis applied to the Heavenly Bodies.

W. F. Barrett—On the Passage of Radiant Heat through Liquids.

W. F. Barrett—On a Simple Method of Exhibiting the Combination of Rectangular Vibrations.

Section B.—Chemical Science.

W. H. Perkin, F.R.S.—On the Chloride of Methylene formed by the action of Nascent Hydrogen on Chloroform.

Dr. T. L. Phipson—On Sulphocyanide of Ammonium.

Dr. J. H. Gladstone—Refraction Equivalents and Chemical Theories.

C. Tomlinson, F.R.S.—On the Action of Nuclei in Inducing Crystallization.

F. A. Abel, F.R.S.—On the Chemical Composition of the great Cannon of Mohammed II., recently presented by the Sultan Aziz Khan to the British Government.

John Spiller, F.C.S.—Analysis of the ancient Roman Mortar of the Castrum of Burgh, Suffolk.

Section C.—Geology.

The President's Address.

Rev. O. Fisher—On the Denudations of Norfolk.

S. V. Wood and F. W. Harmer—On the Glacial Structure of Norfolk and Suffolk.

J. E. Taylor—The Norwich Crags, and their Relation to the Mammaliferous Bed.

A. Bell—On the Molluscan Fauna of the Red Crag.

Section D.—Biology (Department of Zoology and Botany).

Inaugural Address by the President.

J. Gwyn Jeffreys, F.R.S.—Last Report on Dredging amongst the Shetland Isles.

Rev. A. M. Norman—On Shetland Sponges, and on a Remarkable New Genus of Sponge.

Dr. McIntosh—Report on Mr. Gwyn Jeffrey's Zetlandic Annelids of 1867.

Rev. A. M. Norman—On "Hyalonema Boreale, Loven," and Allied Forms.

Rev. A. M. Norman—On the Genera Palythoæ and Zoanthus coating Sponges.

Professor Balfour—Remarks on the Properties of Atropa Rhomboidea (Hooker) in Connection with its Botanical Character.

Professor Balfour—Notices of the occurrence of Hieracium collinum (Fries) in Selkirkshire, with remarks on some recent additions to the Scottish Flora.

A. G. More, F.L.S.—On the rediscovery of Scirpus parvulus.

Section D.—Biology (Department of Physiology).

W. H. Flower, F.R.S., Vice-President, presided.

Professor Bennett—Report on the Action of Mercury on the Secretion of Bile.

Dr. B. W. Richardson, F.R.S.—Report on the Physiological Action of the Methyl Series.

E. Ray Lankester—Report on the Investigation of Animal Substances with the Spectroscope.

W. H. Flower, F.R.S.—On the Homologies and Notation of the Teeth of Mammalia.

Dr. Cobbold, F.R.S.—Flukes from the Indian Elephant, with remarks on their Affinities.

Dr. B. W. Richardson, F.R.S.—On some effects of extreme cold on nervous action.

Professor Rolleston, F.R.S.—On the Physiology of Pain.

Section E.—Geography and Ethnology.

President's Opening Address.

C. R. Markham—Geography of the Abyssinian Expedition.

Rev. F. W. Holland—Topography of Sinai.

Dr. H. Blanc—Native Races of Abyssinia.

Section F.—Economic Science and Statistics.

The President's Address.

Frank P. Fellows, F.S.S.—On Mr. Seely's Proposed Form of Admiralty Estimates' Accounts as recommended by the Naval Committee of the House of Commons.

Henry Jeula, F.R.G.S., F.S.S., Hon. Sec. to Statistical Committee of Lloyds'—A Brief Statement of the Recent Progress and Present Aspect of Statistical Inquiry in Relation to Shipping Casualties.

Professor Leone Levi, F.S.A., F.S.S., &c.—On the Progress of Learned Societies, Illustrative of the Advancement of Science in the United Kingdom during the last Thirty years.

Section G.—Mechanical Science.

The President's Address.

Report of Committee on Steam-ship Performance.

Professor J. M. Macquorn Rankine, C.E., LL.D., F.R.S., &c.—On the Probable Connexion between the Resistance of Ships and their Mean Depth of Immersion.

Charles W. Merrifield, F.R.S., &c.—On the Necessity for further Experimental Knowledge Respecting the Propulsion of Ships.

Captain Douglas Galton, C.B., F.R.S., &c.—Description of a Ventilating Fire Place, with Experiments upon its Heating Power as compared with that of Ordinary Fire Places.

FRIDAY, AUGUST 21st.

Section A.—Mathematical and Physical Science.

W. Ladd—On a Further Development of the Dynamo-Magneto-Electric Machine.

Colonel Strange—On the Necessity for State Intervention to Secure the Progress of Physical Science.

Professor Everett—Report of the Committee on Underground Temperature.

T. Dobson—On a New Correction to be Applied to Observations made with Hadley's Sextant.

L. Bing.—On Actinometry.

Dr. J. H. Gladstone—On the Value of the Hollow Wedge in Examining Absorption Spectra.

Professor C. Zenger—On a New Automatic Telegraphic Apparatus.

Section B.—Chemical Science.

Alfred R. Catton—Report of Synthetical Researches on Organic Acids.

A. Matthiessen—Report on the Chemical Nature of Cast Iron.

A. Matthiessen and W. J. Russell—Note on the Vesicular Structure of Copper.

E. Frankland—On the Combustion of Gases under pressure.

W. Perkin—On the Preparation of Anhydrous Salts of some Organic Compounds.

—Meusel—On Paraffin and its Products of Oxidation.

Alfred R. Catton—Notes on Löwig's Researches on the Action of Sodium Amalgam on Oxalic Ether.

C. W. Siemens—On Puddling Iron.

Section C.—Geology.

W. Pengelly—Fourth Report of Committee for the Exploration of Kent's Cavern, Devonshire.

W. Pengelly—On the Condition of some of the Bones in Kent's Cavern.

G. Maw—On the Sequence of the Deposits in Norfolk and Suffolk superior to the Red Crag.

W. S. Mitchell—Report of Committee on Leaf Beds of the Hampshire Basin.

E. Whymper—Report of the "Greenland Plant Beds Committee."

C. B. Rose—On the Conchoidal Fracture of Flint as seen on Flint-faced Buildings in Norwich, &c.

C. Moore—Report on the Fossil Contents of Mineral Veins in the Mendips, &c.

J. Bryce—Report of the Earthquake Committee for Scotland.

Rev. J. Gunn—On the Alternate Elevations and Subsidences of the Land and the Order of Succession of the Strata.

Section D.—Biology (Department of Zoology and Botany).

W. Carruthers—Report on Fossil Flora.

H. Stevenson—On the Extinction of the Great Bustard in Norfolk and Suffolk.

Alfred Newton—The Zoological Aspect of our Game Laws.

A. D. Bartlett—On the Crested or Top Knotted Turkey.

Professor E. Faivre—Les Incisions Annulaires chez le Meurier (Morus).

Dr. W. Cleghorn—On the Distribution of the Principal Timber Trees of India, and the Progress of Forest Conservancy.

W. Brown—On the Claims of Arboriculture as a Science.

John Hogg—On the Wellingtonia Gigantea, with Remarks on its Form and Rate of Growth as compared with the Cedrus Libani.

Frank Buckland—Progress of Salmon Cultivation in England.

Section D.—Biology (Department of Anatomy and Physiology).

W. H. Flower, F.R.S., Vice-President, Presided.

Dr. Bennett—Report on the Action of Mercury on the Secretion of Bile.

Dr. Anstie—On Certain Effects of Alcohol on the Pulse.

Professor Rolleston, F.R.S.—On the Pectorales Muscles.

Mr. Bridgman—Electrolysis in the Mouth.

Dr. Richardson, F.R.S.—On the Transmission of Light through Animal Bodies.

Section E.—Geography and Ethnology.

W. Hepworth Dixon—The Great Prairies and the Prairie Indians.

Capt. Lindesay Brine, R.N.—Inhabitants of the Cyrenaica and Western Libya.

Thos. J. Hutchinson, H.M. Consul at Rosario—Rivers and Territories of the Rio de la Plata.

A. Waddington—Overland Route through British Territory, from the Atlantic to the Pacific.

R. Brown.—Physical Geography of the Queen Charlotte's Islands.

Section F.—Economic Science and Statistics.

Report of the Metric Committee, and Recommendation Thereon.

Sir W. Jones, Bart.—On the Arterial Drainage of Norfolk.

W. D. Harding, C.E.—On the Fen Drainage of Norfolk.

Rev. Canon Girdlestone—The Condition of the Agricultural Labourer, Specially in the West of England.

Section G.—Mechanical Science.

Interim Report of the Committee on Agricultural Machinery.

R. B. Grantham, C.E.—On the "Broads" of East Norfolk, having reference to Water Supply, Storage, and Drainage.

Ferdinand Kohn—On the Recent Progress of Steel Manufacture.

Rev. Professor Willis, F.R.S.—The Arrangements Employed for the Distribution of Water to Towns and Dwellings in the Middle Ages.

C. J. Appleby—On Mechanism for Utilizing and Regulating Convict Labour.

SATURDAY, AUGUST 22nd.

Section A.—Mathematical and Physical Science.

C. W. Siemens—On the Electric Conductivity of Platinum as affected by the Process of Manufacture.

Professor W. J. M. Rankine—Report of the Committee on Tidal Observations.

R. B. Hayward—On the Chances of Success or Failure of Candidates for Three-cornered and Four-cornered Constituencies.

Professor H. J. S. Smith—On Geometrical Constructions involving Imaginary Data.

Professor H. J. S. Smith—On a Construction for the Ninth Cubic Point.

Professor H. J. S. Smith—On a Property of the Hessian of a Cubic Surface.

Arthur Gearing—Examples of Ocular Demonstration of Geometrical Propositions.

W. H. L. Russell—Division of Elliptic Functions.

Prof. Everett—Resumé of Experiments on Rigidity.

Professor F. Guthrie—On the Thermal Resistance of Liquids.

A. R. Catton—Certain Facts bearing on the Theory of Double Refraction.

Section B.—Chemical Science.

This Section did not meet on Saturday.

Section C.—Geology.

H. Woodward—Fourth Report on Fossil Crustacea.

H. M. Jenkins—On the Tertiary Deposits of Victoria.

Dr. J. Lowe—On the Carstone of West Norfolk.

Professor Otto Torrell—On some new Fossils from the Long Mynd Rocks of Sweden.

J. W. Salter—On a new Pterygotus from the Lowest Old Red Sandstone.

C. Jecks—On the Ferruginous Sandstone of the Neighbourhood of Northampton.

C. W. Peach—On the Fossil Fishes of the County of Cornwall.

S. Sharp—On a Remarkable Petrifaction in Northamptonshire.

C. B. Rose—On the Crag at Aldeby in Norfolk.

Dr. R. J. Mann—Notes on the Character of the Coal Field in Natal.

Section D.—Biology (Department of Zoology and Botany).

This department did not meet on Saturday.

Section D.—Biology (Department of Physiology).

This department did not meet on Saturday.

Section E.—Geography and Ethnology.

This Section did not meet on Saturday.

Section F.—Economic Science and Statistics.

Sir John Bowring, F.R.S.—On the Moral and Pecuniary results of Prison Labour.

F. S. Corrance, M.P.—On the Social Condition of the Labouring Classes.

Section G.—Mechanical Science.

Interim Report of the Committee on the Patent Laws.

J. Whitworth, LL.D., F.R.S.—On the Proper Forms of Projectiles for Penetration Through Water.

C. W. Siemens, F.R.S.—On Puddling Iron.

MONDAY, AUGUST 24th.

Section A.—Mathematical and Physical Science.

Sir W. Thomson—Report of Committee on Electrical Standards.

G. J. Symons—Report of Rainfall Committee.

J. Glaisher—Report on Luminous Meteors.

G. Forbes—On the Meteor Shower of August, 1868.

Padre Secchi—On some Meteorological Results obtained in the Observatory at Rome.

Professor C. Meldrum—Synoptic Weather Charts of the Indian Ocean.

Professor C. Meldrum—Storm Warnings in Mauritius.

Dr. Mann—On the Resemblance and Contrasts of the Climates of Mauritius and Natal.

Dr. Mann—Abstract of Meteorological Observations made at Pietermaritzburg, Natal.

Professor Morren—Sur une Action Particulière de la Lumière sur les Sels d'Argent.

Section B.—Chemical Science.

Otto Richter—On a System of Chemical Philosophy.

T. Wood—On Chemistry as a Branch of Education.

E. Meusel and C. H. Gill—On Parrafin and its Products of Oxydation.

E. Meusel—On the Physical Properties of Two Coloured Compounds.

A. R. Catton—Note on Löwig's Researches on the Action of Sodium Amalgam on Oxalic Ether.

Angus Smith—On the Absorption of Gases by Charcoal.

J. Dewar—On Coal Tar Bases.

Section C.—Geology.

Dr. P. M. Duncan—First Report on British Fossil Corals.

Dr. P. M. Duncan—On the Genus Clisiophyllum from the Scotch Coal Field.

W. R. Grove—"Artificial Rocking Stones."—An Experiment.

C. Moore—On New Discoveries connected with Quarternary Deposits.

Dr. E. Crisp—The Skeleton of a Fossil Whale, recently found on the Eastern Coast of Suffolk.

H. G. Seeley—On the Classification oi the Secondary Strata of England.

Professor H. Coquard—The Cretaceous Strata of England and the North of France, compared with those of the West, South-west, and South of France, and the North of Africa.

J. Evans—On some Cavities in the Gravel of the Valley of the Little Ouse.

Section D.—Biology (Department of Zoology and Botany).

Professor Huxley—On some Organisms, which live at the bottom of the North Atlantic, in depths of 6,000 to 15,000 feet.

E. B. Tylor—Remarks on Language and Mythology as Departments of Biological Science.

Dr. McIntosh—On the Boring of certain Annelids.

Dr. McIntosh—On the Proboscis of Ommatophæa.

C. W. Peach—On a New Eschara, &c., from Cornwall.

Rev. M. J. Berkeley—To Exhibit Prepared Specimens of Agaricus.

M. Moggridge—On the "Muffa" of the Sulphur Springs of Valdieri.

B. T. Lowne—On Type Polymorphism and Variation in Relation to the Origin of Species.

Professor Dickson—On some of the Principal Modifications of the Receptacle and their Relation to the Insertion of the Leaf-Organs of the Flower.

Section D.—Biology (Department of Anatomy and Physiology).

Professor Rolleston—On Sixteen Eskimo Crania.

Dr. Richardson, F.R.S.—Report on the Physiological Action of the Methyl Series.

Dr. Crum Brown—On the Connection between Chemical Constitution and Physiological Activity.

Dr. Hughlings Jackson—The Physiology of Language.

Section E.—Geography and Ethnology.

Edward Whymper—Explorations in Greenland.

Dr. T. Thomson—Report of the Committee on Overland Communication between India and China.

Professor E. Perceval Wright.—On the Seychelles Islands.

Sir Walter Elliot—Sepultural Remains in Southern India.

R. Brown—On the Formation of Fiords, Canons, Benches, and Intermittent Rivers.

Section F.—Economic Science and Statistics.

Report of the Committee on Uniformity of Monies, Weights, and Measures.

Professor Leone Levi, F.S.A., F.S.S.—On the Present State of the Question of International Coinage.

G. Johnstone Stoney.—On the Natural System of Coinage.

C. S. Read, M.P.—On the Recent Improvements in Norfolk Farming.

W. Smith, M.R.C.V.S.—Statistics of the Progress and Extermination of the Cattle Plague in Norfolk.

J. G. Fitch, M.A., Assistant Commissioner to the School Inquiry Commission.—Educational Endowments.

Section G.—Mechanical Science.

J. Jones, F.G.S.—On Some Points Affecting the Economical Manufacture of Iron.

Interim Report of the Committee on the Safety of Merchant Ships and their Passengers.

W. Thorold, C.E.—Auxiliary Railway for Turnpike Roads, and Highways passing Through Towns.

H. Bright, C.E.—London Street Tramways.

W. J. Cooper.—An Improvement in Watering Roads.

Professor Archer.—On R. W. Thompson's Patent Road Steamer.

Lavington E. Fletcher.—The Unsatisfactory Character of Coroners' Inquests Consequent on Steam-Boiler Explosions.

A. Nobel.—On "Dynamite," a Recent Preparation of Nitro-glycerine, as an Explosive Agent.

TUESDAY, AUGUST 25th, 1868.

Section A.—Mathematical and Physical Science.

F. H. Varley—On the Construction of a Galvanometer for the Detection of Weak Electric Currents.

Hon. J. W. Strutt—On a Permanent Deflection of the Galvanometer-Needle by a Rapid Series of Equal and Opposite Induced Currents.

G. Gladstone—Observations on the Atmospheric Lines of the Solar Spectrum in High Latitudes.

Professor Sylvester—On the Successive Involutes to a Circle and some other Curves.

Rev. T. P. Kirkman—On the General Solution of Algebraical Equations.

Rev. R. Harley—Remarks on the Foregoing Paper.

W. Barrett Davis—A Historical Note on Lagrange's Theorem.

Professor Tait—On the Application of Quaternions to the Rotation of a Solid.

Section B.—Chemical Science.

T. Fairley—Report on the Polyatomic Cyanides.

J. Dewar—On Kekule's Model to illustrate Graphic Formulæ.

W. Ditmar—On Vapour Tensions.

Ludwig Mond—On the Manufacture of Sulphur from Alkali Waste in Great Britain.

R. Gerstl—Different Spectra of one Chromium Salt.

J. A. Wanklyn—A Note on Sea Water.

J. A. Wanklyn—Researches on the Ethers.

F. Guthrie—On Amyl-ethyl-methyl-acetonamine.

A. R. Catton—On Mitscherlich's Law of Isomorphism and on the so-called Cases of Dimorphism.

Section C.—Geology.

H. Hicks—On Some Recent Discoveries of Fossils in the Cambrian Rocks.
Rev. J. Brodie—Geological Changes that have taken place on the Coast of Britain in recent times.
C. B. Rose—On the Thickness of the Chalk in Norfolk.
Rev. W. Fox—On Skull and Bones of Iguanodon.
H. G. Seeley—On the Relations Between Extinct and Living Reptiles, and on the Present State of our Knowledge of Pterodactyle.
J. Thompson—Notice of Certain Reptilian Remains Found in the Coal Measures of Lanarkshire.
Dr. Hyde Clarke—Note on the Western Asia-Minor Coal and Iron Basin, and on the Geology of the District.
Professor Tennant—On the Recent Discovery of Diamonds in the Cape Colony.
Rev. C. G. Nicolay—On the Diamonds of Brazil.
J. Curry—On the Formation of Certain Columnar Structures.
J. L. Lobley—On the Range and Distribution of the British Fossil Brachiopoda.

Section D.—Biology (Department of Zoology and Botany).

Professor Archer—On the Occurrence of Erysimum Orientale in Peculiar Circumstances at Edinburgh.
Dr. Karl Koch—On the Specific Identity of the Almond and the Peach.
Dr. Karl Koch—On the Classification of the Species of Crocus.
Dr. Karl Koch—On the Necessity of Photographing Plants for a better Knowledge of them.
Herr Radlkofer—On Sapendaceæ.
G. Maw—On the Occurrence of *Lastrea Rigida* in North Wales.
Dr. Fraser—On a New British Moss found last summer on Ben Lawers.
Professor Hennessy—On the Possible Introduction of South European Plants in the West of Ireland.
J. Hogg—Notes on Two British Wasps and their Nests, illustrated by Photographs.
T. E. Gunn—Notice of Rare Fishes Occurring in Norfolk and Lothingland.
R. Garner—Notice of a Male Octopodous Cuttle-fish.
Dr. Otto Torrell—On the Tusks of the Walrus.
Professor Allman—On the Structure of *Coppinia Arcta.*
Dr. Grierson—On the Study of Natural History in Schools.
Rev. F. O. Morris—On the Difficulties of Darwinism.

Department of Physiology.

Professor Paul Broca—On the Seat of the Faculty of Articulate Language.
Mr. R. Dunn—On the Power of Utterance in Respect of its Cerebral Bearings and Causes.
Dr. Crisp—On the Intestinal Canal and other Viscera of the Gorilla.
Dr. Crisp—On the Relative Weight and Form of the Eye and Colour of the Iris in Vertebrate Animals.
Dr. Crisp—On some Points relating to the Visceral Anatomy of the Thylacinus.
Professor Traquair—Additional Researches on the Asymmetry of the Pleuronectidae.

Section E.—Geography and Ethnology.

W. Gifford Palgrave—The North-east Turkish Frontier and its Tribes.
Professor A. Vámbéry—On the Uigurs.
Dr. R. J. Mann—The Gold Fields of South Africa.
H. H. Howorth—Nomade Races of European Russia.
T. Baines—Victoria and Albert Rivers, North Australia.
J. Logan Lobley—Topography of Vesuvius, with an Account of the Recent Eruption.
Consul T. J. Hutchinson—On the Tehuelche Indians of Patagonia.
Granville Sharp—Description of Hong Kong.

Section F.—Economic Science and Statistics.

Miss Becker—On some Supposed Difference in the Minds of Men and Women with Regard to Educational Necessities.
Joseph Payne—On the Relation between Learning and Teaching.
Horace Mann—Some Statistics Relating to the Civil Service.
James Heywood, M.A., F.R.S.—Sanitary State of the Indians in the New England Company's Settlement of Kanyageh, Canada.
Dr. Hyde Clarke, F.S.S.—On the Progress of Turkey.
F. G. P. Neison, Jun., A.I.A.—The Influence of Occupation on Health.

Section G.—Mechanical Science.

P. Le Neve Foster, Jun., C.E.—On the Irrigation of Upper Lombardy by New Canals to be derived from the Lakes of Lugano and Maggiore.
T. Login, F.R.S.E.—On the Abrading and Transporting Power of Water.
E. Charlesworth, F.G.S.—On the Substitution of Hand for Shoulder Guns; Illustrated by an Explanatory Exhibition of an Elevator Hand Gun made on the Breech-Loading Principle.
J. H. Gwynne—An Improved Centrifugal Pump.
C. Blyth—An Improved Machine for Drawing-off, Measuring, and Cutting Cloth and other Materials for Manufacturing Purposes.
Latimer Clark, C.E.—On the Advisability of Obtaining a Uniform Wire Gauge.
G. Fawcus—Improvements in the Packing of Boats.
G. Fawcus—Improvements in Lifeboats and Pontoons.

WEDNESDAY, AUGUST 26th.

Section C.—Geology.

S. Jenkins—On the Noted Slate Veins of Festiniog.
Professor Göppert.—On the Inapplicability of Fossil Plants to Support the Theory of Gradual Transformation.
W. H. Baily—On the Fish Beds of Kiltorcan, in the County of Kilkenny.
E. R. Lankester—The Oldest Beds of the Crag.

Section D.—Biology (Department of Zoology and Botany).

Professor Lawson—On the Flora of the Isle of Skye.
Professor Lawson—On the Geographical Distribution of *Buxbaumia Aphylla* in Great Britain.
Professor E. Perceval Wright, M.D.—Notes on the Flora and Fauna of the Seychelle Group of Islands.
C. Spence Bate and Professor Westwood—On the Geographical Distribution of the British Genera of the Sessile-eyed Crustacea.

Section D.—Biology (Department of Anatomy and Physiology).

Dr. Thompson Dickson—On Vitality as a Mode of Motion.
Dr. Macalister—On the Comparative Anatomy and Homologies of the Atlas and Axis.
Professor Cleland—Is the Eustachian Tube Opened or Shut in Swallowing?
Professor Cleland—On the Relation of the Limbs to the Segments of the Body.
Mr. R. Garner—On the Anatomy of Carinaria Mediterranea.

Dr. Behier—On the Generation of White Blood Corpuscles.

Professor Heynsius—On the Albuminoid Substances of the Blood Corpuscles.

E. Ray Lankester and H. N. Mosely—The Nomenclature of Mammalian Teeth and the Teeth of the Mole.

Section F.—Economic Science and Statistics.

Edward Crisp, M.D.—On the Statistics of Pulmonary Consumption in 623 Districts of England and Wales.

Henry Dircks, C.E., F.R.S.E., &c.—On Patent Monopoly, as Affecting the Encouragement, Improvement, and Progress of Science, Arts, and Manufactures.

G. Bell Galloway—Inventors and Inventions.

F. Wilson—Classification of Labour.

H. J. Ker Porter, M.R.S.A., &c.—On the Extension of the Contagious Diseases Act.

ADULT EDUCATION IN FRANCE.

The Minister of Public Instruction has published the "Statistics of Adult Classes for the year 1867-8," which show that much is being done in this important matter. During the past winter, 27,902 adult classes for men were opened in 26,193 communes, and 4,429 classes for women, in 4,084 communes, and the number of persons who attended them amounted to 779,373, of whom 95,281 were women. These figures are, however, inferior to those of the preceding year, for, says the document in question, if there has been no falling off in zeal, and if the teachers deserve the highest commendation, the winter was long and rigorous, the cold rendered communication difficult, especially in mountainous parts, while to other difficulties was added the dearness of provisions. In some rural communes a portion of the population was compelled to emigrate. Yet, in spite of these exceptional circumstances, a general desire to attend the adult classes was evident; married men and women, in many instances no longer young, were often to be seen at the evening-schools for months.

Of the whole number that attended the adult classes, at least one-half were in a state of complete ignorance, or had a most imperfect knowledge of the most elementary matters, and it appears that there were certainly not 18,000 who failed to derive any appreciable advantage from their attendance at the classes.

In Algeria, 82 classes were opened for men, and 22 for women, during the year; the whole of these were evening-classes, and open to all without any charge whatever. Of the teachers, 87 were laymen, and only 17 belonging to religious societies. The total number of persons who attended the schools was 2,548 men, and 274 women.

A comparison is made between the state of primary education at the present time and that of thirty-five years ago, when primary schools were organized in all the communes of France. In 1833 the proportion of illiterate conscripts was 48·83 per cent.; in 1853 it was 34·39 per cent., a gain of 14·44 per cent. in twenty years, or 0·72 per annum. The adult classes are gradually being completed by the addition of scholastic libraries, the teachers, as well as the poor scholars themselves, contributing the collections.

The movement is so unanimous, says the report in question, that it cannot be arrested, and it may safely be predicted that before long France will occupy a high place amongst the nations most famous for popular education.

THE DISEASE IN THE SUGAR-CANE IN MAURITIUS.

The following account of the disease which has made its appearance among the sugar-canes at Mauritius, is translated from the *Journal des Fabricants de Sucre*, and quoted in the *Produce Markets Review*:—"It appears, from a communication forwarded by M. E. Elias to the Imperial and Central Agricultural Society, that the sugar-cane disease burst out in Mauritius just about the time that the oïdium or vine disease made its appearance in Europe. By the colonists it was attributed to atmospherical influences; and it was remarked that at the very beginning it attacked almost exclusively the white Oataheite cane, the cane that has been longest under cultivation, and the one most esteemed by the planters on account of its rapid growth, its much greater saccharine richness, and the facility with which its leaves can be taken off in order to expose the plant to the action of the sun and other atmospheric influences. As soon as it was ascertained that the disease attacked this species of cane rather than others, it was resolved to abandon it, notwithstanding all its advantages. Sugar-plants were then procured from all quarters of the globe where the cane grew; but, unfortunately, the error was committed of obtaining plants from Ceylon, where the 'borer' existed, and so this destructive insect was introduced into Mauritius. This is the opinion of nearly all the planters, and it is so far corroborated by the circumstance that the borer first began its ravages on the estate of the very planter who received the plants from Ceylon; from there, the plague extended itself to the neighbouring estates. At Ceylon the ravages of the borer were so disastrous, that the planters were compelled to give up the cultivation of the sugar-cane altogether, and return to that of coffee, originally the chief staple of that island. From the very first, the borer has been the cause of much havoc, and even at the present moment it would do much more harm if the planters did not struggle against its attacks with the greatest energy. From the time of its introduction, the planters have been able to follow its course regularly from one district to another, striking first of all with extreme violence, and then diminishing in intensity, but never wholly disappearing from a place where it has once been established, so that it is necessary now to look upon it as always present, and never to give over watching it and combating it. It was in the year 1854 that its appearance first caused alarm. Its ravages may be compared to that of a fire. It was stated, in one of the reports of the Agricultural Chamber of Mauritius, that this insect was first introduced with the sugar-plants from Ceylon, about the year 1848.

"There are three ways of combating the borer; the first consists in plunging, for four-and-twenty hours, the heads of the canes which are to give the cuttings in water sufficiently warm to destroy the larvæ, without injuring the germinating powers of the plant. The second plan is to cut off the first shoots of the maiden canes; those are called maiden canes which spring directly from the cuttings, and which have not yet brought forth any yield. The planters wait until these new canes have grown for three months, after which they are cut down close to the ground. In this way, not only are the borers destroyed which are found in them, since the canes from this cutting are burnt, after being placed in heaps, but we are enabled to get canes with a much stronger skin, and much more fitted to resist the attacks of the insect. For the third method, there is the destruction of the caterpillars, which takes place in canes which have sprouted after the amputation described previously, as soon as they have attained a certain height. Native labourers traverse the sugar-fields, armed with knives, inspect the canes one after the other, and destroy the borer as soon as they come across it, in one of the holes that the insect makes in the cane. The Agricultural Chamber of Mauritius has offered a prize of 50,000 francs to any one who will discover a sure and practical method of getting rid of the borer. After being tormented by the borer for the last ten years, just as they were congratulating themselves on having almost put an end to the evil, the planters discovered the white louse *(pou blanc)*, at the same time that they became aware of a new disease in the cane, which, though not

quite so disastrous as the first, is still serious enough to cause some anxiety, and to reduce the estimates of the yield; this last disease is generally attributed to the impoverishment of the soil. The first disease affected the heart of the cane, which soon became rotten; the leaves lost their colour, vegetation was arrested, and the cane was completely dried up. The new disease only turns the leaves yellow, as if they had received a sunstroke, and, from that moment, the cane is done for. These effects are noticed more particularly in the centre of the squares, though sometimes the whole field is attacked. It was observed that this last disease was most prevalent in those districts where guano had been used in excess. Hitherto those quarters which are moist and cold have been most free from the white louse, and the last disease. The white louse does considerable damage to the canes on which it settles, and without entirely destroying them greatly impedes their vegetation. The white louse made its first appearance amongst us in 1858, or 1859, and settled on the rose-trees before it attacked the sugar-cane; it was supposed to have come from the Isle of Bourbon."

STATISTICS OF BIRTHS AND DEATHS IN FRANCE.

The tables of births and deaths for the year 1865 have recently been published; and from them M. L. de Lavergne, member of the institute, makes the following remarks upon their results. The returns in question show that the year 1865 was one of the worst of which the statistics have yet appeared; the causes which had arrested the progress of the population had apparently diminished since 1861, but they reappeared with renewed force in 1865.

The returns of births and deaths for that year give the following result:—

Births	1,006,753
Deaths	921,887
Excess of births	84,866

During a certain period preceding 1848, the average annual excess of births amounted to 180,000; since 1848 it has averaged 100,000; and 1865 falls sadly below that rate. M. de Lavergne states that the diminution does not arise so much from a falling off in the number of births, as in an increase in the deaths; these exceeded 900,000 in 1865, a number only reached in 1849, 1854, 1855, and 1859. The Mexican war was probably a principal cause of the large total in 1865.

In thirty-one departments, forming more than one-third of the whole of France, the deaths were actually in excess of the births; and in this list includes some of the richest portions of the country, such as the Bouches du Rhone, the two Charentes, Côte d'Or, Gironde, Manche, Marne, Seine-et-Marne, Seine-et-Oise, Var, Vaucluse, Yonne, Eure, and Calvados.

The departments in which the excess of deaths was greatest were Bouches du Rhone and Var, where the cholera raged during the year 1865. In the case of the former department, the deaths were in relation to the births as more than 18 to 15, and in the case of the Var 10½ to 7.

In the Nord, on the contrary, the most thickly populated of all the departments, the deaths were less than 33 to 46, leaving an excess of 13,293 births. After the Nord, the departments which gained most were those of Brittany, the Pas de Calais, and the Rhine.

The same returns show that the number of marriages have been steadily decreasing during the five years ending 1865; in 1861 they amounted to 305,203, in 1865 they had fallen to 298,838. The diminution was, however, less in 1865 than in either of the three previous years; in 1863 it amounted to nearly 2,200, while in 1865 it was 1,700.

Fine Arts.

EXHIBITION OF HISTORIC PORTRAITS IN PARIS.

A society of literary men, who hold conferences on the Boulevard des Capucines, have had the good idea of occupying their rooms during the off-season with a collection of portraits of notable persons of the time of the Revolution and of the Empire. The collection is not large, including only seventy-two works, and many of these of little artistic merit, but it is interesting.

There are four likenesses of Marie Antoinette; one a full-sized portrait from the collection of Madame Vigée Lebrun, executed before the revolutionary period, but the face is wanting in character though not in beauty. The other portraits of the unhappy queen are very unimportant; one is a common-place water-colour drawing of Marie Antoinette in a towering head-dress; the other a small oil painting of the same in a fancy costume. The queen also appears in a small group with Louis XVI. and other persons.

A small sketch in oil, not badly executed, represents Madame Elizabeth; the face is pretty, with a noble expression. The unfortunate Princesse de Lamballe is represented by a small portrait that bears little witness to the extraordinary beauty attributed to her.

Amongst the most interesting works are two full-sized half-lengths of the poor Dauphin, "L. 17;" one in oil, and the other in water colours. They are attributed one to Prudhon and the other to Madame Lebrun; at any rate they are characteristic pictures, and represent a beautiful, youthful face, one far more robust than the other, but the features and expression much the same in both.

The only portrait of the princes of the Royal Family is one of Monsieur, afterwards Louis XVIII., dressed in a character belonging to one of the historical ballets of Trianon; it is a common-place work.

Of the remarkable men of the revolutionary period, Robespierre is represented by two portraits; one being a mere sketch in oil on a piece of rough pannel, supposed to be from the pencil of David.

Marat is much better represented. One represents him as a young man in 1789; a poor work. Another, by Boze, bears date April, 1793, three months before he was assassinated. It is said to be the best portrait of him known; the face shows much power, but the characteristic is that of vulgar insolence. Lastly, there is a very small pen and ink sketch of the *Ami du peuple*, writing in a kind of cellar, and visited by a man with a pike in his hand and the republican cap on his head; a curious little work.

Saint-Just is represented in a life-sized portrait; the face remarkably handsome and young. He was executed at the age of 26. There are good portraits of Couthon and Danton, the latter by Greuze. A poor faded miniature of Camille Desmoulins; the only one known, and said to be by Boze. A good portrait of Hérault de Séchelles, who drew up the constitution of 1793, and fell with Danton at the age of 34; a well-painted portrait of Fabre d'Eglantine, the face splendid, also executed with Danton; a small, hard likeness of Collot d'Herbois; a good painting of Lebrun Vigée, artist, and husband of Madame Lebrun the painter, a young and beautiful face; a likeness of Marie Joseph Chénier, one of Rouget de Lisle, painted by Vincent, and pierced by a bayonet; Bailly, the Maire of Paris, is represented by two good works, one by Suvée, who painted the death of Coligny by order of Louis XVI., the head remarkably fine, the other, a pretty, small, oval medallion. Portraits of Tallien, of Hébert, by Jules Guérin, and De Calonne, the Louis XVI.'s last finance minister; a large head, well painted. A remarkable portrait of Fouché, evidently by a powerful hand, possibly David, but in a sad condition; the "intense ugliness" of the original is certainly fully expressed.

The women of the period are represented pretty fully. There are, amongst others, a portrait of Madame Roland, a rather girlish face; a very remarkable miniature of Charlotte Corday, the face very beautiful, yet exhibiting deep, though subdued sorrow, far less meretricious than the generality of the portraits extant. Ary Scheffer used this charming miniature for his picture of Charlotte Corday. A remarkably well-executed and characteristic portrait of La Reine des Halles, the market woman who headed the crowd that took possession of the Tuileries, was twice wounded, and slept that night on a gun carriage; a fine portrait of Anne Josèphe Théroigne de Méricourt, who performed the characters of Goddess of Reason, of Liberty, and of Beauty; the famous Jacobin flower girl; Mademoiselle Maillard, an opera singer, who was also a goddess of reason. There are other portraits of persons in the fancy costumes of the period, but they none of them reflect the accounts to be found in the narratives of the period; on the contrary, the dresses are in all cases modest, though showy.

The portrait of Olympe de Gouges, revolutionary writer and friend of Robespierre, who said, "Women have the right to mount the scaffold; they should also have the right to mount the tribune," is a striking figure of a masculine woman. One of the most lovely faces in the collection is that of Madame Tallien, admirably painted, and representing the Queen of the Directory in a man's dress and hat.

Of the Buonaparte family we have a pretty modern-looking water-colour drawing of Josephine previous to the empire; a good portrait of the Empress Marie Louise, the face handsome, but without sentiment; a poor one of Louis Buonaparte, King of Holland, perhaps by Gerard; and a large and fine work attributed to Prudhun, representing the little king of Rome at the knees of Madame de Montesquieu.

There are some interesting pictures amongst the smaller works, including a capital head of a Jacobin, a young Incroyable, and female figures in the curious costumes of the period.

Four remarkable pictures of an earlier period are added to the collection—a fine three-quarter length portrait of Molière, an admirable portrait of Descartes, a Voltaire, young and handsome, and a head of Jean Jacques Rousseau, also young and good-looking.

The managers of this small exhibition have set a good example; the admission is one franc, but each visitor receives a catalogue with annotations by two known writers.

Commerce.

The Indian Tea Trade.—The *Produce Markets Review* says:—"The exports of tea from India in the twelve months ending June 30th, amounted to 8,700,000 lbs., an increase of more than a million on 1866-7, and a total nearly three times as great as five years ago. Notwithstanding the difficulties of the cultivators, the trade thus keeps on increasing, and even the late low rates are understood to have paid on properly managed estates. We think that the present low prices are in reality the best thing that could have taken place for putting matters on a sound basis. While extravagant rates were given here, the hopes of cultivators were unduly excited, and an absurd rate of profit was looked upon as certain. Such high prices in the meantime limited the consumption here to a comparatively small class of tea fanciers, while at the present moderate rates Indian teas are a necessity to the grocer, as they must in future continue to be. Nothing could formerly be more uncertain than the Indian tea market, and it is true that the most extraordinary differences in valuation are still common. But the market is now too large to be raised or depressed by the freaks of individual buyers, and the demand must go on for a long time increasing in a greater ratio than the consumption. A little further reduction, and the natives of India, who are very fond of tea, but who cannot buy it because of its high price, would enter the market, and a very small consumption per head of 200,000,000 people, would tax the energy of tea growers for many years to come. With the introduction of railways and of European enterprise generally, the available wealth of India is increasing in a fabulous proportion, and the old hoarding habits of the natives must, although by very slow degrees, disappear. As the tonic contact of the European way of doing things will also cause them to use their brains more rapidly, some stimulant drink will be required. Wine and spirits are, broadly speaking, unknown to the natives, and as the vine can never be cultivated in any part of the plains, the home product of tea, which is already liked and appreciated, seems to us to be marked out as the Indian stimulant of the future. We thus look upon the position of the Assamese and Himalayan gardens as an eminently sound one."

The Wine Crop in France.—The *Salut Public* of Lyons says:—"The wine crop offers a splendid aspect almost everywhere, and is magnificent in Burgundy, the Maconnais, Revermont, and Lyons country. In the vineyards of Beaujolais, the vine stocks literally bend beneath the weight of the grapes, which at present have attained almost their full size, and have begun to redden for the last few days. The owners are in high spirits; and if slight showers and great heat should alternate, as hitherto, there are grounds for expecting a very superior yield in quantity and in quality, as compared with that of last year; and, besides, the vintage can be made a month earlier. We cannot deny, however, that the prolonged drought, and the extraordinary heat, have caused some damage in certain quarters. In sandy and gravelly soils, many of the grapes have been roasted by the sun. The vineyards of the Mount d'Or have particularly suffered in that respect, and rain is ardently longed for. In the South, the oidium, comparatively inoffensive in these districts, has caused serious loss."

Publications Issued.

Œuvres de Lavoisier.—The fourth volume of this important work, published under the direction of M. Dumas, for the Minister of Public Instruction, has just been presented to the Academy of Sciences. The following is the list of contents of the volume:—1. Reports made to the Academy of Sciences. 2. History of the transformation of the Academy, in the year 1785. 3. Documents relative to the suppression of the Academy. 4. Labours of Lavoisier as a member of the consultative committee of arts and manufactures. 5. Reports on public instruction. 6. Reports on the manufacture of assignats. 7. Memoir on the distillation of eaux de vie and of sea-water.

Notes.

Horticultural Exhibition at St. Petersburg.—The International Horticultural Exhibition, already announced to take place in the capital of the Russian empire during the coming year, is now definitely fixed for the period commencing with the 17th and terminating with the 31st of May. Dr. Regel is appointed secretary of the commission, and president of the united committees, and a long list of officials and eminent horticulturists show that the exhibition in question is intended to be extensive and important. It will be curious to note if the horticulturists of Western Europe will venture to send their products so far.

Depredations at the Museum of Brunswick—It is said that M. Blasius, the director of the Brunswick Museum, has discovered that an immense number of works of art have been stolen from that establishment;

the losses include ninety pictures, of which five are by Albert Durer, and others by Paul Veronese, Murillo, Van Dyck, and other great masters, nearly the whole collection of Rembrandt's etchings, and some by Albert Durer; besides these, the Roman coins missing amount in value to ten thousand thalers.

Yacht Club of France.—The Emperor sent a magnificent silver gilt cup, in the style of the Renaissance, the work of the well-known goldsmith, M. Maurice Meyer, jun., of Paris, to the Yacht Club of France, for the international match which was to take place at Dieppe on the 20th of the present month of August.

The Italian Navy.—The Italian navy at present consists of 69 ships of war, of which 16 are iron clads, 20 screw vessels, 25 paddle, and 8 sailing vessels. The transports are 35 in number, of which 13 are screw ships, 10 paddle steamers, and 2 sailing vessels. The ships of war carry 966 guns, and are manned by 19,277 men. The transports carry 44 guns, with a crew of 2,032 men. The tonnage of the war vessels is estimated at 138,080 metric tons, and are valued at 128,052,840 frs. (£5,122,144). The transports are valued at 13,238,420 frs. (£529,540), and measure 26,343 metric tons.

International Telegraphic Convention.—The *Moniteur Universel* of Paris gives the following account of the proceedings of the International Telegraphic Conference:—With the exception of the Papal States, whose government agreed beforehand to accept the decisions of the congress, all the European states were represented, with the addition of British India and Persia. The business of the conference was to revise the convention which has been in force since May, 1865, and, after long discussion, many ameliorations, including diminution of the tariffs, have been introduced. India affords one of the most remarkable examples; on and after the commencement of the coming year the charge for a simple dispatch between London and Calcutta will be reduced from 120 to 71 francs, and by that time several new European lines will be opened between Europe and India. Another important point is the establishment of an International Telegraph Office for the collection and dissemination of statistical and other information for general guidance. The administration of this central office is confided to Switzerland.

Patents.

From Commissioners of Patents' Journal, August 21.

Grants of Provisional Protection.

Annealing pots and stands—2480—S. Gardner.
Blind furniture—2482—B. Hunt.
Boilers—2479—J. Arnold.
Boilers—2484—J. Standen.
Boot and shoe sewing machinery—2448—A. V. Newton.
Boots and shoes—2466—A. V. Newton.
Boots and shoes, cleaning—2456—H. Churchman.
Bricks, &c.—2443—R. Schomburg.
Bricks, &c., machinery for making—2450—C. G. Johnson.
Buttons, &c., fastening for—2425—A. Arnold.
Candlesticks—2459—L. Price.
Coals, unloading from railway waggons—2430—S. Plimsoll.
Dredging machines—2429—H. O. Robinson.
Drill rollers and seed sowers—2341—J. Brigham and R. Bickerton.
Driving shafts, friction clutches for—2449—F. W. Kitson and P. Cholas.
Dyeing textile materials—2441—H. A. Bonneville.
Fire-arms—2478—W. E. Newton.
Fire-arms and ordnance, breech-loading—2436—H. W. Garrett and G. Holcroft.
Fire-arms, breech-loading—2419—T. Hunt.
Fire-arms, breech-loading—2468—T. W. Stapleton.
Fire-places and furnaces—2409—H. Moule.
Fuel, artificial—2451—J. Hamilton.
Governors of steam engines—2485—A. V. Newton.
Guns, big—2359—W. F. M. Green
Harvesting machines—2444—B. J. B. Mills.
Hats, &c.—2462—H. F. Frentel and H. Zox.
Hydraulic apparatus—2318—M. T. Shaw and T. H. Head.
Hydraulic press boxes—2423—M. Samuelson.
India-rubber fabrics—2471—B. Hunt.
Iron and steel—2453—A. V. Newton.
Iron, cast—2417—J. Heaton.
Lace fabrics—2475—J. Litchfield.
Lifting machine, applicable as a fire-escape, &c.—1185—E. Beningfield.
Looms—2431—J. R. Croskey.
Looms—2455—W. Millard.
Looms—2460—W. Pearson, W. Spurr, and H. Bradbury.
Machinery, regulating the speed of—2476—W. E. Newton.
Mattresses and camp beds—2447—J. Frazer and W. Marr.
Mills for grinding wheat, &c.—2446—E. Evans.
Motive-power apparatus—2490—J. Hird.
Ores, treating—2439—W. Spence.
Organic substances, preservation of—2405—J. F. Lackersteen.
Paper holders—2467—W. M. Moore.
Paper or woven fabrics, folding—2401—W. T. Royle.
Pumps—2457—E. Edwards.
Railway breaks, &c.—2433—G. N. Shore.
Rheumatism, &c., instrument to be used in the treatment of—2410—R. E. Drinhaus.
Rollers, dandy, used in the manufacture of paper—2472—J. Whitehead.
Safes—1311—A. Fiddes and C. J. Curtis.
Safes and strong rooms—2469—C. J. Curtis and A. Fiddes.
Safety-lamps—2464—W. and E. M. Hann.
Safety-valves, &c.—2458—M. Benson.
Sails, reefing and furling—2437—C. Wilson.
Scarfs, &c., method of holding—2415—G. Harvey.
Scissors—2463—A. M. Clark.
Screws and screw drivers—2486—W. E. Newton.
Shields for protecting vessels, &c., against missiles of war—2483—J. Kirk and J. Batstone.
Ships, batteries, &c.—2407—B. Sharpe.
Ships' logs—2427—G. Wilson.
Ships' propellers—2454—N. D. Spartali.
Ships' yards, &c.—2442—A. L. Hoffmann.
Shops, &c., lighting by gas, &c., from the outside—2266—W. Berry.
Steel and iron—2461—J. Hargreaves.
Sugar, loaf, cutting up—2411—W. W. Symington.
Taps—2487—D. Nickols.
Walls, &c., decorating—1821—J. H. Johnson.
War machine, offensive and defensive—2435—S. R. Renaudin.
Washing machines—2474—H. Benjamin.
Water-closets—2481—J. Broadfoot.

Invention with Complete Specification Filed.

Swimming apparatus—2530—F. Barnett.

Patents Sealed.

607. P. H. Hancock and J. P. French.
612. R. Nicholls.
615. R., J. J., and L. R. Bodmer.
621. E. T. Hughes.
622. E. Hutchinson.
623. E. Hutchinson.
624. G. W. R. Pigott.
629. J. McLeod.
638. R. Ramsey and J. Cooke.
642. T. Hill.
643. R. Laidlaw & J. Thomson.
645. W. E. Gedge.
650. W. E. Newton.
654. F. Dumas.
656. R. A. Hope.
657. T. Blocksidge.
658. C. C. and W. T. Walker.
673. J. Livesey.
674. J. G. Stidder.
675. A. S. Stocker.
676. R. Howard.
678. J. Leacock.
679. J. Robinson.
680. J. Dunkerley.
683. J. F. Low.
702. L. B. Schmolle.
725. W. Whittle.
727. G. Anderson.
743. A. M. Clark.
774. J. Brinsmead.
789. S. Brown.
790. R. Leake and R. Platts.
793. C. E. Brooman.
803. P. Koch.
806. W. Hartley.
807. H. B. Barlow.
827. A. Bourdon.
871. W. Bellhouse, jun., and R. Ashworth.
892. W. E. Newton.
947. C. Mather.
990. W. E. Gedge.
1544. W. R. Lake.
1779. H. A. Bonneville.

From Commissioners of Patents' Journal, August 25.

Patents on which the Stamp Duty of £50 has been paid.

2140. A. Watt.
2167. J. Newton.
2174. D. Davies.
2244. H. C. Ash.
2259. C. Horsley.
2348. S. Fox.

Patent on which the Stamp Duty of £100 has been Paid.

2102. W. Baines.
2109. W. D. Player.
2108. S. Elson.

Registered Designs.

4957—July 8—Reversible locket and case—C. Exon, Birmingham.
4958—July 11—A brace buckle or adjuster—W. Tolson, Fazeley, Staffordshire.
4959—July 16—Clip or fastener for elastic and other bands—G. Twigg, Birmingham.
4960—July 25—Reflector for gas—Kinder and Kindsey, Cannon-street, E.C.
4961—July 31—Cover or case for handkerchief—J. N. Richardson and Son, Belfast.
4962—August 4—Chin rest or holder for violins—G. Jones, Wolverhampton.
4963—August 13—Improved yacht camoose—Black and Son, Gosport, Hants.
4964—August 26—Gas stove—W. Warcup, Bristol.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 4, 1868.

Announcements by the Council.

Examinations, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

"On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture III., delivered Monday, February 3.

Construction of Dietaries: Preparation and Culinary Treatment of Foods.

(*Continued from page* 710.)

Treatment of Foods.—In the *treatment* of *vegetable foods* it is important to remember, that all corky and woody tissues, as the skins of fruits, tubers, and cereals, are quite indigestible, and that in consequence of their irritating action they hurry food through the alimentary canal, and so occasion waste. It is necessary, therefore, that all such tissues should be removed as completely as possible.

When it is required to obtain the *starchy* or *farinaceous matters* of *vegetables*, one or other of the following processes is followed.

(*a*). The material is pulped or crushed, and diffused through a considerable volume of cold water. It is then strained and allowed to stand until the farina or starch subsides.

(*b*). Or it is allowed to pass into a state of putrefactive decomposition, whereby the albuminous matter, as the gluten, &c., decay and leave the starch untouched.

(*c*). Or it is subjected to the action of a weak alkaline solution, generally of caustic soda, which dissolves the gluten, and allows the starch to subside. The gluten thus dissolved may be again recovered by neutralizing the alkaline solution with acid, and collecting the precipitated gluten, as in the processes of Durand and others.

I have already explained that in the treatment of the ground meal of wheat and other grain, the bran and coarser kinds of flour are separated by sieves of different degrees of fineness, and that in this manner about eight or nine varieties of product are obtained, as *biscuit flour*, *best or fine households*, *seconds*, *tails*, *fine sharps or middlings*, *coarse sharps*, *fine pollard*, *coarse pollard*, and *long bran*, the proportions of these from ordinary brown meal will vary according to circumstances, but processes have been invented, as by M. Mège Mouries, M. D'Arblay, and others, whereby the yield of fine flour is increased to 86 or even to 88 per cent. of the grain, and by which the quantity of gluten is also regulated.

When the flour is rich in gluten, as in the case of the hard wheats of Sicily, Russia, Sardinia, and Egypt, they are well suited for the manufacture of certain granular powders and dried pastes, which are known as *Semola*, *Semolina*, *Soujee*, *Mannacroup*, *Maccaroni*, *Vermicelli*, and *Cagliari paste*. The last three are generally imported from Naples or Genoa, where they are made from a highly-glutinous wheaten flour, by kneading it into a thin dough or tenacious paste, and then forcing it through holes or slits in a metallic plate. In this way the several varieties of *pipe*, *celery*, and *ribbon maccaroni* are obtained; and the fancy forms of it, called *Cagliari paste*, which are in the shape of stars, rings, Maltese crosses, &c., are produced by stamps. All these varieties of raw wheaten paste are cooked by boiling or baking, and are associated with soup or beef-tea, or milk, or are mixed with eggs, cheese, &c.

The best variety of flour for bread is that which contains less gluten than the preceding, as from 8 to 10 per cent. of it instead of from 12 to 14 or 15. Dantzic flour, and soft Spanish, as well as the American called Genessee, are the best examples of it, and are highly esteemed by bakers on account of the fine quality of bread which is procurable from them; the richer varieties of hard glutinous wheat being used only to impart strength to weak and inferior descriptions of flour.

Bread, which is the most important preparation of

flour, owes its value as an article of diet to a good and equable vesiculation of the dough, the vesiculation being effected by the diffusion of small bubbles of carbonic acid gas throughout its substance; and, as this vesiculation can only take place in a proper manner when the gluten of the flour is in sufficient quantity, and of good quality, it is, to some extent, a test of the goodness of the meal. Those flours which contain too little gluten, or gluten which is deficient of strength, cannot be vesiculated into bread. This is the case with almost every description of flour, excepting that of wheat and rye.

The most common, and also the most ancient method of vesiculating bread is by fermentation; and the process is not very different from what it was in very early times, when we were told that "a little leaven leaveneth the whole lump." Yeast of some sort—as brewers' yeast; or patent yeast, prepared from infusion of malt and hops; or German yeast, which is the solid residue of the yeast produced by the fermentation of rye for making Hollands; or bakers' yeast, which is made from potatoes and flour; or leaven, which is old dough in a state of fermentation, is mixed with the flour or dough, which soon begins to ferment by the action of the yeast fungus (*micoderma cerevisiæ*) on the sugar of the flour. Carbonic acid is thus produced; and by being diffused through the substance of the dough it vesiculates it, and causes it to rise or swell. The most usual practice with the baker is somewhat as follows:—A special ferment is prepared from mealy potatoes (technically called *fruit*) by boiling them in water, mashing them, and allowing them to cool to a temperature of about 80° of Fahrenheit. Yeast is then added to them, together with a little flour to hasten the fermentation. In three or four hours, at a proper temperature (as from 80° to 90° Fah.), the whole mass is generally in a state of active fermentation, with a sort of cauliflower-head. It is then diluted with water and strained, and is mixed with sufficient flour to make a rather thin dough, which in about five hours rises to a fine *sponge*. This is again diluted with water containing salt, and is worked with the necessary quantity of flour into dough, and allowed to stand for two or three hours, when it rises, and is in a fit condition to be baked into loaves.

It can hardly be said that the potatoes are an adulteration in this case, for they do not ever amount to more than 6 lbs. to a sack of flour, which makes about 380 lbs. of bread, or 95 4-lb. loaves. The salt is added to the extent of about 4 lbs. or more to a sack of flour, the proportions being regulated according to circumstances, for the object of it is to improve the quality of the loaf as regards whiteness, firmness, and flavour.

There is, no doubt, a slight loss of nutritive matters by this mode of vesiculation, for a small portion of the sugar of the flour is converted into alcohol and carbonic acid, but the quantity is so inconsiderabe as to be undeserving of notice. The advantage of the process, however, is that it is an excellent test of the quality of the flour; for weak flour, or flour that has been injured by germination, or by keeping, will not stand the action of yeast, but will be either ropy, or sticky, or heavy, when baked into bread.

Another method of vesiculation is to generate carbonic acid in the dough by the action of an acid on bicarbonate of soda. Dr. Whiting's process, which was patented in 1836, was to mix the carbonate of soda with the flour, and then to act on it with a proper proportion of muriatic acid added to the water. He used from 350 to 500 grains of carbonate of soda to 7 lbs. of flour, and to this he added 2¾ pints of water charged with from 420 to 560 grains of muriatic acid. Other proportions are used by bakers who make unfermented bread; but in all cases the proportions should be such as to form common salt (which is the product of the action of muriatic acid on carbonate of soda)—the carbonic acid being liberated in the substance of the dough. Care should be taken that the muriatic acid is pure, for that found in commerce is generally highly charged with arsenic.

In 1845, another acid was patented instead of muriatic—namely, tartaric; and the various preparations called *baking-powders*, *custard-powders*, *egg-powders*, &c., are nothing but mixtures of tartaric acid and carbonate of soda, with a little farinaceous matter, the common proportions being 1 part of tartaric acid, 2 of carbonate of soda, and 4 of potato-flour or other dry starch, with a little turmeric powder to give it a rich yellow tint. When this is mixed with flour and wetted, it effervesces, as in the case of a common seidlitz powder, and so diffuses the carbonic acid through the dough.

Very lately, Mr. McDougall has proposed the use of phosphoric acid, as a more natural constituent of food than the preceding, and this, with an alkaline carbonate, forms the preparation which is known as *phosphatic yeast*.

A third process, which is now extensively used in the vesiculation of bread, is that of Dr. Dauglish, and by which the bread called *ærated* bread is obtained. It consists in the addition of a solution of carbonic acid in water to flour under pressure. The mixture is made in a closed air-tight vessel, in which the dough is well kneaded by machinery, and directly the outlet of the vessel is opened, and the pressure thus removed, the gas escapes from the water, as in the case of an uncorked bottle of soda-water, and expands into little bubbles within the substance of the dough. By its expansion, also, it forces itself out of the mixing-chamber, and rises into a spongy dough.

In all cases, however, where carbonic acid is generated within the dough by other processes than fermentaion, the dough must be baked immediately or it will fall, and the loaf be heavy. Various contrivances have been suggested for helping the process of kneading, which is laborious, and sometimes not altogether cleanly work. Mr. Stevens' hand-machine appears to accomplish this very well. It is in use in the Holborn Union, where about 5,633 lbs. of bread are made every week by one man and two boys; and they contrive to make ninety-six 4-lb. loaves out of every sack of flour (280 lbs.). The materials used on the average of a whole year being as follows:—

Proportions Per Week.

Flour	4,129 lbs.	Which produce 5,633 lbs. of bread, or 1,408 4-lb. quartern loaves.
Cones	140 „	
Potatoes	168 „	
Salt	68 „	
Malt	13 „	
Hops	1½ „	

The potatoes, the malt, and the hops, are for the purpose of making the yeast or ferment for the bread.

But, by whatever process bread is made, it is necessary to observe certain precautions to ensure the production of a good loaf.

1st. The flour should be from sound grain, sufficiently rich in good gluten.

2nd. The yeast should be sweet, and should show a lively action in the sponge.

3rd. The dough should be well kneaded to insure the thorough diffusion of the gas, and to give toughness to the gluten.

4th. The salt should be used in such proportion as to regulate the fermentation, and give firmness to the gluten, whiteness to the bread, and a good flavour.

5th. The baking should be so managed as to insure the thorough heating of the loaf to the temperature of at least 212° of Fahrenheit, in order that the insoluble starch may be changed by the heat into soluble dextrine; and the crust should be light-coloured and thin. This is best effected when loaves are baked singly, as on the Continent, and not in batches, as with us; for in the last case, the top and bottom crusts are thick and hard, and are frequently scorched, while the interior of the loaf is doughy and under-done.

Specimens of the different kinds of bread of England and the Continent are upon the table; and you will notice

the dark colour of the *rye-bread* of Europe. I am indebted for these illustrations to the kindness of Mr. Twining, who has liberally placed the valuable collection of foods in his museum at our disposal. Here, also, is a sample of rye-bread supplied by Mr. William Ray Smee, who, in the interest of the poor, has had it made according to the formula of the Board of Agriculture of 1795. It consists of one part of rice and four parts of rye ground together, and sifted in the usual manner. The meal is then made into dough with yeast; and when fermented is baked in the form of long rolls. The bread is very dark, like all rye-bread, and has a close texture, but it is agreeable to the palate, and is very nutritious. The great recommendation of it is its cheapness, for it can be made at less than a penny a pound, and is therefore a very suitable bread for the poor.

Those flours which do not contain sufficient gluten of the proper quality for fermentation or vesiculation, as barley-meal, oat-meal, Indian-meal, and the flour of peas and lentils, are best cooked by baking them in the form of cakes or biscuits—a practice which is as ancient as the time of the Patriarchs, when, during the Passover, they were commanded to eat unleavened bread. The chief food of the common people of Rome was a heavy kind of unleavened bread, like the present *polenta* of the Italians, which is made of Indian meal and cheese. As in former time, biscuits and unfermented cakes are made from meal or flour mixed with water and baked; but the texture of the substance is close, and it is not easy of digestion unless it is thoroughly disintegrated. When biscuits are lightened by means of egg and sugar, with a little butter, they are much more digestible; and they are still more so when they are vesiculated and puffed up by means of a small quantity of carbonate of ammonia, as in the case of *cracknells* and *Victoria biscuits*.

The so-called *farinaceous foods* for infants are only baked flour, sometimes sweetened with sugar. The flour must be baked until it acquires a light-brown colour, the temperature being about 400° or 450° of Fahrenheit. The granules of starch are then disintegrated, and converted into a soluble substance, named *dextrin*—which, by a further process of cooking or boiling, as in making pap, forms, when properly sweetened, a very excellent food for children. *Tops* and *bottoms* owe their value to the same circumstance—namely, that the farinaceous matter, which is so indigestible with infants, is broken up by baking into soluble dextrin.

All varieties of meals and arrowroots are easily cooked by stirring them into boiling water, or boiling milk, until they have the consistence of gruel or hasty pudding, and then boiling for a few minutes. In the case of Indian-meal, rice, split-peas, lentils, and haricots, the boiling should be continued for a considerable time, and the whole grain should be previously steeped in water for many hours; for the starch and cellulose of these vegetables are not digestible unless they are thoroughly disintegrated by cooking. It may be said, indeed, that all vegetables with dense tissues require prolonged boiling to cook them, for cellulose is not capable of digestion by man unless it is broken up by the action of heat—even starch is likely to pass through the alimentary canal unchanged, if it be not rendered soluble by fermentation or cooking. It is an important question, whether in utilizing starchy foods, it may not be advantageous to help their transformation by allowing the grain to germinate to some extent, as in the process of malting, when the starch is changed into sugar. Mr. Lawes has examined this question, and has concluded, from his experiments on stock, that in the case of pigs and bullocks the fattening effect of the grain is not increased; but it may be different with the human stomach, where the transformation power is not nearly so active as with lower animals. Here, in fact, is an example of it:—The food which Liebig recommends for infants is a preparation of malt with wheaten-flour and milk, to which a little bicarbonate of potash has been added; and the reputation of it in Germany, as an article of diet for children, is considerable. The preparation is made by mixing one ounce of wheaten flour with ten ounces of milk, and boiling for three or four minutes; then removing it from the fire, and allowing it to cool to about 90°. One ounce of malt-powder previously mixed with 15 grains of bicarbonate of potash, and two ounces of water, are then stirred into it, and the vessel being covered, is allowed to stand for an hour and a-half, at a temperature of from 100° to 150° Fahrenheit. It is then put once more upon the fire, and gently boiled for a few minutes. Lastly it is carefully strained, to remove any particles of husk, and then it is fit for the child's food. The composition of the food, according to Dr. Liebig, is as follows:—

Foods.	Plastic matter.	Carbonaceous matter.
	oz.	oz.
10 oz. milk	0·40	1·00
1 oz. wheat-flour	0·14	0·74
1 oz. malt-flour	0·07	0·58
	0·61	2·32

The relation of the plastic to the carbonaceous being as 1 to 3·8, which is the right proportion for the food of children.

The effect of the malt-flour is to transform the starch into glucose, and thus the mixture gets thinner and sweeter as it stands; and the bicarbonate of potash is added to facilitate the change, and to neutralize the acid constituents of the flour and malt.

Liebig's extract of malt is another such preparation for a quick assimilation of starchy matters.

Vegetable substances are occasionally fermented, either for the purpose of increasing the relative amount of glutinous matter, or for the purpose of rendering them acid. Potatoes, for example, as well as barley, wheat, and rye, leave a residuum after fermentation, which contains more gluten than the original substance, in consequence of the transformation of sugar and starch into alcohol; and although the residuum is coarse, and is hardly suited for human consumption, yet it is an excellent food for cattle: in fact, in Germany it is often eaten by the poor.

When the process is carried still further, and the mass acquires an acid property in consequence of the formation of acetic, butyric, and lactic acids, various sour preparations are obtained, which are no doubt useful in assisting the digestion of other foods. The ancient Romans had many such fermented substances which were not unlike the *sauer-kraut* of the Germans. This, as you know, is made from the leaves of cabbages, gathered generally in autumn, and from which the stem and mid-rib are removed. They are cut up into thin slices, and are placed in a tub or vat, alternately with layers of salt, until the vessel is full. It is then subjected to pressure, and allowed to stand for five or six weeks (according to the temperature); the lactic fermentation is thus set up, and the mass becomes sour. It is cooked by stewing it in its own liquor with bacon, pork, or other fat meat; and certain condiments, as dill or carraway, are added to improve its flavour. In Prussia, and in many parts of Germany, there is a similar preparation of fermented beans; and in Holland and the South of Europe, cucumbers are fermented. We also have our pickled vegetables, in which acetic acid takes the place of lactic acid. All these preparations are no doubt aids to digestion, especially when the fibre of meat is tough, and contains tendon, or hardened cellular tissue. This is especially so with salted meat, and, therefore, a little pickle is always a good and palatable addition to cold boiled beef.

Vegetable substances, as *tea*, *coffee*, *maté*, *cocoa*, *&c.*, the infusions of which are used as beverages, are prepared for commerce in nearly the same manner. When taken from the tree, and while in a fresh condition, they are

allowed to undergo a moderate kind of fermentation, and they are then dried and roasted. In the case of tea, the roasting operation is performed during the process of drying and curling, by heating the leaves upon wire-sieves held over a charcoal fire, but cocoa and coffee are roasted in metallic cylinders, which are kept revolving over a clear fire—coffee being roasted until it is partially charred, and has lost from 14 to 20 per cent. in weight. By this means the aroma, or volatile oil, is, in each case, produced; and there is also an empyreumatic change in the astringent acids, the sugar, the gum, and the starch, whereby extractive matters, varying in amount and quality, according to the degree of heat, are formed. Shrader has examined the subject in respect of coffee, and has ascertained that the following are the proportions of the several constituents in raw and roasted coffee:—

	Raw Coffee.	Roasted Coffee.
Peculiar coffee principle	17·58	12·50
Gum and mucilage	3·64	10·42
Fatty matter and resin	0·93	2·08
Extractive	0·62	4·80
Woody tissues and cellulose	66·66	68·75
Mixture, &c.	10·57	1·45
	100·00	100·00

Infusions of tea and coffee should be made with boiling water, but they should never afterwards be boiled, for the aromatic principle is very volatile, and would be thus lost; besides which a decoction of tea or coffee is disagreeably bitter on account of the solution of the coarse forms of extractive matter. Soft water also extracts these matters, and, therefore, appears to give a stronger infusion than moderately hard waters, but it is always at a sacrifice of delicate flavour. Excellent tea is made in London with water of 14 or 15 degrees of original hardness, and of about 5 degrees when boiled. This was a subject of investigation by the Government Chemical Commission (Professors Graham, Miller, and Hofmann), who were appointed in 1851 to inquire into the chemical quality of the water supply of London; and they reported that in their experiments they found that tea made from the boiled London water of 5 degrees of hardness, could not generally be distinguished from tea made with water of 2½ degrees only, although a delicate palate would recognise a slightly increased bitterness without any enhancement of flavour in the latter. It would seem, indeed, that moderately hard water makes the best flavoured tea, provided it is allowed to stand upon the tea sufficiently long. In the case of the Greenwich pensioners the tea was made from water of 24 degrees of hardness before boiling, and 18·6 degrees after; but the infusion was maintained for half-an-hour, by surrounding the vessel with a steam case; and thus an excellently flavoured tea was obtained. The Commissioners indeed truly remark, that "where any great loss of strength of tea infusion has been observed in passing from a soft water to a harder, it may be probably referred to the circumstance that the mode of infusing it has not been properly adapted to the hard-water; and then there is doubtless some waste of tea." Lake waters have been a good deal extolled on account of their softness and supposed fitness for making tea, solely because they happen to produce a deep-coloured solution, which conveys a false notion of strength; but, in reality, flavour is always sacrificed for the mere look of the thing, there being no increase of physiological or dietetical property. The Chinese, who are very good authorities on this subject, never use either very soft or very hard waters, for their rule is to take the water of a running stream—"best from the hill side, and next from a river." We may conclude, therefore, that water of from four to seven degrees of hardness after being boiled, is best suited for infusions of tea and coffee; for such water dissolves the aromatic and physiological constituents, without extracting the disagreeable bitter principles. In the case of coffee, in fact, a little acid, as a portion of lemon juice, improves the flavour, notwithstanding that it adds to the hardness of the infusion. Experimentally it is found that infusions of tea and coffee are strong enough when the former contains 0·6 per cent. of extracted matter, and the latter 3 per cent., so that a moderate sized cup (5 oz.) should contain about 13 grains of the extract of tea, or 66 grains of coffee. These proportions will be obtained when 263 grains of tea (about 2½ teaspoonfuls), or 2 oz. of freshly roasted coffee are infused in a pint of boiling water; and the amounts of the several constituents dissolved are about as follows:—

Constituents.	Tea.	Coffee.
	grs.	grs.
Nitrogenous matters	17·2	44·0
Fatty matter	.. ..	3·0
Gum, sugar, and extractive	31·7	103·2
Mineral matters	9·1	22·8
Total extracted	58·0	173·0

So that tea yields to a pint of fresh water about 22 per cent. of its weight, and coffee about 20 per cent. Lehmann found that only 15½ per cent. of tea was dissolved by water; whereas, Sir Humphrey Davy estimated it at 33⅓ per cent. No doubt the quality of the water as well as that of the tea affects the results, for distilled water will extract from 40 to 44 per cent. of black tea, and nearly 50 per cent. of green; but for all this, about 22 per cent. is a good average.

Tea is generally measured into the tea-pot by the spoonful, and Dr. Edward Smith has made a curious inquiry into the average weights of a spoonful of different kinds of tea. The results are here shown:—

Weight of a Spoonful of Tea.

Black Teas.	Grs.	*Green Teas.*	Grs.
Oolong	39	Hyson	66
Congou (inferior)	52	Twankay	70
Flowery Pekoe	62	Fine Imperial	90
Souchong	70	Scented Caper	103
Congou (fine)	87	Fine Gunpowder	123

From which it would seem that from three to seven teaspoonfuls of black tea, or from two to four of green, are required for a pint of infusion of the strength already given.

Cocoa is best made by boiling the mixture for a little while, for it nearly always contains a large proportion of starchy matter, which has been added to dilute the rich fat of the cocoa. Indeed cocoa contains so much butter or solid fat (from 48 to 50 per cent.), that it is necessary to reduce it with some easily digestible substance, as starch, lentil powder, carageen moss, Iceland moss, sugar, &c.—hence the various preparations of it called *granulated cocoa*, *soluble cocoa*, *chocolate*, &c., the processes for making which I will briefly describe. When the berry is roasted and is cold, it is passed through a machine called a "kibbling-mill," which deprives it of its husk, and of the thin skin which surrounds the kernal or nib. If the nibs thus cleaned are ground in proper mills, they form the variety of cocoa called *flaked* cocoa, but if other preparations are to be made, the nibs are ground between heated rollers or otherwise, until they form a smooth paste, when the diluting substances are mixed with it and are thoroughly incorporated. If *soluble cocoa* is to be made, the diluting material is sugar with some kind of arrowroot, as tous-les-mois, maranta, curcuma, &c. If *chocolate* is required, the diluting material is sugar only, with some flavouring agent, as vanilla; and if fancy preparations, as *carageen*

moss cocoa, *Iceland moss cocoa*, *lentil cocoa*, &c., are required, then these several substances are incorporated. *Granulated cocoa* is a preparation of cocoa, with sugar and starch, so ground as to form a coarse powder, in which the particles of broken cocoa are covered with a layer of sugar and starch. It is obvious that whenever the mixture consists of starch or other farinaceous substance, the solution of the cocoa preparation must be boiled; but when sugar has been used, as in chocolate, which is the most ancient preparation of it, the combination is such as to require no culinary treatment, or, at most, the action of boiling water or boiling milk.

It is remarkable that, although cocoa is much less used than either tea or coffee, yet it was known in Europe a century before either of the others. As early, indeed, as 1520 it was brought from Mexico by Columbus, who found it the common beverage of the people; and when Cortes was entertained at the court of the Aztec Emperor, Montezuma, he was treated to a sweet preparation of the cocoa, called *chocollatl*, flavoured with vanilla and other aromatic spices, and served to him in a golden vessel. The Spaniards thus acquired a knowledge of the berry and of its chief preparation, which they kept secret for many years, selling it very profitably as chocollat to the wealthy and luxurious classes of Europe. It was, however, an expensive preparation, and did not come into general use until long after the public coffee-houses of London were established. The earliest notice of it, according to Hewitt, is in Needham's *Mercurius Politicus*, for June, 1659, wherein it is stated that "chocolate, an excellent West India drink, is sold in Queen's Head-alley, in Bishopsgate-street, by a Frenchman, who did formerly sell it in Gracechurch-street and Clement's-Churchyard, being the first man who did sell it in England:" and its virtues are highly extolled. This was about five years after the London coffee-houses had been established, for the first of them is said to have been opened in 1650, by a Levantine named Pascal Rossee, in St. Michael's-alley, Cornhill; and a year after they were opened in Paris and in Holland. In 1660 they were so much frequented, and coffee was so largely drank, that they were made a source of revenue, a tax of 4d. a gallon being levied on all the coffee drank in them; and three years later they were regularly licensed at the Quarter Sessions, like common taverns. In 1668, when Ray, the distinguished naturalist, published his "History of Plants," he tells us they were as numerous in London as at Cairo; and at last they became so great a nuisance, on account of their political associations, that in 1675 Charles the Second endeavoured to suppress them by proclamation, calling them seminaries of sedition; but the keepers of them were sufficiently powerful to make him revoke the prohibition. The history of these houses would form a curious chapter in politics and literature, for they are associated with the earliest development of free political discussion, and with the greatest names in English literature. Among the oldest of them is the "Grecian," where Shakespeare and Rare Ben were frequent visitors; and hardly less ancient is "Wills," where Dryden held forth with pedantic vanity, and where the foundation was laid for that critical acumen which soon became a distinguishing feature in English literature. In the city, too, there was "Garraway's" where not only was tea first sold, but where, in Defoe's time, "foreign banguiers," and even ministers resorted to drink it. "Robins" and Jonathans," and the "Cocoa-nut Tree," in St. James-street, were also famous, and had their distinguished followers.

(*To be continued.*)

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—Lockwood's Working Men's Club.—A meeting of the members was held on Thursday, August 28th, to take into consideration the establishment of science classes in the club-house; Mr. Reuben Hirst, treasurer, occupied the chair. The scheme of the Department of Science and Art, and the pecuniary advantages given by the Government, were detailed and explained by Mr. Henry H. Sales; and after addresses by Mr. Shaw, Mr. Kenworthy, and others, it was unanimously resolved to take measures for the establishment of a class for the study of chemistry during the winter season.

EXAMINATION PAPERS, 1868.

(*Continued from page 692.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

CHEMISTRY.

THREE HOURS ALLOWED.

No candidate is allowed to answer more than three questions in each division.

First Division.

1. What weight of oxygen is contained in one gramme of potassic chlorate?
2. What volume of hydrogen would be obtained if all the oxygen were taken away from a cubic foot of steam?
3. How could you prove that gunpowder is a mixture of sulphur, carbon, and nitre?
4. Describe by equations the action of hydrochloric acid on the following compounds—viz., chalk, iron, and manganese (peroxide).
5. What are the chief impurities in common spring water? How are they detected?
6. How would you ascertain whether a given mineral contains silica?

Second Division.

1. A silver coin is suspected to contain a little gold; how would you ascertain whether gold is present in it?
2. What is the commonest ore of lead? How is the metal obtained?
3. What reasons are there for attributing to alumina the formula $Al^2 \Theta^3$?
4. How is metallic zinc prepared? Give its characteristic reactions, and the formula for its crystallised sulphate.
5. How would you test for copper in a mixture containing other metals?
6. Name and describe the chief ores of iron.

Third Division.

1. How would you ascertain whether a given sample of water contains organic matter in solution.
2. What are the chief proximate constituents of wheat flour? How would you separate them?
3. How would you ascertain the proportion of alcohol in a given sample of wine?
4. Describe and explain the process of etherification.
5. How can aniline be made from a benzoate?
6. How is acetone prepared? Give its empyrical and its rational formula, and adduce proofs of the latter.

MINING AND METALLURGY.

THREE HOURS ALLOWED.

Six questions to be answered.

1. Name the various machines employed for grinding the ores of copper, lead, tin, and silver.
2. Which are the most important silver-producing countries in the world?
3. Describe Pattinson's process for desilverising lead.
4. How do you estimate the amount of gold contained in a given weight of auriferous quartz?
5. Describe the metallurgical treatment of zinc ores by what is called the Belgian process.

6. Describe the characteristic peculiarities of the Cornish pumping-engine.

7. What is the geological age of the gold-producing rocks of California?

8. What process would you commercially employ in order to ascertain the produce of copper of an ore containing less than 3 per cent of that metal?

9. Under what conditions is stream tin usually found, and wherein does it differ from tin ore obtained from mineral veins?

10. Describe the process of reducing poor copper ores to the state of matt, or regulus, by roasting in the open air, and fusing in a blast furnace.

11. How would you estimate the amount of tin contained in a specimen of gun-metal?

12. Describe the process of making iron by the Catalan forge.

BOTANY.

THREE HOURS ALLOWED.

The candidate is expected to answer correctly three questions in Section I. and six questions in Sections II. and III., including descriptions of at least two of the fresh specimens. Nos. 8, 9, *and* 10 *each stand for an answer.*

Section I.—Structure and Physiology.

1. Define the following, and comment upon each as required:—

Radicle. What is meant by the terms *superior* and *inferior* applied to it?
Zoospores. What is their function?
Drupe. Give four examples.

2. A potato is planted weighing four ounces. In six months the produce of the tuber weighs, say four times as much. Whence is the addition in weight derived? And of what proximate and ultimate elements does it consist?

3. Explain the mode of growth of the *bark* of trees and the general characters which distinguish that of the Beech, Birch, and Elm respectively.

4. To what is the *green colour* of leaves due? In what functional contrast do the green organs stand to those of other colours?

5. What are *Stomates?* Where do they occur?

6. What are *Seeds?* Describe the structure of the seeds of the *Hawthorn* and *Wheat.*

Section II.—Systematic and Economic Botany.

1. Which Natural Orders furnish the following products? State the part of the plant affording each:—

Gum Arabic, Sago, Olive Oil, Indigo, Capers, Opium, Tamarinds.

2. State the distinctive characters of the three principal Orders of Vascular Cryptogams.

3. Describe the principal modifications of the *fruit* in British Cruciferæ.

4. Enumerate all indigenous British *Coniferæ*, and state how they differ.

5. Distinguish Chenopodiaceæ from Polygonaceæ.

6. What is meant by a *Natural System* of classification?

7. Name the Natural Orders to which the three plants marked A, B, and C respectively belong, *with reasons* for your opinion.

Section III.—Descriptive Botany.

8, 9, and 10. Describe the three plants marked A, B, and C, noticing the various organs in their proper sequence.

(*To be continued.*)

SCIENCE INSTRUCTION in CONNECTION with the SCIENCE and ART DEPARTMENT.

The following table gives the number of schools and students since the passing of the General Science Minute:—

Years.	Number of Schools.	Number under Instruction.
1860	9	500
1861	38	1,330
1862	70	2,543
1863	75	3,111
1864	91	4,666
1865	120	5,479
1866	153	6,835
1867	212	10,230

Each separate Institution, in which scientific instruction is given, is treated as a school, but the subjects taught and the number of classes in the different schools vary much. In some cases a school consists of but one class, and there is only one subject taught, in others there are as many as nine and ten classes in different subjects. The total number of classes in the 212 schools was about 560. 4,520 students came up for examination in May from these classes which are under certificated teachers, besides about 400 self-taught students and pupils of classes not under certificated teachers. The results, as compared with the previous year, are given below:—

Years.	Number examined.	Number of Papers worked.	Number of Papers. passed.	Prizes.
1865	2,633	4,592	3,371	1,482
1866	2,980	5,466	3,562	2,071
1867	4,430	8,213	6,013	3,453

At the examinations for seafaring men held in March, September, and December, about 40 persons were examined, in addition to the above.

The May examinations were held at 167 centres, 152 provincial and 15 metropolitan. At these examinations the Royal exhibitions to the Royal School of Mines in Jermyn-street, and College of Science in Dublin, were competed for as in former years. Four were thus awarded to the Royal School of Mines, and five to the Royal College of Science in Dublin.

The payment to teachers for the year 1867 amounted to £7,976, being at the rate of 15s. 7d. for each person under instruction. The previous year this payment amounted to about 14s. 6d. The number of teachers paid was 194, the payments varying from £1 to £220, the average being about £14 per teacher. Grants were also made towards the purchase of apparatus, diagrams, and examples, amounting in the year to £167 19s. 0¾d., being an increase on the year before, 1866, when they amounted to £142 10s. 3½d.

At the commencement of this year, 1868, there were 283 science schools and institutions in which science instruction was being given under certificated teachers, 199 in England, 11 in Scotland, and 73 in Ireland. These had 789 classes, and were teaching 11,606 students. This is an increase of 76 schools and 3,314 students over last year, and is irrespective of two navigation schools, which do not send up pupils for examination, and, therefore, receive no payments on results.

The examination in November, 1866, was the last special annual examination for teachers' certificates. By the minute of 12th February, 1867, all persons who obtain a first or second class at the annual May examinations of the Department are qualified, if they teach, to earn payments on results. As the May examinations are held all over the kingdom, teachers are enabled to qualify themselves with much greater facility than when they were required to attend a special examination in London, Dublin, Edinburgh, or Manchester. The abolition of this special examination is also a great saving of expense to the candidates and to the Department.—*(From the "Fifteenth Annual Report.")*

INDIAN ARCHITECTURE.

Scarcely two years have elapsed since Mr. Fergusson, in an able paper, brought this new and comparatively unknown subject before the members of the Society. The seeds sown on that occasion by the paper, and the discussion which followed, appear to have borne fruit both in India and at home.

About this time, a correspondence on the subject of surveying the architectural remains in India, and taking casts of some of the typical monuments for the information of this country, seems to have been commenced between the Science and Art Department and the Secretary of State for India, and between the latter and the Governor-General of India. This correspondence has recently been laid before Parliament in the Appendix to the 15th Report of the Department of Science and Art. The Department expressed a wish to have a complete representation of Indian architecture for the South Kensington Museum, and transmitted the following memorandum in illustration of its desire:—

CLASSIFICATION OF INDIAN ARCHITECTURE.

(From Fergusson's "Dictionary of Architecture.")

BUDDHIST ARCHITECTURE.

Division of Subject—Topes, Sanchi—Temples, Karli—Monasteries, Ajunta—Ornamentation of caves.

Birth of Gautama Bhudda, 623 B.C.
Death of Gautama Buddha, and first convocation held, 543 B.C.
Chandragupta, contemporary of Alexander, 325 B.C.
Asoka, third convocation held; Buddhism made the religion of state. Lâts erected. Earliest monuments and inscriptions in India, 250 B.C.
Dasaratha, his grandson. Earliest caves in Behar, about 200 B.C.
Cuttack caves, from 200 B.C. to about the Christian era.
Topes at Bhilsa, 2nd century B.C., to 2nd or 3rd A.D.
Vicramaditya buildings at Oujein, 56 B.C.
Salivahana cave at Karli, 79 A.D.
Topes at Manikyala, 1st century B.C. to 3rd or 4th A.D.
Topes in Afghanistan, 1st century A.D. to 5th or 6th.
Caves in Ajunta, 1st century A.D. to 10th or 11th.
Caves at Ellora, 5th century A.D. to 8th or 9th.
Topes at Sarnath, 6th to 9th century A.D.

CEYLON.

Description of ruins at Anuradhapoora—Ruins at Mehentele—Great monastery and sacred tree at Anuradhapoora—Ruins at Pollonarua.

Devenampiatissa, contemporary with Asoka, 250 B.C.
Introduction of Buddhism to Ceylon. Building of Thupamyra Tope, and that at Mehentele, &c., 250 B.C.
Dootoogamoni. Building of Runwelle Tope, and Maha Lowa Paya Monastery, 161 B.C.
Walagambahu builds Abayagiri, 104 B.C.
Abha Sena builds Lanka Ramaya, 231 A.D.
Maha Sena builds Jetawana Tope, 275 A.D.
Pandu: invasion from Cashmeer, 434 A.D.
Aggrabodhi changes capital to Pollonarua, 769 A.D.
Wejayabahoo, capital Dambadinia, 1235 A.D.

BURMAH.

Forms of Burmese buildings—Dagobas at Khomadoo—Pegue—Rangoon, &c.—Monasteries.

Rahamam, son of Asoka, begins to reign at Prome about 243 B.C.
Samundri Prome era established 76 A.D.
Samudda Raja begins to reign at Pugan, 107 AD.
Buddhagosa visits Ceylon, 386 A.D.
Panya becomes the capital, 1300 A.D.
Pugan destroyed, 1356 A.D.
Panya and Chitkaing destroyed, and Ava becomes the capital, 1364 A.D.
Alompra in Monchabo, 1752 A.D.

JAINA.

Definition of Jainism—Temples on Mount Abu—Origin of Domes—Domes of Jains and Buddhists—Temples of Somnath—Chandravati and Sadree—Towers at Chittore.

Parswanath, 23rd Tirthankir, about 800 B.C.
Mahavira, 24th and last Tirthankir (contemporary and preceptor of Geutama Buddha), died about 600 B.C.
Amogaversha, King of Conjeveram; revival of Jaina religion by Jina Sena Acharya, 9th century A.D.
Munja of Ougein, 933 A.D.
Bhoja of Ougein, about 1000 A.D.
Kumara Pala of Gujerat converted, 1174 A.D.
Temples on Mount Abu, 1032 to 1231 A.D.
Khombo Rana, of Merwar, built temple at Sadree, and pillar at Chittore, 1418 A.D.
Udaya Sinh, third sack of Chittore by Akbar, 1580 A.D.

SOUTHERN HINDU.

Historical notices — Form of Temples — Porches of Temples — Gateways — Pillared Hall — Temples at Seringham, Trivalur, Tinnevelly, &c. — Kylas at Ellora—Construction of Rock-cut Temples—Modern Hindu style in the South.

Kula Sechara founds Madura about the Christian era.
Vamsa Sechera rebuilds it, 9th century, founds the College of Madura.
Vikrama Chola—Rise of Cholan supremacy; capital, Tanjore, 827 A.D.
Vira Chola builds temple at Chillumbrum; Ari Vari Deva, his grandson, completes temple at Chillumbrum, 1004 A.D.
Kylas at Ellora, excavated by Cholan princes, about 1000 A.D.
Rise of Chalukya power, 1058 A.D.
Trimul Naik rebuilds Madura, 1621 A.D.

NORTHERN HINDU STYLES.

Cuttack Temples—Temples in Upper India—Modern Temples at Bindrabun and Benares—Mixed Hindu style—Tombs—Palaces—Ghâts—Bunds—Wells, &c.

Invasion of Cuttack by strangers coming by sea, 318 A.D.
Lelat Indra Kesari builds temple at Bobaneswar, 657 A.D.
Ananga Bhim Deo builds temple at Juggernath, 1174 A.D.
Indra-dyumna excavates caves at Ellora, 1176 A.D.
Raja Nursing Deo builds Black Pagoda at Kanaruc, 1236 A.D.
Maun Sing builds temple at Bindrabun, 1592 A.D.
Amara Sing rebuilds Oudipore, 1596 A.D.
Jaya Sing builds Jeypore, 1698 A.D.
Sooraj Mull builds palace at Deeg, 1750 A.D.

On July 30th, 1867, the Department expressed a readiness to share with the Indian Government the expenses of taking plans, photographs, and casts of the finest monuments, and suggested a joint committee of action. On the 6th December, 1867, the India Office stated that steps had been taken in India to form an organization for collecting information, &c., and on 7th May, 1868, transmitted a copy of the following document:—

"EXTRACT FROM THE PROCEEDINGS OF THE GOVERNMENT OF INDIA IN THE HOME DEPARTMENT (PUBLIC) UNDER DATE THE 24th FEBRUARY, 1868.

"Read the circular addressed to the several local governments * and administrations † noted below, dated the 29th August, 1867, requesting their attention to the subject of conserving ancient architectural structures or remains, and other works of art in India, and desiring

* Madras, Bombay, Bengal, N. W. Provinces, Punjab.
† Chief Commissioner, Oude; Chief Commissioner, Central Provinces; Chief Commissioner, British Burmah; Resident at Hyderabad; Commissioner, Mysore.

the submission of lists of all such structures, and a report of the measures, if any, adopted in preserving from time to time to time all such objects of architectural interest within the limits of the several presidencies and provinces.

"Read the despatch from Her Majesty's Secretary of State, No. 165, dated the 9th December, 1867, communicating certain suggestions with reference to the proceedings above mentioned, reported to him in the despatch of the Government in India, No. 163, dated the 6th September, 1867.

Resolution.

"On further consideration of this important subject, his Excellency the Governor-General in Council is led to form the opinion that the first step towards a satisfactory attainment of the objects in view is to require the insertion, in every annual Administration Report, of a separate Chapter on Archæology, under which heading the local governments and administrations should be requested to notice the condition of all works of art mentioned in the lists required of them under the instructions contained in the circular of the 29th August last.

"2. Petty repairs, or measures which may be necessary for the preservation of these structures, should be dealt with also by the local governments; operations on any large scale being referred for consideration to the Department of Public Works.

"3. But in the matter of obtaining casts and photographs of the most important works of ancient architecture in India, the Governor-General in Council considers that it will be best to proceed in the first instance experimentally.

"4. The process of preparing casts is not difficult, and information obtained from Mr. H. H. Locke, the principal of the School of Art in Calcutta, confirms the belief that men can easily and speedily be instructed in the art, who already possess some slight elementary knowledge as modellers or even as potters of a superior class. Probably fair modellers may be procured at Lucknow for the work in the Upper Provinces.

"5. The work of training may commence during the ensuing hot season and rains in the several local schools of art, and be confined to *a set of men* who should be employed in modelling at first the fragmentary remains of ancient art to be found in the local museums, some of which are worthy of being so modelled and sent home.

"6. A single party for each province should thus be trained for the work; and, when fully trained, employed during the cold weather, under the general superintendence of some one qualified for the task, in taking a complete set of models of one or more large buildings.

"7. A party of 10 or 12, for example, would, in the opinion of his Excellency in Council, be probably able to make casts of all those portions of such a building as the Sanchi Tope as may be desirable to reproduce. Each party should be placed under the immediate superintendence of some intelligent subordinate of the Public Works Department, who should be solely employed on the duty, and should reside on the spot. It will be his immediate province to see that the modellers carry out the orders of the superintending officer.

"8. The modellers should prepare what are called "waste moulds," and then "piece moulds" on the spot; these last should be made, if possible, in a convenient form for removal, and from them any number of casts can be prepared.

"9. These piece moulds, or casts, as may be most convenient, should be transmitted to the seat of Government, or other place selected as the head-quarters of the general superintendent, and from these the requisite number of casts will be prepared and sent to Europe.

"10. Whilst the modellers were engaged at work, the Public Works Department subordinate should also be employed in preparing accurate plans and measurements of the entire building. Arrangements could likewise be made for procuring photographs of it from such points of view as may be necessary, and which should be indicated by the officer superintending the operations. A written description should also be procured from some competent person for publication in England, with illustrations from the plans and photographs of such of the details (which the casts would give) as may be thought expedient. One or two such memoirs for each party during the year would, in all probability, be sufficient for the present.

"11. As regards the cost of these proceedings, they may be estimated, by a rough calculation for each party for the first year, as follows:—

Training 12 men for eight months at Rs. 30 each	2,880	0	0
Pay while in the field, say at Rs. 60, for four months	2,880	0	0
Pay of a Public Works Department subordinate to supervise, say at Rs. 300, for four months	1,200	0	0
	6,960	0	0
Charges for photographing, say	*1,000	0	0
" " gypsum, or plaster of Paris say	2,000	0	0
" on account of contingencies	2,000	0	0
Total	11,960	0	0

"12. The officer superintending will also be paid for his visitation and superintendence, which would probably raise the cost to about Rs. 13,000 for each party.

"13. His Excellency in Council would propose for the present to have only four parties working, viz., one party in Madras, one in Bombay, one for Lower Bengal and Behar, and another for the North-western and Central provinces at a cost of Rs. 52,000 per annum.

"14. It is suggested that the local governments might allow the experiments to be carried on at first under the charge of the principals of the Schools of Art and Design at the Presidencies, who would train the men, and then be deputed to take them out to work on the building which may be selected for their labours. They should visit their parties once or twice during the season. In the North-western Provinces the services of Lieutenant Cole, R.E., might, with advantage, be secured, should he be willing to undertake the duty, and if the Department of Public Works will allow him to undertake it. The selection of the work or works to be experimented upon should be left to the local governments. In the Upper Provinces the Sanchi Tope and others in its vicinity, and one of the Orissa Temples in Bengal, would, perhaps, be fit subjects. Much assistance in the execution of this project may be obtained from local officers interested in archæology, and regard may conveniently be had to this point in the selecting the locality of the experiment.

"15. Some difficulties may be encountered in procuring a sufficient supply of plaster of Paris. It has been ascertained that the School of Art in Calcutta has found itself compelled already specially to import gypsum from Europe, but gypsum of good quality exists in various parts of India; and in Madras, it is believed that Dr. Hunter already uses a coarse kind, and supplies it far more cheaply than if it were imported from Europe.

"16. The Governor-General in Council would be glad if the local governments directed their attention to this point."

Order.

"Ordered, that a copy of the foregoing resolution, and of the despatch from her Majesty's Secretary of State, No. 165, dated the 9th December, 1867, and enclosures, be forwarded to the local governments† and administrations‡ mentioned below.

"Also, that a copy of the resolution, and of the Secretary

* This is for a professional artist.

† Madras, Bombay, Bengal, N. W. Provinces, Punjab.

‡ Chief Commissioner, Oude; Chief Commissioner, Central Provinces; Chief Commissioner, British Burmah; Commissioner of Coorg.

of State's despatch referred to, be forwarded to the Foreign Department, for communication to the Commissioner of Mysore and the Resident at Hyderabad.

"Further, that a copy of the resolution, and of the despatch from the Secretary of State mentioned therein, be forwarded to the Financial Department.

"Ordered also, that a copy be sent to the Department of Public Works.

"(True extract.)
"(Signed) E. C. Bayley,
"Secretary to the Government of India."

If this organisation work effectively, there appears good reason to expect that the monuments of India will be preserved from ruin, and that illustrations of the most important will soon be seen in this country.

Fine Arts.

Special Collection of Designs, by the Great Masters, in the Louvre.—Attention has recently been called to a fact connected with the Louvre, which will certainly be new to the great majority of visitors to Paris, as it is so even to the natives. There exists, in the upper floor of the museum, a collection of forty-two of the most precious specimens of sketches and drawings by the old masters, belonging to the Louvre, each one being protected by a box frame of oak, furnished with shutters like a triptych. The collection includes thirteen by Poussin, nine by Raphael, three each by Michael Angelo and Titian, two by Perugino, one each by Fra Bartholomeo, Albert Durer, Verrochio, Andrea Solaris, Francia, Perino del Vaga, Leonardo da Vinci, with one belonging to the Florentine school, and another to the Venetian or Lombardian school of the end of the fifteenth century, artists' names unknown. This remarkable collection is open to the public every Saturday, from two to four o'clock.

Manufactures.

Chemical Manufactures in Italy.—In Italy sulphuric acid is manufactured principally at Turin, Milan, Venice, Rimini, Bologna, Naples, and Palermo, and the annual produce may be estimated at 75,000 quintals, to the value of 750,000frs. (£30,000). Upwards of 7,000 quintals of sulphuric acid are annually employed at an establishment at Castellamare, near Naples, for the manufacture of a madder dye. At this manufactory, from 400,000 to 500,000 quintals of madder are used, and the annual production of dye may be estimated at 200,000 quintals. The manufacture of nitric acid is carried on on a much smaller scale than that of sulphuric, being about 3,000 quintals, to the value of 300,000frs. (£12,000). The production of muriatic acid is estimated at 2,300 quintals, to the value of 108,000frs. (£4,320). Acetic, arsenic, and benzoic acids are manufactured in very small quantities. Pyroligneous acid is distilled from wood, at Florence and at Intra, on the Lago-Maggiore. Citric acid forms an important branch of manufacture in the southern provinces, and, especially in Sicily, an impure citric acid is obtained by inspissating the expressed juice of the lemon, in the form of a black fluid, like thin treacle. There are no returns of the quantity produced, but in the establishment of Signor Fonzio, at Palermo, 22,000 litres of juice are extracted from 4,000,000 of lemons annually. The exports of this fluid are estimated at 1,938,434 kils., to the value of 407,000frs. (£16,280). The rind of the lemon is removed, for the sake of its essential oil, and, in 1865, 305,251 kils. were exported, to the value of 7,000,000frs. (£280,000). In Sicily there are two manufactories of citrate of lime, which produce from 1,500 to 2,000 kils. per annum. The great supply of boracic acid is derived from the boracic acid lagoons of Tuscany, between Pomarance and Massa. Before the discovery of this acid, in the time of the Grand Duke Leopold I., by the chemist Hoefer, the fetid odour developed by the sulphuretted hydrogen gas, and the disruptions of the ground occasioned by the appearance of new *soffioni*, or vents of vapour, had made the natives regard them as a diabolic scourge, which they sought to remove by priestly exorcisms; but since science has explained the phenomena, the *fumachi* have become a source of public prosperity. In 1818 a French company undertook various works for the purpose of obtaining boracic acid. For this purpose one or more *soffioni* were surrounded with low walls, so as to form a sort of reservoir, varying from 5 to 15 metres in diameter, according to the number and size of the *soffioni*. The vapours, containing a very minute quantity of boracic acid, which issue from these soffioni, keep the waters on the reservoirs, or *lagoni*, always at a boiling temperature; hence, after impregnation for 20 to 30 hours, by the streams pouring through the liquid reservoir, the waters are drawn off into a second reservoir, situated at a slightly lower level, to suffer a second impregnation. Thence they are drawn into a third, and so on, till they reach the lowest receptacle. In this passage they get charged with about half per cent. of boracic acid. They are then concentrated in leaden reservoirs by the heat of the vapours themselves. The liquid, after having filled the first compartment, is run very gradually into the second, then into a third, and successively into the last, when it reaches such a state of concentration that it deposits the crystallised acid; the workmen remove it immediately by means of wooden scrapers. This mode of gradual concentration is very ingenious, and requires so few hands that it may almost be said that the acid is obtained without expense. The manner in which the boracic acid is produced in the soffioni has not yet been explained, for in collecting these vapours no trace of the acid is found. From boracic acid, borax, extremely refined, is manufactured. The use of borax, in former times, was limited to the purpose of soldering and working of metals, or to the manufacture of enamels—it is now applied for making glazes for porcelain, pottery, china, &c. It is surprising that these natural advantages should have remained unproductive for so many ages, and that it should have been reserved for the skill of Count Larderel, of Monte Cerboli, who took the management of these works in 1826. Although the well-known manufacture is not recent, still, the bold originality of its first conception, the perseverance and extraordinary resources displayed in the successful establishment, and the value of the product which it supplies, will always place the operations of Signor Larderel amongst the highest achievements of the useful arts. The vapour issuing from the volcanic soil is condensed, and the minute proportion of boracic acid which it contains is recovered by evaporation in a district without fuel, and by the aid of the volcanic vapour itself as a source of heat. According to the estimate of the *ingenieur des mines*, the works of Signor Larderel produce 6,000 quintals per annum, but according to other sources, which we believe to be more correct, is 20,000 kils. The total production of boracic acid in Italy is estimated at 18,055 quintals per annum, to the value of 1,445,890frs. (£57,836). The exports were as follows:—

Years.	Quantity.	Value.
	kils.	frs.
1862	1,206,855	6,155,000
1863	1,293,968	6,599,000
Average ..	1,250,411	6,377,000=£255,080.

In 1863, 962,444 kils. were exported to England, and 331,624 kils. to America. Soda and potash in Italy are

chiefly obtained from the vegetable kingdom, and in Central and Southern Italy the production of these alkalis, obtained by the combustion of certain plants, is estimated at 15,464 quintals. The following is the average of three years:—

Years.	Imports.		Exports.	
	Potash.	Soda.	Potash.	Soda.
	quintals.	quintals.	quintals.	quintals.
1863	3,652	50,516	2,760	6,024
1864	12,327	46,036	6,405	1,103
1865	6,118	48,284	1,768	4,119
Average ..	7,966	48,270	3,644	3,748

The principal manufacture of white lead (carbonate of lead) is carried on at Genoa and Leghorn, and the total production may be estimated at 16,400 quintals, to the value of 1,640,000frs. (£65,600) per annum. Zinc-white is only manufactured at Venice, by Sig. Bigaglia, who produces yearly 140,000 kils., to the value of 91,000frs. (£3,640). Alum is found principally at Montioni, in Tuscany, in large irregular masses. The sorted pieces are roasted, or calcined, by which operation the hydrate of alumina associated with the sulphate of alumina loses its water and its affinity for alum. It becomes therefore free, and during the subsequent exposure to the weather the stone gets disintegrated, and the alum becomes soluble in water. The calcined alum stones piled in heaps, from two to three feet in height, are kept continually moist by sprinkling them with water. As the water combines with the alum the stones crumble down, and form eventually a pasty mass, which must be lixivated with warm water, and allowed to settle in a large tank. The clear liquor, being drawn off, is evaporated, and then crystallised. A second crystallisation finishes the process, and furnishes a marketable alum. The following is the quantity and value of the products of this industry at Montioni:—

Crystallised alum	68,356 kils.
Value	15,038 francs.
Number of workmen employed	35
Days employed	190
Wages	8,655 francs.

The production of sulphates of iron, copper, and zinc, are very limited, and are chiefly manufactured in Lombardy, Piedmont, Tuscany, and Naples, and are estimated at 16,000 quintals per annum. In 1863, the imports of these sulphates were 6,644 quintals; in 1864, 6,979 quintals; and in 1865, amounted to 10,972 quintals, to the value of 382,000frs. (£15,280). The manufacture of alum from the artificial sulphate of alumina is carried on at Bagnoli, near Naples, where many thousand quintals of alum are produced annually, and are used chiefly by the various paper-mills in the Neapolitan provinces. The production of bitartrate of potash, or cream of tartar, is estimated at 30,000 quintals, to the value of 2,600,000 francs per annum (£104,000); and the average exports of this product exceed 14,000 quintals, as will be seen by following table:—

Exports.

Years.	Quantity.	Value.
	quintals.	francs.
1863	11,797	1,061,000
1864	18,084	1,617,000
1865	13,017	1,171,000
Average	14,299	1,286,000

The carbonate and sulphate of magnesia (Epsom salts) are prepared in comparatively small quantities, namely, about 4,000 quintals, which are sold in Italy at from 120 to 125 francs per quintal. Chloride of lime is manufactured, on a small scale, at Turin, Pisa, Bologna, and Salerno. Corrosive sublimate and red oxide of mercury are manufactured at Milan; the quantity of mercury used for this manufacture is from 1,500 to 2,000 kils. About half the produce is exported to Russia, at the price of 6·50frs. per kilo. Another important manufactory of this product, that of Signor Zecchini, at Venice, produces upwards of 19,800 kils. yearly. Salts of ammonia are chiefly produced in towns where there are gas-works. Liquid ammonia is prepared from the saturated liquor drawn from the purifying vessels at the gas-works at Turin, Milan, Venice, Florence, Rome, and Naples. Litharge is chiefly manufactured in the Romagna, on a scale not only to supply the wants of local industry, but it also forms an important article of export. The manufactory at Rimini exports about 10,706 kils. yearly of this substance. A trifling quantity is also made in Piedmont, Lombardy, Venice, Tuscany, and the Neapolitan provinces.

Commerce.

Cocoa.—The annual production of the crop of this plant *(Erythroxylon coca)*, in Bolivia, is officially estimated at 600,000 anobas of 25lbs. each. It grows in abundance on the surface of the yungas of the department of La Paz. The peculiar qualities of this plant are well known. The Indians, of whom there are about a quarter of a million in the states, chew it continually, as it has the reputation of staying hunger, allaying thirst, and doing away with the necessity for sleep. It is the most powerful of tonics, if half the virtues attributed to it are true. In France, a tonic wine and an elixir are now made from the leaves, and sold. This plant is also cultivated in vast tracts of Peru, known under the name of cocalis.

The Watch Trade in Switzerland.—According to the latest statistics, the number of watches manufactured annually in Switzerland amount to upwards of 1,200,000, and may be valued at from 55 to 60 millions of francs. The number of workpeople employed in this branch of industry is about 60,000.

Publications Issued.

The Slide Valve Practically Considered. By N. P. Burgh, Engineer. Second Edition. *(E. and F. N. Spon.)*—This work has been entirely re-written. Chapter I. contains the proportions for single ported slide valves, which are treated at some length. The formulæ are put forth in a simple and practical style, for the purpose of general application. Chapter II. contains particulars of exhaust relief, and double and treble ported side valves; the proportions investigated of these are under all circumstances, noticing in particular the width of the supply-opening caused by the valve on the cylinder facing, width of the large bar, and amount of opening for the main exhaust-port. The examples described in these chapters are taken from actual construction, the proportions therefore form a guide for future practice. The mechanical matters that relate to the outside lap of the slide valve are noticed under the following questions:—The variation in the speed of the piston and crank-pin; relation of the travel of the valve to the eccentric circle; and delineation of the paths of the crank-pin and centre of eccentric. In chapter IV., the geometrical demonstrations to produce the outside lap of the slide valve, for any point of off-cut, &c., have been fully explained. Of foreign authors, Dr. Zeuner, a German, and Messrs. Long and Buel, Americans, have been referred to and quoted. The English authorities cited are Professor Rankine and Messrs. Watt. After that, Mr. Burgh has dealt with the matter,

investigating and explaining the actual meaning and practical value of the versed sines of the crank and eccentric arcs, their application and reference, and the reason why the length of the eccentric rod must bear a distinct relation to the length of the main connecting-rod, and the position of the latter to that of the slide valve. The application of the slide valve as an expansion-valve has been explained in chapter V. Chapter VI. is an explanation of the proportions of modern slide valves in actual practice by the firms of Messrs. Penn, Maudslay, Rennie, Ravenhill, Watt, Napier, Dudgeon, Winter, Spencer, &c. Single, double, and treble ported slide valves are described; also valves for compound engines, and expansion slide valves, making in all eleven examples, fully illustrated, and all the main dimensions given. In chapter VII. the the most modern types of packing rings, and their means of adjustment for slide valves, are explained and completely illustrated. As a conclusion, chapter VIII. treats of general observations, taking up certain matters and disposing of them as far as practice will admit. The number of illustrations in the first edition was only eighteen; this edition has thirty eight, with thirty-seven pages of additional descriptive matter; and thus the entire subject has not only been extended in explanation, but in illustration also, up to the practice of this date.

Notes.

French View of English Agriculture. — Few occurrences in England have called forth from our neighbours in France such unanimous admiration as the late meeting of the Royal Agricultural Society of England, held at Leicester; all who visited it seem to have been delighted, not only with the show itself, but also with the manner in which they were received by the agriculturists of England. Amongst the best notices that have appeared, is that by M. F. R. De Tréhonnais, a gentleman who holds an appointment under the Imperial Government in Algeria, and who profited by a holiday in Europe to visit the Leicester meeting and report upon it in M. J. A. Barral's excellent *Journal de l'Agriculture*. M. De Tréhonnais does not hesitate to run the risk of being considered, as he says, "more English than the English themselves," but says boldly that it is well to hold up before his countrymen "the wondrous picture of English agriculture, which is far, very far, in advance of our own, in order to excite fruitful emulation, and show the true road to progress." M. De Tréhonnais sketches the history of agricultural progress in England, in a manner which shows him master of his subject. Speaking of his journey to Leicester, he says that the road which leads from London to that town passes through one of the best cultivated countries in the world; the fields, it is true, are small, but the hedges which bound them are neat and well clipped, and the crops are exquisitely clean. The unusual drought had destroyed all the green crops, but the wheat was magnificent, and the heavy sheaves already cut promised an abundant harvest. M. Tréhonnais gives a concise and vivid sketch of the various races of animals bred and fed in England, showing an intimacy with our agriculture which is explained by his assertion that he has been for more than twenty years a member of the Royal Society of Agriculture. His admiration of the horses is as great as for the horned cattle and other animals, and he declares his conviction that it would be impossible, in any other country, to collect so many horses, exhibiting so many good qualities, at once as were to be seen at the Leicester gathering. Summing up his observations, he declares his conviction that the show in question was the best ever seen in England; never, he thinks, did the various classes of animals exhibit so many really useful qualities. M. De Tréhonnais promises to follow up his notice of the live stock at Leicester with another on the agricultural implements shown there, and on the experiments made in steam cultivation.

Peculiarities of the Season in France.—The excessive heat and dryness of the summer caused the trees to assume an autumnal garb in the month of July, and in many cases to be denuded of leaves; the larger trees remain leafless, but the younger, and particularly the limes, have been, in many places, covered with new leaves since the heavy falls of rain, which arrived at the beginning of August. Another proof of the exceptional character of the weather lies in the early period of the commencement of the vintage; many of the proprietors in the neighbourhood of Nimes have already begun to get their grapes in, a fortnight before the usual time even for early seasons.

Exhibition in Chili.—An agricultural exhibition is to be held next year in Chili, and is to be opened on the 1st of April. This will be the first exhibition that has been held in the republic of South America.

Utilization of Sewage.—A series of experiments have been made at Clichy on the Seine, near the mouth of the great collector of Asnières, with the view to the solution of the important question of the application of sewage water, with regard to sanitary and agricultural considerations. The experiments include the separation of the solid matter by chemical means, and the direct application of sewage water without any previous preparation. According to the report made by M. Mille, the engineer entrusted with the experiments, the chemical purification is obtained by means of sulphate of alumina, which precipitates the solid matter held in solution. The cost of this process is said to amount only to two centimes, or less than a farthing, per ton, and the value of the solid manure is given at nineteen francs (fifteen shillings) per ton. The direct application of unprepared sewage water by means of irrigation is reported to have yielded excellent results last year; thus treated, Indian corn gave a crop equal to nearly four tons and a half per acre, while crops of beetroot exceeded twelve tons per acre. The experiment with pumpkins was also eminently successful. A jury appointed to taste the different products came to the decision that the increased size did not seem to have injured the flavour or other qualities, and that there was no evidence of taste or smell of the system adopted. It should be stated that the quanty of sewage water used in these cases was not greater than that ordinarily supplied by market gardeners to their lands after they have been manured. The experiments commenced at Clichy are to be pursued upon a much larger scale on the plain of Gennevilliers.

Correspondence.

Workmen's Holidays.—Sir,—In answer to your request for information on workmen's holidays, we forward you a few remarks on the subject, and on others that seem to grow out of it, or have some connection with it. We have, for some time, encouraged our men to take their holidays at one time rather than piece-meal. In order to carry out the plan with success, it is almost necessary (in order to avoid delays and losses) to organise a manufacture, and convert it, as far as possible, into a smooth-working system. We find the most convenient time to be at the end of the London season; the time would probably vary in other trades. Only among men of sober habits do we think it practicable. We virtually prohibit over-time, as we consider it tends to bodily and mental exhaustion, and so tends to the use of stimulants to restore the over-taxed energies. To promote regularity, and prevent waste of time and materials, mistakes and alterations, we have printed general directions for carrying on our manufacture; among them is one that workmen should give due notice to the foreman before absenting themselves, in order that arrangements may be made

to prevent inconvenience by reason of their absence. During the holidays taken by the men it seems very usual for them to visit their friends in the country, taking advantage of the excursion trains that run during the autumn. About 15 years ago, one of our apprentices (a very well behaved and intelligent young man) visited Paris on his own account, paying his expenses out of his savings. We doubt if it would be a real benefit for employers to give the holiday and pay wages as if they had the equivalent labour; if done for one (unless for some special reason) it must be done for all, or jealousy and heartburning would arise. There is a certain sweetness in enjoying leisure and change of scene, the fruit of one's industry and frugality; if obtained as a dole from an employer, it would come without so much moral training and self-restraint. We think that if periodical visits to foreign countries could be arranged for working men of intelligence above their fellows, to be paid for partly by their own savings and partly as a grant from some public body, as a reward for talent and good conduct, much good would result; they would be looked on as travelling scholarships, and be highly esteemed by the artisan class. These rewards would probably fall to the lot of those who in their earlier years had gained prizes at the Society of Arts Examinations; in fact, it would be very desirable to encourage these young men, after they have become workmen, to look forward to such further distinction; it would afford that opening to promotion that is so valued by the highest class of artisans at the present day. If some arrangements could be made, through the British embassies and consulates in foreign states, to procure the admission of travelling workmen to the most celebrated manufactories in foreign countries, it would tend much to the benefit such persons would receive, on visiting a foreign country for the first time, and enable them to take full advantage of their journey. Upwards of thirty years ago, when the late Duke of Cumberland became King of Hanover, he found the art of carriage-building in a very backward state in his new country; he, therefore, from time to time, sent over picked men to London and Paris, to improve themselves in their art. However, the laws relating to trade and manufacture in Hanover imposed so many restrictions that no great benefit resulted from the steps then taken; as in all countries, if trade and manufactures are to be fully developed, they must be free.—We are, &c., Hooper and Co., per George Hooper, Juror, Class 61, Paris Exhibition of 1867.

113, Victoria-street, London, S.W.

Patents.

From Commissioners of Patents' Journal, August 28.

Grants of Provisional Protection.

Anchors, &c.—2532—R. Saunders.
Boilers—2580—J. Landless.
Boilers, indicators for—2497—A. V. Newton.
Boots, &c., protecting the side-springs of—2519—R. H. Southall and W. Hallam.
Clocks, electric—2523—R. C. Rapier.
Coal, grinding, &c.—2539—T. R. Crampton.
Cocks or valves—2525—W. Payne.
Cog wheels, cutting wooden cogs of—2543—C. Evotte.
Colouring matters, brown—2548—C. D. Abel.
Cornices, &c.—2504—H., T., and G. Moore.
Explosive compounds—2542—W. Shaen.
Eyelets, machine for making—2494—B. Hunt.
Fans—2496—W. W. Hughes.
Fire-arms, &c., breech-loading—2534—I. M. Milbank.
Fog alarum, to produce audible signals—2564—W. E. Newton.
Food, preparing for horses, &c.—2428—J. Scott.
Forks and spoons combined—2470—G. W. Maddick.
Furnaces—2517—C. D. J. Seitz.
Fusee boxes—2290—J. M. Hector.
Grain, decorticating—2536—H. Steffanson and J. Hadley.
Grain, hulling—2526—G. A. Buchholz.
Head-dress, portable—2335—C. Ritchie.
Hydraulic apparatus for watering streets, &c.—2510—E. P. G. Headly.
Indigo, preparing—2541—H. B. Binko.
Iron and steel—2511—D. Hill, J. Richardson, G. N. Duck, C. G. Johnson, and W. F. Masterman.
Iron and steel, coating with gold, &c.—2545—J. B. Thompson.
Iron and steel, rolling—2501—J. Brown.
Iron or steel scraps, utilising—2514—J. Thompson.
Iron, &c., treating—2540—H. K. York.
Lace, &c., ornamenting—2522—J. Cleaver.
Lathes, &c.—2551—R. Robinson and G. D. Edmeston.
Liquids, measuring—2512—J. Winsborrow.
Looms—2537—J. Holding.
Looms—2509—J. R. Croskey.
Metallic ropes—2516—H. H. Henson.
Molasses, drying, &c.—2558—W. B. Espeut.
Motive-power, increasing—2403—J. Ratcliffe.
Paddle wheels—2291—J. J. Aston.
Paper bags—2493—T. Corfield.
Paper, card-board, &c., manufacturing—2515—J. Broad.
Paper-making machines, rollers for—2508—J. McFarlane.
Pencils for marking on linen, &c.—2550—J. Hickisson.
Photographic frames—2528—W. E. Newton.
Postal sample bags or envelopes—2521—H. Lunn.
Pottery kilns, &c.—2554—H. Y. D. Scott.
Printing machinery—2503—J. Salmon.
Printing surfaces—2507—A. Argamakoff.
Printing surfaces, raised—2498—D. Fruwirth and A. Hawkins.
Railways—2506—J. H. Johnson.
Railways, rolling stock, &c.—2531—W. Thorold.
Regulators, self-acting, for supplying fluids at high pressure, &c.—2426—C. Geoghegan.
Resins, treating—2489—F. Walton.
Seal-skin cloths, ornamenting—2520—H., J. W., & R. E. Dewhurst.
Sewing machine needles—2566—W. Edwards.
Sewing machines—2568—G. F. Bradbury and T. Chadwick.
Shafts, &c., regulating—2499—R. Robinson.
Ships' bottoms, &c., preventing the fouling of—2529—R. Sim.
Ships' propellers—2502—A. M. Clark.
Silk-combing machinery, &c.—2546—W. E. Newton.
Size, manufacturing—2556—A. M. Clark.
Steering apparatus—2347—A. M. Clark.
Sugar, manufacturing—2560—A. Smith.
Sunshades for windows—2518—J. Wilson.
Telegraphic wires and cables, manufacturing—2505—M. Gray and F. Hawkins.
Telegraphing on board ships—2495—B. Hellwag.
Telegraphs, &c.—2576—D. G. Fitz-Gerald.
Telegraphy, submarine—2547—J. Macintosh.
Valve motion—2513—J. T. and T. Pendlebury.
Watches, &c.—2387—A. Watkins.
Wool, carding—2477—G. Leach.
Wool, extracting burs from—2524—H. B. Walker.
Wool, &c., combing—2538—S. C. Lister.
Wool, &c., washing—2527—J. Petrie, jun.
Worsted, &c., dyeing warps of—2535—B. Ingham.
Yarns, sizing and drying—2570—C. J., W., A., and F. Simpson.

Patents Sealed.

592. W. R. Lake.
690. E. Baker.
691. H. B. Wilder.
695. G. Lindsley.
700. W. Barford and T. Perkins.
710. T. Horsley.
714. W. E. Gedge.
718. J. Barker.
720. W. B. Thompson and W. Gall.
721. J. A. Haswell & G. Brown.
722. J. Manly, jun.
723. W. Spence.
728. E. Burton and J. Lawrence.
729. H. Kennedy.
730. S. A. Bell & G. H. Higgins.
733. B. W. A. Sleigh.
734. J. A. Lee.
737. S. Jefferies.
740. E. Clifton.
741. J. Lewthwaite.
744. W. K. Stuart.
745. J. G. Kincaid.
746. W. and T. Mitchell.
750. J. Brigham & R. Bickerton.
752. C. R. Rockley.
753. C. Schinz.
770. A. M. Clark.
772. D. Price and C. Rowe.
785. J. Houston, jun.
788. J. Campbell.
796. R. Tooth.
833. S. Brooks.
834. E. and J. Broadbent.
842. W. Hawthorn.
877. J. Carter.
920. A. V. Newton.
985. A. V. Newton.
1043. J. H. Johnson.
1077. J. H. Johnson.
1156. J. M. Plessner.
1467. J. Hickmott.
1845. H. A. Bonneville.
1867. T. A. Weston.
2086. G. H. Wilson.

From Commissioners of Patents' Journal, September 1.

Patents on which the Stamp Duty of £50 has been paid.

2071. M. H. Blanchard.
2215. G. Robinson.
2264. W. Barford and T. Perkins.
2192. F. Hazeldine.
2203. H. A. Bonneville.
2196. F. A. E. G. de Massas.
2232. T. Wrigley and M. B. Westhead.
2213. W. P. Piggott.
2224. G. F. White and H. Chamberlain.
2223. W. Clark.

Patent on which the Stamp Duty of £100 has been Paid.

2141. J. Ronald.
2143. W. S. Guinness.
2253. R. A. Brooman.

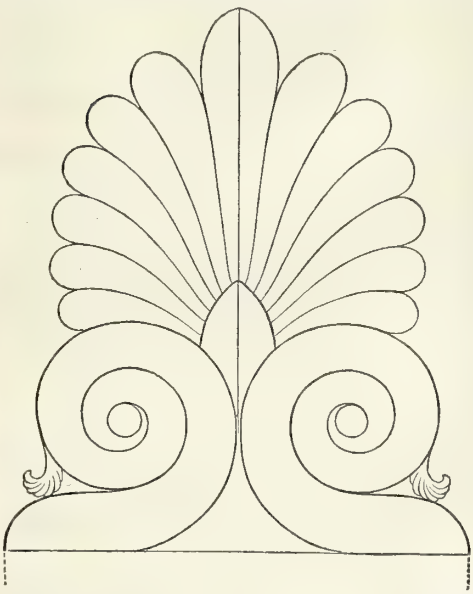
Journal of the Society of Arts.

FRIDAY, SEPTEMBER 11, 1868.

Announcements by the Council.

Whitworth Scholarships.

SPECIMEN, IN A REDUCED SIZE, OF SECOND GRADE FREE-HAND DRAWING EXERCISE.



Competitors for the Whitworth £100 Scholarships will be required to produce a certificate of having passed in the ability to draw outlines like the above either enlarged or reduced in size from a copy. The examinations will be held at any school of art or night class in the United Kingdom, during the month of May, 1869, or, if specially required, at a science school.

Examinations, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or " churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed " Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

" On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture III., delivered Monday, February 3.

Construction of Dietaries: Preparation and Culinary Treatment of Foods.

(*Continued from page* 723.)

In the treatment of animal food there are several points for consideration. In the first place it is always best to prepare the animal for the shambles by fasting it for a few hours before it is slaughtered, as partially digested food, and the food recently absorbed into the system, quickly pass into a state of putrefactive decomposition and taint the whole carcase; besides which, a day's repose is often necessary to quell the excitement occasioned by the journey or voyage which the animal may have made on its way to the place of slaughter. In the second place, it is proper to remove as much blood from the body as possible at the time of killing, as this also is apt to pass into a state of decay. The regulations of the Jews in this particular are most effectual, and are derived from very ancient statutes in Leviticus, which ordain that no manner of blood, whether it be of fowl or of beast, shall be eaten by man; and with the view of

letting as much of it flow away as possible, the practice is to slaughter every animal by cutting its throat with a sharp knife. There are, indeed, the most precise rules for this purpose. In some countries, however, the blood is regarded as a very nutritious part of the animal, and great pains are taken to prevent its escape. Dr. Livingstone says, that many of the South African tribes kill the beast by thrusting a javelin into the heart, so as to prevent the loss of blood. But in these cases the meat is never kept, but is eaten directly after the animal is slaughtered. A proposition has also been made in this country for killing animals by letting air into the pleural cavities, whereby the lungs collapse, and so cause almost instant death by asphyxia without loss of blood; but the practice is objectionable, not merely because of the liability of such meat to quick putrefaction, but also because of the difficulty of discovering disease in it.

In the third place it is proper that the carcass of the animal should be allowed to cool and set thoroughly, before it is packed for conveyance to the market. If this is not properly attended to it soon decays. It should also be packed loosely, or even freely exposed to the air, as the colouring matter of the blood and muscles continue to absorb oxygen, and to breathe, as it were, for some time after death, and while this goes on decay is arrested.

Lastly, all meat should be kept a little short of decomposition before it is cooked, or even until decomposition has just commenced, as the tissue then becomes loose and tender, and very digestible.

In the culinary treatment of animal food, the objects are fourfold:—

1st. To coagulate the albumen and blood of the tissues, so as to render the meat agreeable to the sight.

2nd. To develop flavours, and to make the tissue crisp, as well as tender, and therefore more easy of mastication and digestion.

3d. To secure a certain temperature, and thus to be a means of conveying warmth to the system.

4th. To kill parasites in the tissues of the meat.

Now, as the researches of Dr. Beaumont and others have demonstrated that meat is always rendered more and more indigestible in proportion to the prolonged action of heat, it is highly necessary that the temperature should not be continued beyond the point necessary to accomplish these objects. Liebig says, that a temperature of 133° Fahr. will coagulate albumen, and that the red colouring matters of the blood and muscle are coagulated and destroyed at from 158° to 165° (say 170°). He therefore advises that all cooking operations, in respect of meat, should be limited to 170°. His directions are that, in *boiling* meat it should be introduced into the vessel when the water is in a state of brisk ebullition, and that the boiling should be kept up for a few minutes. The pot is then to be placed in a warm situation, so that the water is maintained at from 158° to to 165°. The effect of this is, that the boiling water coagulates the albumen and tissue upon the surface of the meat, and to a certain depth inwards, and thus forms a crust which does not permit the juice of the meat to flow out, nor the water to penetrate into the meat. The flesh, therefore, retains its savoury constituents, and is not too sodden; but if, on the other hand, the meat be set upon the fire with cold water, and then slowly heated to boiling, the flesh undergoes a loss of soluble and savoury matters, while the soup becomes richer in them. The albumen, in fact, is gradually dissolved from the surface to the centre; the fibre loses, more or less, its quality of shortness or tenderness, and becomes hard and tough. The thinner the piece of flesh is, the greater is its loss of savoury constituents.

This explains the well-known observation, that that mode of boiling which yields the best soup, gives the driest, toughest, and most vapid meat; and that, in order to obtain well-flavoured and eatable meat, we must relinquish the idea of making good soup from it.

If finely chopped flesh be slowly heated to boiling with an equal weight of water, and be kept boiling for a few minutes, then strained and pressed, we obtain the very strongest and best flavoured soup which can be made from flesh. When the boiling is longer continued, some little additional organic matter is dissolved, but the flavour and other properties of the soup are thereby in no degree increased or improved. By the action of the heat on the fibres of meat, a certain amount of water or juice is always expelled from them; whence it happens that the flesh loses weight by boiling, even when immersed in water (as much sometimes as 24 per cent. of the weight of the raw flesh). In larger masses this loss is not so great.

Even in *roasting* meat the heat must be strongest at first, and it may then be much reduced. The juice which, as in boiling, flows out, evaporates, in careful roasting, from the surface of the meat, and gives to it the dark brown colour, the lustre, and the strong aromatic taste of roast meat. It is doubtful, however, whether the heat of 170° is sufficiently high to ensure the destruction of the parasites of meat, and therefore, I would advise that the temperature should be as nearly as possible to that of boiling water (212°).

Of the four methods of cooking which are commonly practised in this country—namely, *boiling*, *baking*, *roasting*, and *frying*, the former is undoubtedly the most economical, and produces the most digestible food, but the flavour of the meat is not well developed, and it is quite unsuited for many descriptions of meat; the flesh of young animals, for example, consisting of an undue proportion of albumen and gelatine in the tissues, will boil away to a large extent, and so will lose fatty tissue, like that of American bacon; and, indeed, unless the process is well managed, there will always be considerable loss, as I have just stated, from the escape of albumen, saline matter, and the alkaloids of the meat, into the water, amounting sometimes to from 16 to 24 per cent. of the weight of the joint; and that these are valuable constituents of flesh, is proved by the experiments of the French Academicians, who found that when a dog was fed daily upon half a pound of boiled flesh, which had been previously soaked in water and pressed, it quickly lost weight, as much, indeed, as one-fourth of its entire weight in 43 days; and in 55 days the emaciation was extreme. Of course, these observations do not apply when the liquor in which the meat is boiled is eaten with it, as in the case of hashes, stews, &c.

Dr. Pereira states that, at the Wapping Workhouse, where mutton (chiefly fore-quarters) and beef (consisting of the brisket, thick and thin flanks, leg of mutton pieces, and clods—all free from bone) were boiled, the average loss in weight was only about $17\frac{1}{2}$ per cent.; but this is under the common proportion, and shows that the meat was from old and lean animals. The ordinary loss of weight in cooking is about as follows in every 100 parts:—

	Boiling.	Baking.	Roasting.
Beef generally	20	29	31
Mutton generally	20	31	35
Legs of mutton	20	32	33
Shoulders of mutton	24	32	34
Loins of mutton	30	33	36
Necks of do.	25	32	34
Average of all	23	31	34

But although the loss of weight in baking and roasting is greater than in boiling, yet it is chiefly from evaporation, and from the melting of the fat. Flavours also are developed which give a pleasant relish to the meat; but there are many disadvantages to these methods of cooking, as that the surface of the joint is often overdone, when the interior is almost raw; and that the action of the heat on the superficial fat frequently produces acrid

compounds (consisting of *acrolein* and *fatty acids*) which are very distressing to a sensitive stomach. This is always the case when meat is fried or grilled, and is thus subjected to a temperature of 600° or more; in fact, all baked and roasted fatty foods are apt, on this account, to disagree with delicate stomachs; and it is often remarked that, although bread and butter, boiled puddings, boiled fish, or boiled poultry can be eaten freely without discomfort, yet toast and butter, or meat pies and pastry, or fried fish, or roasted fowl will disagree with the stomach. The practice of covering poultry and game with lard, or oiled paper, or thin dough, or even with clay (feathers and all, as is the Indian custom), and then roasting, is no doubt advantageous, as it modifies the temperature and prevents the formation of acrid fatty compounds. It was by some such device as this that Aristoxenes was able to serve up a pig apparently boiled on one side and roasted on the other—the savoury crackling being suited for stronger stomachs, while the more delicate side of it was best adapted for weaker digestions.

In deciding, however, on the proper method of cooking a joint, regard must always be had for the kind of flavour that is to be developed. Shoulders of mutton and fresh beef are rarely boiled, because of their insipidity. The same is the case with game and poultry, for the barndoor fowl and turkey are nearly the only examples of the latter which can be boiled, and there are no such examples among the former. What should we think of a boiled pheasant? A story is told by a writer in the Society's *Journal* of a poacher who wished to seduce a bumpkin new poacher by a practical illustration of the fine flavour of game, and calling at his cottage one day, he left for him a hare warm from the chase, telling him to cook it, and to try if it warn't a nice dinner for nothing. A week after he called again, and asked him how he liked his dinner. "Didn't loike it at all," exclaimed the recipient. "Well, man," says the poacher, "how did e cook en?" "Why, biled en in tarmuts, to be zure." I won't attempt to describe the disgust of the poacher. The same is the case with venison, although it may be boiled, especially when it is rather high, for about half the time necessary for cooking it, yet it must be roasted, in order to develop its flavour. Hunters in the wild prairies of America are accustomed to cook the flesh of the deer by *brittling* it in the following manner:—They strip off the long muscles from each side of the spine, both above and below, and tie them up in a roll, after well smearing them with oil or fat; they then roast them, and baste them perseveringly with oil. If opportunity permits they sprinkle them with lemon juice before they are oiled and made up into a roll. The flavour of roasted meat and its grateful effect on the sense of smell must have been recognised in very early times, for burnt-offerings are frequently spoken of by Moses as "a sweet savour unto the Lord," and particular accounts are given of the manner in which these offerings of the lamb and the kid, &c., were to be made acceptable, not merely to the Lord, but also to Aaron and his sons, who were to eat of them. How far back in history the flavour of roast-pig was eulogised I know not, but it is immortalised in the essay of Charles Lamb. As for the process of *baking* meat, it is not nearly so refined as that of roasting, although it has one advantage, in the circumstance that the temperature can be more easily regulated than with roasting.

In making *soup* the object is to extract, as completely as possible, all the soluble constituents of the meat or bone, and when the latter is used it should be chopped or broken into small pieces, and boiled for a considerable time—not less than nine or ten hours. Shin-bones will then yield about 19 per cent. of their weight of fat and gelatine—the soup being, according to Dr. E. Smith, very nutritious, so that 6 lbs. of bones will produce a soup that contains the nutritive power of 2 lbs. of meat, as far as carbon is concerned, and of 1 lb. of meat in respect of nitrogen; but although this may be so as regards the actual quantities of carbonaceous and nitrogenous matters present, yet it is very doubtful whether they are equally nutritious, for in the renowned experiments of the French gelatine commission it was found that the soup or jelly from boiled bones would not support the life of dogs, although raw bones, in like proportion, would.

Ox-tail soup is much richer than that from bones alone, as it contains the saline and other constituents of flesh. It is now a favourite and rather expensive soup, although at one time, it was the humble fare, and almost the only nitrogenous food of the poor Protestant French refugees of Clerkenwell. Prior to the year 1689, or thereabout, the butchers of London left the tails attached to the hides, which were sent to the tanners of Bermondsey, but the poor French refugees, in their extremity of want, bought the tails for a mere trifle, and converted them into soup, which was soon found to be of excellent quality.

Soup made from meat should be obtained in the way already described—that is, a given weight of meat, chopped fine, should be allowed to macerate in its own weight of cold water, and should then be gradually heated to the boiling-point, after which it should be strained and pressed. In this way about three per cent. of the nutritious matter of the meat is dissolved, besides the saline constituents. If the soup be simmered with the meat for some hours, a larger proportion of organic matter, chiefly gelatine, will be dissolved; and a good soup thus made from shin of beef will contain about 600 grains of solid matter in a pint, and of this about 39 grains are saline.

Lean meat contains about 25 per cent of solid matter, the rest being water, and of this from 7 to 10 parts are soluble in cold water; rather more than half of this is albumen and miochrome (colouring matter), which are coagulated by heat, and thus, if the cold solution of flesh be boiled, it contains only from 3 to 4 per cent. of the meat; and when evaporated to dryness it constitutes the *extractum carnis* of Liebig. It can hardly be said, however, that the nutritive power of this extract is very great, for its chief constituents are *certain acids*, *lactic* and *inosic*, with *enosite*, *creatine*, *creatinine*, and an indefinite colloidal organic substance of a brown colour and syrupy consistence; besides which it contains the soluble saline matters of the meat, as phosphate and chloride of potassium, with a little chloride of sodium. Analyses of this extract, as found in commerce, have furnished from 41 to 60 per cent. of water, from 22 to 41 per cent. of organic matter, and from 8 to 16 per cent. of saline matter. The extract is always acid; and it should be of a pale yellowish-brown colour, with an agreeable meat-like odour and taste. It should also be perfectly soluble in cold water, and should not contain albumen, fat, or gelatine.

False views have been entertained of the nutritive power of this extract, for, as one pound of it represents the soluble constituents of from 30 to 34 pounds of lean meat, or from 45 to 48 pounds of ordinary butchers' meat, it has been assumed that its nutritive power is in this proportion; but Liebig has taken care to correct this error, by showing that the extract, when properly prepared, merely represents the soup or beef-tea obtainable from that quantity of meat; and, as it is deficient of albumen, it must be conjoined to substances which are rich in this material, as beans and peas. No doubt the physiological action of the extract is due to the alkaloids which it contains; and as the former of these are of tea and coffee (theine or caffeine) in their effects on the body, it must be concluded that extract of meat is more of a vital restorative than a nutritious food. It is from this point of view that Parmentier, Proust, and even Liebig himself are disposed to regard the physiological effects of the preparations. "In the supplies of a body of troops," says Parmentier, "extract of meat would offer to the severely-wounded soldier a means of invigoration which, with a little wine, would instantly

restore his powers, exhausted by great loss of blood, and enable him to bear being transported to the nearest field hospital;" and, in almost the same language, Proust remarks that "we cannot imagine a more fortunate preparation under these circumstances; for what more invigorating remedy, what more powerfully-acting panacea than a portion of genuine extract of meat dissolved in a glass of noble wine?

As in the case of soup and beef-tea, its nutritive power must be assisted by vegetables and other substances which are rich in nitrogenous matters. Conjoined, therefore, with wheaten flour, with peas or lentils, or even with the gluten obtained in the manufacture of starch by Durand's process, it may be made to have the nutritive power of meat. Already there is a preparation of it by Messrs. Peek, Frean, and Co., in which the extract is mixed with baked flour and pressed into small biscuits; indeed, as far back as the year 1851, Mr. Borden, jun., obtained a patent for combining extract of meat with flour, farina, or meal, and baking it in the form of biscuits. In this manner, by using the extract of 5 lbs. of meat with 1 lb. of flour, he produced biscuits which contained 32 per cent. of nitrogenous matter, and 1 oz. of the biscuit grated into a pint of water, then boiled and flavoured, made a good soup. In the case of Liebig's extract of meat, one pound of the preparation is sufficient, with the usual rations of potatoes and other vegetables, to make soup for 130 men; and a strong broth is made by dissolving a teaspoonful of it (about 150 grains) in half a pint of boiling water, and flavouring with salt and pepper.

A still more nutritious broth, containing the albumen of the meat, is obtained by infusing a third of a pound of minced meat in 14 ounces of cold soft water, to which a few drops (4 or 5) of muriatic acid, and a little salt (from 10 to 18 grains) have been added. After digesting for an hour or so, it should be strained through a sieve, and the residue washed with 5 ounces of water and pressed.

The mixed liquids thus obtained will furnish about a pint of *cold extract of meat*, containing the whole of the soluble constituents of the meat (albumen, creatine, creatinine, &c.), and it may be drank cold, or slightly warmed—the temperature not being raised above 100° Fahr. for fear of coagulating the albumen.

There are many questions connected with the economy of cooking which I have not time to discuss, but I may state that this Society has done good service for the community in obtaining valuable information as to the simplest and cheapest apparatus for the purpose. Foremost among them is the cooking-pot of Captain Warren. It is a sort of double sauce-pan, and is easily made by fitting a small covered sauce-pan into a larger one. The inner vessel contains the joint or other thing to be cooked, and the outer one has a little water in it, so that the temperature in cooking can never exceed 212°. By this means the joint is cooked in its own vapour without coming into contact with water or steam, and thus it cannot lose its soluble constituents; and if it be desired to improve the flavour of the joint just cooked, it may be afterwards roasted for a short time before the fire. The loss in weight under these circumstances is not nearly so great as in the common way of cooking, and the flavour and tenderness of the meat are considerably increased; besides which, there is the certainty of cooking the joint equally throughout, without over-dressing it. Moreover, by the adaptation of a steamer to the outer vessel, vegetables may be also cooked at the same time. When the meat is boiled by this process, there is little or no loss of weight, and even when it is afterwards roasted, for the purpose of improving its flavour, the loss is not nearly so great as when a joint is roasted in the ordinary way. In one experiment it was found that 15 lbs. of meat roasted in the usual manner, in the kitchen of the Cambridge Barracks, lost 4 lbs. 4 ozs. in weight, whereas the meat cooked in Captain Warren's pot, and then roasted, lost only 2 lbs. 15 ozs., so that there was a gain of 1 lb. 5 ozs.

Another apparatus of very great ingenuity is a cooking-pot from Switzerland, where the saucepan containing the joint and a little water is, after boiling for a short time, placed in a box lined with felt, and thus left for an hour or two to cook, the conducting power of the felt being so bad that the heat is retained in the most perfect manner. The apparatus is not only economical, but it is also excellently well suited for picnic parties, or for soldiers on the march, who may thus secure a hot dinner, cooked while on the journey.

The cooking appliances of the poor are very imperfect, and hence they resort to the cook-shops of their neighbourhood; but even then their meals are scanty and wretchedly cooked. In the poor districts of London three halfpence is the usual expenditure for a dinner by children—a penny going in pudding, and the halfpenny in potatoes. If they pay twopence they are allowed to sit down, and have a little gravy with it. Everybody has heard how the poor of Paris dine *à la squirt*, where the tin soup basins are nailed to the table, and where the attendant Leonoras draw up the seething soup from a hidden cauldron by means of a huge syringe, from which it is driven out into the customer's basin. The price of the meal (4 sous) must be instantly paid down, or the callous handmaid sucks up the soup again into the monster squirt. Scenes like this, and even worse than this, in the abodes of the poor have urged philanthropists to seek a better means of supplying their wants, without trespassing upon the dangerous ground of charity. In Paris an enterprising widow (Madame Robert) conceived the idea of giving a poor man a good dinner for twopence. Her daily bill of fare was cabbage-soup, a slice of bouilli (beef), a piece of bread, and a glass of wine; and thus, in the neighbourhood of the Marché des Innocents, did she daily provide for some six thousand workmen, who took their dinners in the open air, but sheltered from the weather; and she gained a farthing by each guest. In this country a like benevolence has set on foot, with more or less success, in different places, restaurants for the poor. In Glasgow, for example, the working-class dining-rooms, which are far above the rude accommodation of Madame Robert, are established to provide a substantial dinner for 4d. or 5d. Long ago the special correspondent of the *Daily Telegraph*, in writing about them, said that he obtained a capital dinner of good pea-soup, boiled beef, ten ounces of potatoes, and pudding—more than he could eat—for the sum of 5½d.; and a writer in the *Times* also stated that for 4½d. he had a pint basin of pea-soup, a plate of hot minced collops, a plate of potatoes, and eight ounces of bread; while his companion had, for the same sum, a pint basin of broth, a plate of cold beef, a plate of potatoes, and a slice of plum pudding, all excellent in their quality, and well cooked. The practice in these places is to provide daily a variety of hot foods, as soup, broth, potatoes, rice, cabbage, pudding, tea and coffee, besides bread and butter, cold pressed beef and ham; and every ration, except meat, is so apportioned as to be sold at the uniform price of a penny. The meat costs three halfpence; and, with the view of clearing off the remainder of the soup after the proper dinner hour, so that a fresh quantity may be made every day, it is the practice to sell the soup and broth, at half-price, from six o'clock to eight o'clock in the evening, and then to give the remainder away. All the articles are of the best quality, and are well cooked. They are bought by contract at wholesale prices; and, although they are sold so cheaply, yet they yield a small profit, and so give the system the stability of a commercial enterprise.

Very recently, too, Mr. Riddle has proposed, in a paper which was read before this Society, that arrangements might be made for cooking dinners on a large scale, and sending them out to the houses of the poor. He proposes to prepare, daily, good rations of roasted, baked, and boiled meat, with vegetables, and to send them out in 2lb., 4lb., or 6lb. tin canisters, all ready for immediate use, and kept warm in little compartments of a properly-

constructed cart. There would be no difficulty about this, and the meat might be delivered in excellent condition, and with great punctuality. None but those who are acquainted with the utter helplessness of the poor in the matter of cooking food, or who know the difficulties of even better classes of persons in this matter, can form any notion of the value of such a proposition; and I should be glad to see it realised.

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*The "Whitworth Scholarship."*—The Leeds Town Council, at their meeting on August 12, appointed a committee to award, to the most suitable candidate, the exhibition of £25, placed at their disposal by Mr. Whitworth, to enable a person from Leeds to compete for the Whitworth Scholarship at the examination to be conducted in May of next year. After examining into the claims of several candidates, the committee have awarded the exhibition to Mr. Oliver Pegler, who has gained the following prizes and certificates in the examinations of the Society of Arts and the Department of Science and Art, through the Leeds Mechanics' Institution Local Board:—Society of Arts, 1867—3rd-class certificate in chemistry. 1868—1st-class certificate in chemistry; 2nd-class ditto in freehand drawing; 3rd-class ditto in electricity and magnetism. Science and Art Department, 1867—1st-class certificate and Queen's prize in inorganic chemistry. 1868—1st-class certificate and Queen's medal in organic chemistry; 2nd-class in magnetism and electricity; 3rd-class in acoustics, light, and heat; 3rd-class in mining; 3rd-class in metallurgy. *Hunslet Mechanics' Institute.*—At a special meeting of the Board of Directors, held Friday, September 4, 1868, Mr. Alderman Blackburn, President, in the chair, after an explanation of the aid offered by the Department of Science and Art had been given by Mr. Henry H. Sales, it was unanimously resolved to organise a class for the study of elementary chemistry forthwith.

EXAMINATION PAPERS, 1868.

(*Continued from page 724.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

FLORICULTURE.

THREE HOURS ALLOWED.

1. Name for each month in the year three popular flowers, which can be had in profusion for decorative purposes, indicating whether they come into bloom naturally, or require to be forced.
2. Explain in detail the operation of planting a tree or shrub of moderate size, indicating all the more essential points to be attended to.
3. Mention all the cultivated species of Tacsonia known to you, and show how they may be popularly distinguished.
4. How would you tell a Pteris from a Polypodium, and how a Polypodium from an Aspidium?
5. Cheilanthes, Trichomanes, Gymnogramma, and Osmunda, are all Ferns. Would you consequently treat them all alike as to the supply of moisture afforded them? If not, explain what difference you would make.
6. In what condition of the sap would you perform the operation of pruning, and for what reason?
7. Name a score of the best modern bedding plants for colour, and the same number for producing foliage effects.
8. Name a good selection of Lawn Grasses, and state the proportions of each which should be sown to ensure a good turf, giving the quantities proper for sowing an acre.
9. Explain the principal differences of treatment respectively conducive to foliiferous and floriferous growth in plants entirely under the control of the cultivator.
10. State what you believe to be the chief merits and defects of the different kinds of hot-water boilers known to you.
11. In hybridising plants, has any general result as to the influence of the male and female parents respectively been observed, and if so, what is it?
12. Explain the general features of the treatment required by the following subjects respectively:—Ferns, Orchids, Cacti, Heaths, Hardy Annuals, and Bedding Plants.

FRUIT AND VEGETABLE CULTURE.

THREE HOURS ALLOWED.

1. When is grafting to be performed? Describe the process in detail.
2. When is budding to be performed? Describe the process, and state the condition in which the scion and stock must be for the operation to be successfully performed.
3. What produces rust in grapes, and how would you prevent it?
4. How would you distinguish the fruit of Elruge nectarine from that of Violette hâtive, and is there any characteristic by which the trees may be distinguished?
5. How would you distinguish the fruit of Roman nectarine from that of Pitmaston orange, and what characteristic distinguishes the trees?
6. Describe the mode of forcing strawberries, the preparation of the plants, the subsequent culture, and the varieties best adapted for the purpose.
7. Give as complete a list as you can of the plants grown as salads, distinguishing those for summer and those for winter use.
8. Describe the culture and management of the cucumber by training it over a trellis, so as to furnish a supply of fruit during the months of December and January.
9. How would you keep up a supply of coleworts and cabbages by merely two sowings in the year? Give the details of the process.
10. How would you distinguish salsify from scorzonera when growing? and how by the roots?
11. Describe the process of forcing the mushroom.
12. What soil would you select as best for a crop of broccoli, what for carrots, and what for onions?
13. What influence has light on plants?
14. How do plants absorb nutrition?

ANIMAL PHYSIOLOGY.

THREE HOURS ALLOWED.

Candidates may answer any four of these six questions, but only four. If any paper is found to contain answers to more than four questions, marks will be given for the first four only of those answers.

1. State the properties of gastric juice, and its effect upon food. Briefly describe the various circumstances which affect the quantity and quality of gastric juice, explaining the manner in which they act.
2. Explain the structure and the use of the arteries.
3. Give the composition of urine, indicating the nature of its constituents. What purpose in the economy does the secretion of urine serve?
4. Compare the eye and the ear, both as regards structure and function.
5. What are the essential differences between the work done by (*a*) a simple nerve; (*b*) the spinal cord; (*c*) the brain?
6. Give a brief sketch of the structure and functions of the larynx.

DOMESTIC ECONOMY.

THREE HOURS ALLOWED.

1. Describe the effects of roasting, baking, broiling, frying, boiling, and stewing as regards economy, and the comparative suitability of these processes in the preparation of meat for food.

2. What are the most important substances composing the flesh of animals?

3. Prepare a table of diet for a poor family. Explain the advantages of the various substances which you would use, having regard to economy, and the health and strength of the members of the family.

4. Give a full account of the properties and uses of milk.

5. Mention some of the common condiments, their special uses, and the effects they have when taken into the animal system.

6. What species of fungi are eatable, and mention some of the indications by which the wholesomeness or unwholesomeness of this class of vegetables may be known?

7. What are the usual adulterations in milk, ground pepper and coffee, bread, and how may they be detected?

8. What means are commonly employed for purifying water? How far are they severally effectual? What are the effects of the impurities in water in a sanitary or economical point of view?

9. Mention the chief points for consideration in the selection of a house in a town, to contain eight beds, as respects the site, design, aspect, and materials of construction.

10. Mention similar details respecting the selection of a house in the country.

11. Explain the process of respiration, and the effects of bad ventilation upon the constitution.

12. Mention the several advantages of a small fire in a sick room, even in warm weather.

13. State what ought to be done, and what ought specially to be avoided, in the treatment of a frozen person or a frost-bitten part.

14. State what ought to be done, and what ought specially to be avoided, in the treatment of scalds or burns.

15. In a case of severe bleeding from a wound in the leg or thigh, state what should be done in the absence of a medical man.

16. State the causes that predispose to typhus fever and cholera.

17. Give rules for the general management of a sick room, as respects air, light, and warmth, furniture-cleaning, quiet, food, and drink.

18. Describe the different modes in which small savings may be turned to a good account.

19. What is the expense of carpeting a room 28 feet long, and 19 feet wide, with carpet three-quarters of a yard wide, at 5s. 9d. a yard?

20. I owe a tradesman £528 9s., which will be due to him four months hence, at $4\frac{1}{2}$ per cent. interest. What should I save if I paid the debt immediately?

(*To be continued.*)

ART INSTRUCTION AFFORDED THROUGH THE SCIENCE AND ART DEPARTMENT.

The following is taken from the 15th report of the Department of Science and Art:—

The National Art Training School.—The head master's report for the year ending 31st of July shows that 28 students, in training for masterships of Schools of Art, have received allowances for maintenance, of whom four have been appointed to local Schools of Art. Free studentships were allowed to 37 students who had been successful in obtaining medals or passing examinations; 16 sappers of the Royal Engineers, and 30 other persons, either former students in training, national scholars, or persons in the employment of the Department, have attended the school without payment of fees, making a total of 118 free students. Three certificates of competency as masters for Schools of Art were granted after examination to students in receipt of allowances, and six to other candidates in the school.

Twenty-three students in training as designers or art-workmen have received allowances for maintenance as national scholars. Of these, three have obtained remunerative employment as designers within the term of four sessions, to which these scholarships are limited, and two others, at the expiration of their scholarships, have obtained employment as ornamentists of a high class.

Students in training have been under instruction in etching by Mr. R. J. Lane, A.R.A., and a second volume of 50 of their etchings has been published, and will be distributed among those Schools of Art in which the students have shown, by their previous progress, that they are likely to make good use of such works.

Together with students in training, the general public are admitted to the school on payment of adequate fees; 422 students paid fees for the first session of the year, and 406 for the second session. The amount paid in fees was £1,964 2s. The total number of individual students in the year was 727, as compared with 807 in the preceding year. This reduction has been influenced by a change in the regulations for the admission of students, which excludes amateurs desirous of taking a few lessons only.

Schools of Art.—Ninety-eight schools of art are now in operation. They give instruction to 17,341 students, a slight increase as compared with 1867. One, a branch school at Abingdon, has been closed, another, at Greenock, has ceased to fulfil the conditions of an art school, and has become a night class for artizans. New schools have been established during the year at Dorchester and Kilmarnock.

The professional examiners of the works sent up to the national competition, report that the designs submitted to them show that the work of these schools is acting satisfactorily upon the manufactures of the country.

Six certificates of qualification as masters of schools of art, and 185 certificates of qualification to give instruction in elementary drawing in schools for the poor, and night classes, have been taken by students of local schools.

Twenty-one schools of art have availed themselves of the use of the collections at South Kensington by borrowing works for study in the schools, and 14 have had loans of objects for exhibition.* Special grants of examples and works of art have also been made to various schools.

Night Classes.—The encouragement given towards instruction in drawing in classes, of pupils above 12 years of age meeting after 6 p.m. in national or parochial schools, and in working men's, mechanics', or similar institutions, has extended these classes during the second year of their action from 32 to 72, while the number of students has doubled—from 1,140 in 1866 to 2,533 in 1867. The examinations of these classes are framed to induce such a course of study as shall prepare the pupils for the more advanced or more technical classes in the schools of art or of science.

Schools for the Poor—Aid towards instruction in drawing in these schools, formerly administered through the agency of the local committees of schools of art, is given directly to the managers of the schools, who also aid in the conduct of the examinations of the children. In 588 schools 79,411 children have been taught drawing during the past year; in 1866, 80,084 children were taught in 560 schools for the poor.

Examination of Teachers in Training Schools.—Students in training schools for elementary teachers are annually examined in drawing, in November. This year 2,161 were examined; 1,382 passed in one or more of the subjects required for a certificate, and 175 obtained certificates of competency to give instruction in drawing concurrently with writing.

Grants in aid of the purchase of examples have been given on 147 requisitions from art schools or drawing classes to the amount of £225 18s. 7d. In 1866, 192 grants amounting to £256 12s. 10d. were made.†

* This seems a very few.—Ed. *J. S. A.*

† The grant has lately been increased to 75 per cent. of the cost.—Ed. *J. S. A.*

The grand total of persons taught drawing through the agency of the department, and the amount of fees paid, have been as follows during the last three years:—

	Numbers taught.	Fees paid. £ s. d.
1865	103,588	19,592 15 0
1866	104,668	18,676 18 0
1867	105,529	17,805 0 0

Payments of Results.—The following table shows the number of payments made on the results of examination.

Nature of Payment.	1866.	1867.
1st Grade.—1s., 2s., or 3s. on account of children taught in schools for the poor	29,827	29,385
2nd Grade.—10s. on account of students in schools of art and night classes	2,935	3,606
3rd Grade.—10s. on account of elementary works executed in schools of art and night classes (increased to 15s. in 1867)	1,597	1,742
3rd Grade.—15s. on account of advanced works executed in schools of art (increased to 20s. in 1867).	486	512
3rd Grade Certificate.—Payment of of £10 on each student obtaining an art-teacher's certificate	6	6
Total	34,851	35,251

Prizes.—The total number of prizes issued has been as follows:—

Nature of Prizes.	1865.	1866.	1867.
1st Grade Prize (Poor Schools)	9,491	3,772	3,655
2nd Grade Prize	1,550	1,298	1,369
3rd Grade Prizes issued	892	743	635

The details relating to instruction in art will be found in the report of the official inspector, Mr. Bowler.

In the national competition, 10 gold, 20 silver, and 52 bronze medals were awarded, together with 33 prizes of books. These take the place of 100 medallions for competition in former years.

SCIENCE AND ART.

The influence of the Department of Science and Art throughout the United Kingdom, estimated only by the numbers of persons who have attended the schools and museum, is stated in the fifteenth report of the Department to be as follows:—The system of science and art instruction has reached 10,230 individuals in science, and 105,529 individuals in art. The students at the School of Naval Architecture numbered 44, at the School of Mines 13 regular and 102 occasional, and at the College of Chemistry 121. At the evening lectures there was a total attendance of 2,207.

At the Royal College of Science for Ireland there were 35 individual students; 4,958 persons attended the various courses of lectures which were delivered during the year in connexion with the Department in Dublin; and a course of lectures at the Edinburgh Museum of Science and Art was attended by 790 persons.

The total number of persons, therefore, who have received direct instruction as students, or by means of lectures, in connexion with the Science and Art Department. is about 123,500, being an increase of over 10,000, or nearly 9 per cent. on 1866, when the numbers were about 113,000.

The attendance at the museums and collections under the superintendence of the Department in London, Dublin, and Edinburgh has been 1,305,374, showing a total increase of 152,374, or 13·2 per cent. on the numbers of the preceding year, which were 1,153,091.

The attendance at the Educational and Art Libraries, and at the library of the Royal Dublin Society, shows a satisfactory progress. The numbers in 1867 were 32,665, or 5,392 more than in the preceding year.

The returns received of the number of visitors at various local exhibitions to which objects of art were contributed from the Art Museum show an attendance of upwards of 62,000 persons.

The expenditure of the Department during the financial year 1866-7, exclusive of the cost of the geological survey, was £152,856 18s. 1d., while in 1867-8 it was £179,950 6s. 1d., showing an increase of £27,093 8s.

We can confidently report that at no period since the establishment of the Department has its influence in promoting the knowledge of science and art, especially among the industrial classes, been so widely extended or its beneficial results so marked as during the past year. The increased grants for which Parliament has made provision in the vote for science and art for the current year, supplemented as they are by private munificence, will, we trust, enable us to effect an appreciable advance towards affording to all classes of Her Majesty's subjects opportunities for acquiring instruction in the sciences and arts which are applicable to productive industry.

NEW EDUCATIONAL ESTABLISHMENTS IN FRANCE.

The Emperor and his ministers are earnestly occupied with the extension and the improvement of the means of scientific and industrial education, and some of the results are now before the world.

In the first place we have the programme of the École des Mineurs of Saint Etienne, destined to train young men for directors of mines and mineralurgical works, and also for minor employments in the same. The course of study is entirely gratuitous, and includes the following subjects:—The working of mines; the nature of the strata and their principal mineral elements; the art of assaying and of treating minerals; the elements of mathematics; the powers of resistance; and the general nature and mode of employment of materials used in the construction and working of mines, workshops, and transport ways; book-keeping by double entry; and mechanical drawing.

Diplomas of capacity of several degrees will be granted to the pupils on the completion of their studies. The conditions of admission are laid down in a programme to be obtained at the offices of the Minister of Commerce; the candidates must possess a knowledge of the French language, of arithmetic, geometry, algebra, rectilinear trigonometry, and descriptive geometry, to the extent required for the degree of bachelor of sciences; of chemistry to the same extent, metallurgical chemistry excepted; a good knowledge of natural philosophy; and the elements of linear and free-hand drawing, and practical geometry. The candidate must have attained the age of sixteen, and, with the exception of those who have served in the army or navy, who are received until the age of twenty-eight, must be less than twenty-five years of age. The candidates are examined in the first place by an engineer of mines or an engineer of roads and bridges, and, finally, before the council of the school. Young men who have passed through the polytechnic school are not subjected to the preliminary examination. The council of the school will determine the order of merit of the candidates, but the admissions to the school are left to the minister.

The Emperor is said to be engaged at present with the arrangements for the foundation of an Imperial

Academy of Agriculture, founded on the pattern of the Academie Française, with forty chairs, the members to be elected by the *Comices Agricoles* of the whole of France. The duties of the new academy will not, it is said, be confined to the study of agricultural questions; it will be endowed with certain powers with respect to regional exhibitions of agriculture, the prizes to be awarded, and the reforms demanded, and, above all, in the direction to be given to primary instruction in relation to the right, duties, views, and wants of the rural population. The academy is to receive an endowment from the state, but will also receive local and individual subscriptions.

But the most important event in connection with scientific education came before the public on the 6th of the present month of August, in the form of a long report by the Minister of Public Instruction, accompanied by two Imperial decrees. The objects of these documents are, to give literally the expressions of the title of the report, the establishment of laboratories both for study and research, and the creation of a practical school for high scientific studies.

The great length and importance of these documents compels us to defer their analysation for the moment, but we may mention that it is not intended to create entirely new establishments or a separate staff of professors. "The sites," to quote the expressions of the report, "will be the amphitheatres and the laboratories of our great institutions; the professors, those of the College of France, of the Museum, of the Sorbonne, &c."

The decrees are already in action, for a register is announced to be open at the Sorbonne for the reception of the names of candidates for admission.

The new school is the extension of the principle applied recently to the secondary education of girls to general scientific education. We may add that the school is to consist of four sections:—1. Mathematics; 2. Natural philosophy and chemistry; 3. Natural history and physiology; 4. Historical science and philology; to which may be added hereafter a fifth section for juridical studies.

ART SCHOOLS IN PARIS.

In the year 1851 the following establishments for instruction in drawing and the decorative arts existed in Paris. The Impérial Mathematical and Drawing School (Ecole Impèriale de Dessin et de Mathématiques); the Free School of Design for Young Girls; five schools aided by the city of Paris, of which two were female schools; and seventeen courses of instruction in drawing attached to the adult classes. At this date the sum set apart annually by the municipality of Paris for art education only amounted to 39,000 frs.

Since the year 1851, both the number of schools and the grants in aid have very largely increased. This increase is, in great part, due to the reports of the French jurors at the Exhibition of 1862, who were loud in praising the great advance made by England in design and decoration since the development of her art schools, and who did not hesitate to express an opinion that much must be done in France to enable her to keep her place in the front rank of industrial art. In 1867 the sum devoted by the municipality to the aid of art and drawing schools, amounted to no less a sum than 321,395 francs, and to those existing in 1851 the following establishments have been added:—One male and eighteen female schools of design; twelve adult classes for men; sixty-two courses of drawing under certificated teachers in the lay boys' schools, and ten special courses in the so-called Central Schools (Ecoles dites Centrales) for the pupils of the one hundred and ten public girls' schools. In addition to this, the boys' schools, under the supervision of the religious orders, have given increased efficiency to their long-established courses, both of ornamental and linear drawing, by the appointment of more teachers, and by providing numerous and well-chosen copies and models.

All this, however, goes no further than the encouragement of elementary art education; between the School of Fine Art (Ecole Impériale des Beaux Arts), which is intended for the training of artists, and these primary schools of art, there is found a want of a superior school, like our own normal school at South Kensington for training teachers. For females this requirement has already been met by the institution of Notre-Dame-des-Arts, described in a former number of the *Journal*. An establishment for advanced instruction in art for men is now in course of being formed.

It is proposed:—

1. To create a museum and library of applied art, consisting of objects presented or lent for a certain period; the collection to be continually augmented by specimens, models, or photographs of all the art-products manufactured in France.*
2. To found a superior and central normal school of industrial art.
3. To organize special exhibitions of designs and works of art, with competitive prizes.

A portion of this programme has already been carried into execution by the Central Society of Applied Art (Union Centrale des Beaux Arts Appliqués). This society is already favourably known by its periodical exhibition at the Palais de l'Industrie, and of works of art of different epochs. The last of these exhibitions was enriched by many objects lent by celebrated collectors, and was very numerously attended. The project of a museum and library, to be opened in a room in the Place Royale, is still in embryo; but the normal school is in course of being organized, and, by special permission of the Minister of Public Instruction, it is to have the title of college—"Collège des Beaux-Arts Appliqués à l'Industrie."

THE NAVAL SCHOOL AT BREST.

Napoleon, in 1810-11, established the first naval school ships in France, the *Tourville* being appointed to that purpose at Brest, and the *Duquesne* at Toulon. These schools were placed under the orders of the maritime prefects of the two localities. In 1816 these two schools were abolished by decree, and a royal marine college was established at Angoulême. Several other changes took place, and in 1830 the college was replaced by a naval school on board the *Orion*, an old 74; this vessel has been succeeded by several others, all of which have received the name of the second schoolship, the *Borda*, named after Captain Borda, a naval officer of great scientific and practical ability. The present ship is a noble three-decker, pierced for 120 guns, was launched in 1847, and was in the Crimea. The *Borda* is stationed at Brest, and its rig has been reduced to that of a frigate. The forepart of the second gun-deck of the vessel still retains something of its old character, and is provided with six guns on each side for practice. The other parts of the vessel have been completely altered; the decks have been cut away, so as to form two large lecture-rooms and two school-rooms. Not only the pupils but also their professors and most of the officers are lodged on board the vessel. On deck are specimens of various kinds of guns in use in the French navy and a gymnasium. The quarter-deck, which is continued to the mainmast, is divided, the forepart being appropriated to the pupils, and the aft to the officers. The commander of the *Borda* is a full captain, and the instruction, which is practical as well as theoretical, is confided to eleven professors, of whom five belong to the hydrographic department, eight full lieutenants, and a principal engineer. The duties of the five hydrographic professors are thus

* To carry out this part of the project in its integrity a law would have to be passed similar to the one enforcing the deposit of new books in the public libraries.

divided:—Two teach astronomy and navigation, two analytical and mechanical science, and the last natural philosophy and chemistry. The duties of the other professors are thus arranged:—Two for literature, history, and geography; two for the English language; and two for drawing. The lieutenants direct four courses of instruction, namely, naval architecture, the theory and practice of managing a ship, gunnery and small arms, with practice, and nautical calculations. The engineer professor teaches the theory and management of steam engines and mechanics. The other officers are a captain of frigate (second in command), a chaplain, a financial and an administrative officer, and two medical men. Besides these there is a captain of gunnery and several under officers of the marine and of artillery.

The school session commences on the first of October, and on that day promotions are made of the pupils in the various classes. Those who have passed two years of study in the ship are called grand antients, and rank with naval aspirants of the second class, and are eligible to make a voyage of circumnavigation in another vessel appropriated to that purpose; pupils who have been one full year in the *Borda* are called ancients, and the rest new boys, or in French naval language, *Fistots.* The boys have each a number, and in all the ordinary routine of the school ship, this takes the place of a name.

The elder pupils are employed as monitors over the younger, and each of the former has one or more nominated to him, not as a fag, but as a scholar, whom it is his duty to teach all he himself knows. It is said that this system succeeds admirably, and that for the first few months the instruction of the new comer is left almost entirely to his *ancient;* and the new pupil thus escapes without difficulty many errors of discipline in which he would otherwise infallibly fall.

The discipline of the school is severe; the boys are up every morning, all the year round, at five o'clock, stow away the hammocks in which they sleep, attend prayers, and then commence their morning's work.

The boys are well fed. They have coffee or chocolate in the morning, dinner (old style) at 12 o'clock, a hunch of bread (*goûter*) at 4.30, and supper at 7.45, with bread *à discrétion*, or as much as they please, and about four-tenths of a pint of wine at each of the two principal meals.

The morning studies are given to science; those of the mid-day to practise with guns, or practical study, marine machinery, or drawing; and the evening to literature, the English language, or naval architecture. All the studies take place on board, with the exception of natural philosophy and chemistry, the professor of which has at his command in the town the collection of instruments and chemicals, as well as the lecture-room and laboratory of the central pharmaceutical establishment. At times, also, the pupils are taken to visit the vessels in course of construction, and the workshops in the arsenal, and to practice with small-arms on shore.

There are eight boats attached to the *Borda*, and the pupils are practiced almost every day, and in all weathers, in rowing and sailing, under the eye of an officer, who watches the exercices from on board a small steam gunboat attached to the school. The ordinary studies of the school finish between six and seven in the evening, and the pupils turn in at nine o'clock for their eight hours' rest.

Thursday and Sunday, as usual in France, are exceptional days, when, after nautical calculations, which are never omitted, the elder pupils, or *ancients*, practice with small-arms on shore, and the juniors are drilled in the use of the sword, musket, and bayonet. After this they have six hours' hard work in manœuvreing two small corvettes, provided for the purpose, that belonging to the "ancients" being a screw-steamer.

The boys, as a rule, are at liberty on alternate Sundays, and the most advanced every Sunday afternoon; this is a recent innovation; the pupils used to be scarcely free more than once a month, but this gave rise to much discontent and some disturbances, and the rule has therefore been made less severe. In addition to this liberty, however, all the lads are allowed to see their friends for a short period on shore during the exercises on shore on Sunday and Thursday mornings, and those who are not free on Sunday are taken on shore for a change in the afternoon. During the summer months the boys bathe in the sea, at a place called Lanninon.

One curious custom exists in the school—the boys are allowed to smoke during the hour of recreation after dinner and at certain other times; the reason for this is, that as it was found utterly impossible to stop the practice entirely, it was better to recognise it in moderation, and thus stop its secret indulgence with the danger of fire.

The punishments inflicted in the school are extra drill and confinement, either in a small cell or in a dark hole, with a regimen of bread and water; for very grave offences boys are dismissed or expelled. On the other hand, the marks for good conduct are numerous; there are several examinations in the various classes during the nine months of the scholar year, and those pupils who gain the greatest number of marks are called *élèves d'élite*, and wear a gold anchor on their collars, or, in the case of the first twelve, two anchors; the pupil who has gained the highest number of marks bears the proud but merely nominal rank of *first brigadier*, and he who enters the school with the greatest success at the examination is called *major.* A general examination takes place at the end of the year, when the *ancients* who pass become *aspirants* in the navy, and the juniors are raised to the upper class in the school; those who fail in the examination are either sent back to their class, or rejected as unfit for the naval career. The first and second prizemen, on quitting the school receive each a quadrant in the name of the Emperor, and the third a telescope.

The elder pupils have nearly three months' holiday, but the junior pupils pass a month on board another vessel, the *Bougainville*, for what is called the summer campaign. This vessel, which was constructed specially for the school, is a screw despatch boat, with engines of 120 horse-power; the summer voyage is settled by the Minister of Marine, and includes a visit and examination of the ports of Lorient and Cherbourg, touching at some remarkable points of the French coast, and casting anchor sometimes off the English coast, and sometimes running as far as Ferrol in Galicia.

The *grand ancients*, when their holidays are over, that is to say on the 1st of October, join the *Jean Bart*, which makes an annual voyage of several months' duration. This vessel was built in 1852, and made its first voyage of this kind in 1864-5. She is an 80-gun ship, of the mixed class, having engines of 450 nominal horse-power; in August in the present year she will have completed her fourth and last voyage of circumnavigation, another vessel, the *Donawert*, now being prepared to succeed her. The upper gun-deck of the *Jean Bart* is disarmed, and converted for the use of a part of the officers and the pupils, who number about a hundred, and occupy eight cabins, each with two portholes; here the young men eat, drink, and sleep, as well as pursue their studies.

The officers of the *Jean Bart* consist of a full captain in command, a second captain, a chaplain, ten lieutenants, one having charge of each pupil's cabin, or *poste*, as it is called, and two giving instruction in sailing and gunnery; a surgeon-major, who gives instructions respecting the means of keeping a crew in health; two assistant-surgeons, an engineer, a drawing-master, and some others.

The Minister, as in the case of the summer cruise of the junior pupils, settles the course to be taken by the *Jean Bart.* Generally the West India Islands are visited in the months of March and April, when the pupils are principally exercised in hydrographical works off St. Pierre and Fort de France; in gunnery, on board; and small-arms on shore; in the daily management of boats for embarcation and disembarcation; and in the manage-

ment of sails in the intricate channels of the archipelago. They are shown, moreover, how to perform difficult operations, such as the unshipping of the rudder and bringing it on deck for examination, lifting a mast, &c. The pupils are required to keep written records of all such operations, and to illustrate the narrative when necessary with drawings. When they visit foreign yards and arsenals they are expected to give minute accounts of what they have seen there, and, besides a daily journal, to write critical notices of all the different machines, methods of rigging, and manœuvres which they have witnessed.

The difficult channel of the Isle St. Sebastian, off the coast of Brazil, that of Bermudas, the river Hudson, and the coast of Newfoundland, are amongst the places selected to initiate the pupils in the difficulties of navigation. At Annapolis, in the *Chesapeake*, a visit is paid to the naval school of the United States at the season when the general examinations take place in that establishment. The voyage usually terminates with a visit to Cape Breton, and some points of Newfoundland; the fisheries and drying-houses of St. Pierre and Miquelon are generally visited, and the *Jean Bart* returns to Brest between the 1st and 15th of August, having been absent ten months. A sailing brig, named the *Obligado*, has lately been attached to the *Jean Bart* as a supplementary vessel.

The above sketch will give a fair idea of the means which the French Government adopts for the education of its future naval officers.

RAILWAY WAGONS FOR MEAT TRANSPORT.

The adoption of refrigerator cars for bringing dressed beef, pork, mutton, and poultry from the Western States to the seaboard cities, promises most important results. Under the old system of putting the live animals into the cars and transporting them eastward, they almost invariably suffered a large decrease of weight from want of proper feeding and watering. Those who have seen cattle trains on a hot day will understand something of the torments to which the cattle have to submit and the probable effect upon the flesh as human food, of their long confinement in these pest houses denominated "cattle cars." Persons of delicate organization have been known to faint from the effects of the stench of the passing trains, and the effect upon the health of the animals must be very prejudicial, rendering them unfit for human food. By the adoption of the refrigerating car all this can be changed for the better. The cattle are slaughtered and dressed when in their best condition, and the meat there packed directly into the car, and thus transported to the points of consumption. These cars are of the eight-wheeled freight pattern, built of two thicknesses of three-quarter inch pine plank, three inches apart. In the intervening space, three-inch slabs of cork are inserted, cork being considered the best non-conductor of heat. On the top of the car is a flutter wheel of zinc, working horizontally by the current of air created during the motion of the train. On the same spindle with this wheel is a revolving fan, which throws the air through flues, the entire length of the car to the ice-chambers at each end. It is here cooled and condensed, and falls through other flues to the floor, passing under the hanging meat, and enveloping it as it rises to the ceiling. The temperature maintained is forty-two degrees.

These cars can carry from 20,000 lb. to 25,000 lbs. each, and the meats invariably come forward in excellent condition. The benefits of this system in brief are: a saving in weight to the owners of the cattle, the abolishment of slaughter-houses in or near cities, the retention of the refuse matter to be returned to the soil through the compost heaps where the cattle were raised—a most important matter—and the improved character of the meat brought to market. If there were no question but that of the greater humanity of this method of treatment of cattle, it ought to be decisive in favour of this system, but there are other questions all in favour of it. For sanitary reasons the system should be adopted; first, that it enables cities to get rid of slaughter-houses, those great pests of every inhabited neighbourhood. Second, that the meat is preserved in a more healthy and fit state for human food. The return of the refuse matter of slaughtered cattle to the soil, thus enriching it with those elements which enter into the growing of cattle, is a matter which the more intelligent agriculturists and cattle breeders will properly estimate, and one to which we hope they will give due emphasis in the discussion of this question in the agricultural journals.—*American Railway Times.*

Manufactures.

French Upholstery.—The raw materials used in the manufacture of fabrics for upholstery are very numerous. The organzines of France and Piedmont, the wefts of China and Japan, are used in the manufacture of the silk fabrics. The price of these materials has much increased during the last few years. It is now at 120frs. to 130frs. for the warp, and 110frs. to 120frs. for the weft. The French silk is the dearest and the most esteemed. The manufacture of reps and table-cloths is composed of French wool, valued at ten or fifteen francs the kilogramme, and floss silk, worth from forty to sixty francs, which is chiefly derived from Switzerland. Utrecht velvet is made of goats' hair, spun in England, and sold at from nine to thirty francs the kilogramme, according to its purity. Horse-hair fabrics are woven of materials of French origin; that which comes from Buenos Ayres is much more expensive, costing from sixteen to thirty francs. Woollen damasks are woven with wool coming from the north of France; the weft is worth from seven to eight francs the kilogramme, the warp from nine to ten francs. For the mixed silk fabrics, they use warp at a price of fifty to sixty francs the kilogramme. The Algerian fabrics are composed of cotton warps and woollen wefts, worth from five to six francs the kilogramme. The price of the cotton fabrics, such as calico and cretonne, used for making prints and chintzes, is from fifty centimes to 1 fr. 50 c. per metre; these fabrics are woven in Alsace and Rouen. The cloth used in upholstery is manufactured at Mouy; the widest, used for table-covers, is worth in its rough state three francs the metre; and that used for covering furniture about eight francs the metre. The printing of the calico, cretonne, and textile fabric, is performed principally at Mulhouse, Rouen, and Claye; the cloth is printed in Paris. The carpet manufacture employs English and French wool; the minimum price for the ordinary qualities is eight francs the kilogramme. Tapestry is made of unmixed English wool, which costs, without dyeing, from twelve to fifteen francs the kilogramme. The embroidered cotton fabrics come from Tarare and its neighbourhood; the figured muslins from St. Quentin. The flax yarn for tick is spun at Lille. The figured fabrics used in upholstery are woven in the Jacquard machine; the plain fabrics are partly woven in power looms; the embroidery and tapestry is produced by hand; but they are beginning now to manufacture carpets by machinery. The printing is accomplished by cylinders or plates. The cost of manufacture amounts to 10 or 15 per cent. of the value of the common articles; to 20 or 25 per cent. in that of the better fabrics; and to 30 or 40 per cent. of that of the most expensive articles. The average amount of general expenses is 10 per cent. of the value of the production, without counting the cost of the designs and the inventions, which is often very considerable. Plain fabrics, at least those which are worked by hand, are manufactured in the homes of the workmen, in the neighbourhood of the principal manufacturing centres; for instance, the Utrecht velvets are woven in the

environs of Amiens, by workmen who also cultivate the ground. Figured and fancy fabrics are usually manufactured in large workshops. In the upholstery trade, only about 30 per cent. of the hands employed are women. Paris is the principal market for all kinds of fabrics for upholstery; those manufacturers who have no depôt in Paris have always an agent of some kind. Many manufacturers only work for one or two Parisian wholesale houses, and refuse all other business; and this association between the manufacturer and the Parisian salesman results from the absolute necessity of dividing, and thereby diminishing, the risks of manufacture (often considerable) in the production of those fancy articles of which the consumption is relatively small aud variable. The manufacturers of hand-made tapestry only work to order, for a new pattern has to be made for almost every buyer. Those who make carpets by machinery prepare their designs beforehand, of the different sizes accepted in the trade, so as to always have a large assortment on hand. The manufacture of fabrics for upholstery is one of those for which France is most justly celebrated; the tapestry of the imperial manufactories of Gobelins and Beauvais are without a rival. The production of these fabrics is estimated at about 60,000,000. The exportation of carpets and tapestry is now very large. French woollen manufactures bear comparison with those of the best foreign markets; and their silk fabrics are unrivalled. Among the principal improvements introduced since 1855 are:—Firstly—The great extension of steam machinery. Secondly—The introduction of a machine with eight and ten rollers, printing fabrics with that exquisite perfection of colouring which formerly could only be produced by hand.

Colonies.

TOBACCO.—An excellent sample of tobacco has lately been shown, manufactured by Mr. Norrie, of West Maitland, New South Wales. This sample is similar to that which he exhibited at the late agricultural show, and obtained the prize, but its having now acquired a little more age, the tobacco is in a better condition than at the time of the show, and will bear favourable comparison even with tobacco manufactured from American leaf. This tobacco smokes with a pleasant taste, and leaves a pure white ash, and is free from that acidity which often characterizes colonial tobacco, and arises chiefly from want of care in drying the leaf. It is now evident that it needs only proper attention to the various stages of the manufacture for colonial makers to produce an article of a very superior description to that usually found in the market.

FLAX.—Flax cleaning operations are being steadily extended in the country districts of South Australia, and as superior samples of this valuable commodity have lately been finding their way into market, an increased price has been obtained. A large rope-manufacturing firm in Sydney have despatched an agent to this province to purchase at least 30 tons per month, and it is stated that negotiations are pending for the lease for a term of years of 2,000 acres of swamp in the Waikato for the growth of flax to supply a paper-mill recently established near Sydney. The last quotation of the article is £30 per ton.

Obituary.

MR. GEORGE ROWDEN BURNELL.—George R. Burnell, known as the writer of several scientific works, died at his residence, in Kensington Garden-terrace, on the 23rd July last, in his 54th year. His attainments were numerous. He had an extensive knowledge of languages, and had resided in America, France, and Belgium, besides visiting Spain and Sardinia. About seven years of his life were spent in France, during which time he was engaged on the Paris and Rouen Railway, and as superintending architect of the Havre Docks. On the cry being raised of "*La France pour les Français*," in 1848, he returned to England. Though he executed several works both here and abroad, his bent was decidedly literary. He contributed several articles to the *Builder* early in his career, especially on roofs. In 1857 he wrote a rudimentary work on "Limes and Cements;" in 1861, "The Annual Retrospect of Engineering and Architecture." He edited "The Builders' and Contractors' Price-book," and "The Engineers' and Architects' Pocket-book." He was connected, too, with the *Journal of Gaslighting* for many years, and wrote several papers for the Society of Arts, and for the Instution of Civil Engineers, for which he received prizes. He was the author of many articles in Brande's "Dictionary of Science," and in the "Dictionary of Architecture," published by the Architectural Society, especially one on the word "Abattoir." Mr. Burnell was a relative of Mr. W. Tite, M.P., and at his suggestion was made a member of the Government Committee appointed to inquire as to the preservation of the stone of the Houses of Parliament—a committee, by the way, that sat long, published a useful report, and never received the slightest acknowledgment of its services. He was elected a member of the Society of Arts in 1860.

Publications Issued.

BOOK-KEEPING. By R. G. C. Hamilton and John Ball. *(Macmillan and Co.)*.—This is one of the Clarendon Press series, and, in a small compass gives the theory and practice of this art. The work is named as one of the text-books which may be consulted with profit by those proposing to go in for the Society of Arts Examinations.

Notes.

STRIKES IN THE TIME OF EDWARD III.—When Edward III. was rebuilding Westminster Palace, so many workmen and labourers withdrew from his works, that he issued a proclamation that no one was to employ them under penalty of being sent to the Tower; but no difficulty with the men is recorded to have taken place here. This smooth-sailing was, perhaps, due to the observance of certain articles drawn up by the trade, which we are about to notice. From Mr. Riley's documents it appears that about three years after the "strike" at Westminster the corporation took the masons in hand. Solid, hard-handed, slow-thinking men they were, not particular about such trifles as the way their names were spelt, or whether they had any surnames at all; though not clumsy, very precise over the way they did their work, and determined that no one should do it in any other fashion. The mason hewers set themselves against the light masons and setters, and their disputes seem to have been very frequent and tiresome, when the mayor undertook to investigate their case. He attributed their dissensions to the fact that their trade was not regulated "by the government of folks of their trade," and agreed to receive twelve of their representatives, who should draw up a code of articles by which, for the future, it should be ordered and ruled. Six masons on behalf of the hewers, and six on behalf of the light masons and setters attended this conference. The regulations, which were drawn up in Norman-French, were briefly thus:—Every man might work in any branch of the trade, if skilful at it; "good folks" were to be chosen and sworn to see that no mason undertook work that he was not able to do, under penalty of fine and expulsion. No one was to take work in gross (wholesale or by contract)

if he had not ability to complete it in a proper manner. He who did undertake such work in gross was to take with him to the employer six or four ancient men of the trade to testify that he was able to perform it, and take upon themselves the responsibility of finishing it if he should prove unable to do so. No one was to set an apprentice or journeyman to work, except in the presence of his master, before he was perfectly instructed. No one was to take an apprentice for less than seven years. The masters that were chosen to superintend the trade were to oversee that those who worked by the day took for their hire what their work was worth, and asked no outrageous pay. If any objected to be ruled by these persons, his name was to be reported to the mayor, who with the consent of the aldermen and sheriffs, would imprison or otherwise punish him, "that no other rebels may take example by him, to be ruled by the good folks of their trade;" and, finally, no one was to take the apprentice of another to his prejudice or damage, until the expiration of their term, under penalty of half a mark for each conviction.—*Builder*.

New Manures.—In a paper read before the British Association at Norwich, Mr. Read, M.P. for Norfolk, says:—"Already the constant repetition of the same crop is acting prejudicially to the Norfolk farmer. Clover sickness is a common complaint; and no chemist can tell us what it is that the clover extracts from the land which our manures do not return to it; nor have they suggested any treatment which has in the slightest degree mitigated the evil. It is feared that turnips are showing signs of a similar ailment; anyhow, it is certain that the same dressing of manure fails to produce the same weight of roots as it did 25 years ago."

Patents.

From Commissioners of Patents' Journal, September 4.

Grants of Provisional Protection.

Boots, &c., removing dirt from the bottoms of—2625—G. Tidcombe.
Brewers' finings—2561—E. Beanes.
Brewing apparatus—2602—T. Haigh.
Brick-making machinery—2636—R. Scholefield.
Bricks, tiles, &c.—2630—W. H. Tooth.
Bricks, &c., composition applicable to the manufacture of—2629—O. C. Setchell.
Buildings, apparatus to be employed in the construction of—2612—J. Tall.
Cages, &c.—2555—C. Mohr and S. E. Smith.
Cans, &c., closing—2421—C. J. L. Nicholson.
Carriage springs, &c.—2565—J. Palmer.
Cartridges—2033—W. H. Crocker.
Cartridges—2628—W. R. Lake.
Casks, &c., bushing the bung-holes of—2633—H. Ground.
Clothing, &c., disinfecting—2544—G. Nelson.
Coal, &c., cutting—2643—J. Gillott and P. Copley.
Copper, &c., smelting—2600—H. C. Ensell.
Cotton, &c., threads of, preparing for the market—2593—W. J. Almond.
Despatch boxes, &c.—2607—F. J. Knewstub.
Dress fastenings and ornamental appendages—2635—R. Couchman.
Dyeing, &c., red colour for—2017—J. H. Johnson.
Earthenware, &c.—2586—J. H. Atterbury.
Electro-magnets—2571—A. Albini and J. Vaglica.
Fabrics, woven—2656—S. R. Samuels and J. Birks.
Feed-water heaters—2596—H. N. Waters.
Fire-arms, breech-loading—2645—A. M. Clark.
Flax, &c., preparing and spinning—2579—D. Fraser.
Furnaces—2627—A. Goodman.
Furnaces, blast—2617—J. Watson.
Grain, cleaning—2567—J. H. Johnson.
Grain, &c., preparing and manuring before sowing—2626—A. F. Eckhardt.
Heald warpers—2623—W. Chorlton.
Heat, &c , non-conducting composition for preventing the radiation or transmission of—2492—F. Le Roy.
Horizon, artificial, used for taking altitudes—2624—C. George.
Horses, roughing—2620—H. Thompson.
Illuminated devices and designations—2616—F. M. B. Bertram.
Lamps—2445—C. F. C. Cretin.
Leather, compound for tanning—2589—A. Clark.
Linen, &c., drying—2590—W. H. Davey.
Looms—2306—T. F., J., C. H., and E. Firth.
Looms—2613—T. Wrigley and J. Holding.
Looms—2650—J. Hamer.
Memoranda, &c., apparatus for receiving—2639—B. J. Cohen.
Mills for grinding—2575—J. G. Tongue.
Millstones, dressing—2614—A. B. Childs.
Motive-power engines—2654—W. L. Williams.
Motive-power, obtaining—2572—H. J. Behrens and E. Dart.
Motive-power, &c., obtaining—2581—E. Ledger.
Mowing and reaping machines—2652—R. W. Morgan.
Mules, self-acting, for spinning, &c.—2649—S. Morris.
Music books, &c., machinery for turning over the leaves of—2533—J. Grant.
Needles, &c., flattening heads of—2641—J. Barrans.
Oil testers—2592—T. R. Shaw.
Ores, &c., decomposing the sulphurets of iron contained in—2562—B. Hunt.
Pianofortes, apparatus for attaching to, in order to facilitate the study of the notes—2595—G. Calkin.
Pumps—2587—J. Norbury and J. Shaw.
Railway breaks—2597—P. Robertson.
Railway rails—2591—J. Heaton.
Railway rails, uniting the ends of—2621—W. R. Lake.
Railway trains, communication between passengers, guards, and engine drivers—2609—J. L. Clark.
Resinous sudations, administering—1505—W. E. Gedge.
Rotary engines—2601—A. V. Newton.
Rotary engines—2651—W. Hall.
Rotary or centrifugal machines—2608—T. W. Rammell.
Sand, &c., grinding—2549—J. Fletcher, sen., J. Fletcher, jun., and W. Fletcher.
Sewing machines—2599—H. Hughes.
Sewing machines—2646—R. Harvey.
Sewing needles, holders for—2631—G. J. Colette.
Shaft tugs—2648—J. Dawson.
Ships' propellers—1435—H. A. Bonneville.
Ships' signal lamps—2577—J. S. Starnes.
Steam cultivators—2279—R. Brett and G. Daniels.
Stearine, manufacturing—2647—A. E. Borgen.
Stoves, &c.—2569—W. Corbitt.
Stoves, &c.—2573—J. Phillips.
Sulphate of iron solution, treating and utilising waste—2588—F. Braby.
Tents—2557—J. H. Dearle and T. Brown.
Timber, cutting—2642—J. J. Long.
Tools for cutting tubes, &c.—2583—W. Thomson.
Vapour, condensing—2644—J. H. Johnson.
Walls, &c., constructing—1416—S. Parr and A. Strong.
Water meters—2563—B. P. Stockman.
Wheat, &c., manufacturing into flour—2605—J. H. Johnson.
Wheels and tyres—2610—B. Walker and J. F. A. Pflaum.
Window sashes—2594—J. Sawyer.
Wool, &c., washing—2582—L. Gay.

From Commissioners of Patents' Journal, September 8.

Patents Sealed.

757. J. Hammersley.
758. H. A. Dufrené.
760. W. R. Lake.
764. J. L. Clark.
766. J. B. Fell.
773. I. L. Pulvermacher.
775. J. M. Stanley.
776. T. Whittaker.
777. J. Eastwood.
779. W. Langwell & H. Spring.
786. J. G. Tongue.
791. H. Symons.
798. J. and J. Thompson.
800. W. W. Greener.
801. F. J. Baynes.
810. A. F. Baird.
812. H. Willis.
814. E. Morewood.
815. W. H. Halsey.
817. P. F. Halbard.
820. W. B. Kinsey.
839. S. Naylor.
840. M. T. Shaw and T. H. Head.
846. W. Thompson.
851. A. P. Stephens.
852. J. Hodgeson.
854. A. and E. Geary.
864. H. Kershaw.
866. S. H. Salom and T. Field.
896. J. S. Gee.
925. J. B. Linnett.
935. G. Davies.
956. G. Twigg and H. Bateman.
957. S. Duer.
958. G. Davies.
961. G. Macdona & O. Hilliard.
962. W. S. Boulton.
1007. A. Elliot and J. Barker.
1082. A. B. Walker.
1096. J. H. Johnson.
1109. R. J. Morison.
1114. T. Baker.
1164. E. Watteeu.
1289. G. Coles, J. A. Jaques, and J. A. Fanshawe.
1296. G. Coles, J. A. Jaques, and J. A. Fanshawe.
1334. C. B. and J. Hardick.
1434. H. A. Bonneville.
1463. C. D. Abel.
1796. D. Jones.
1800. C. H. Wells.
1940. K. Malster.
2211. W. R. Lake.
418. A. B. Ibbotson.

Patents on which the Stamp Duty of £50 has been Paid.

2265. S. Chatwood.
2274. R. A. Brooman.
2277. J. Grand.
2337. W. J Murphy.
2363. A. V. Newton.
2369. H. A. Bonneville.
2465. A. V. Newton.
2294. J. M. Hart.
2300. W. L. Wise.
2355. J. Wakefield.
2397. D. J. Fleetwood.
2279. T. T. Ponsonby.
2315. G. T. Bousfield.
2569. G. W. Rendel.

Patent on which the Stamp Duty of £100 has been Paid.

2203. F. E. Schneider.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 18, 1868.

Announcements by the Council.

Examinations, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Harvesting Corn in Wet Weather.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

Subscriptions.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

Cantor Lectures.

"On Food." By Dr. Letheby, M.A., M.B., &c.

Lecture IV., delivered Monday, February 10th.

Preservation of Food—Unwholesome and Adulterated Food.

It requires no argument to show that the preservation of food is a matter of great public importance; for it not only enables us to provide against actual want in periods of unusual scarcity, but it also affords the means of equalising the distribution of food at all times, so that the excess of one country may be used in supplying the deficiency of another. In the pastoral districts, for example, of Canada, Australia, Tasmania, the Cape of Good Hope, Mexico, the Argentine Republic, and the Brazils, thousands of tons of meat are always available as food, and yet they are lost to us because of the difficulties of preserving it. In South America, at least two millions of beasts are annually slaughtered for the fat, skin, and bones, the flesh of which could be supplied here at less than 2½d. per pound. So also in Australia, the amount of meat available as food is practically inexhaustible. Last year Mr. Philpott stated to the Food Committee of the Society of Arts, that he himself was in the habit of melting down from 1,000 to 1,500 sheep daily for four months together; and that in the vast districts of rich pasture-land from Victoria to Brisbane, there was an unlimited supply of the very finest meat—all of which was at present entirely wasted, because of the difficulty of disposing of the flesh; and, therefore, the carcasses of the animals were melted down for fat. A bullock in Australia, he said, costs only from £3 to £4; and legs of mutton of the very best quality were, when salted, sold for three shillings a-dozen. If some simple and practicable means could be devised for preserving such meat, it might be supplied to our markets at less than 3d. a pound.

Until recently the only process employed for this purpose was the rude method of salting the meat, but the deterioration of it was so obvious, and the distaste for it so general, that it was only practised to a limited extent, and for occasions when fresh meat could not be obtained. The salt junk of the navy in olden time was a good example of the wretchedly unwholesome and indigestible meat prepared, for it could hardly be called preserved, by this process. Recognizing, therefore, the necessity for a bettter means of preserving food, the naval authorities of every country appealed to science, and gave the largest encouragement to inventors. A further stimulus to invention was created by the necessity for supplying our Arctic explorers with good and wholesome food during their long winter residence in the frozen seas of the north; and as that inquiry was set on foot, not merely for the purpose of discovering a north-west passage to our possessions in America, but also with the view of prosecuting scientific research in almost inaccessible regions, an unusual inducement was offered for the preparation of such food. The demand thus created was soon acknowledged by science, and was also met by the practical skill of the manufacturer, so that the Arctic voyager went confidently on his journey, knowing that he had other food than the unwholesome junk of the navy. The earliest preparations supplied to him were mixtures of dried meat with sugar and spice (*pemmican*), but after a time they were furnished with fresh meat, preserved in air-tight cases. At first the supply was chiefly for voyagers in cold countries, but when the value of this method of preservation became known, the European residents of hot climates, as India, eagerly sought for the fresh foods which they were accustomed to use in their own country, and thus an additional stimulus was given to this process of manufacture. At the present time it has acquired gigantic proportions.

I have before me a list of the specifications of patents relating to the preservation of food, from the year 1691 to the end of 1855, and I find that only one was described in the seventeenth century, and three in the eighteenth, while as many as 117 were specified in the first 55 years of the present century. Invention, however, has not been prolific of new processes, for it is mainly confined to an application of one or two simple elementary principles—26 of the patents, for example, are for the preservation of food by drying; 31 by excluding atmospheric air; 8 by covering the food with an impervious substance, as fat, extract of meat, gelatine, collodion, &c., and 7 by injecting meat with various salts.

But before we proceed with the examination of these processes, it will be advantageous to inquire a little into the circumstances which favour organic decomposition. It would seem, from experiment and observation, that three concurrent conditions are absolutely necessary for active putrefaction—namely, the presence of much moisture, the access of atmospheric air, and a certain temperature, as from about 40° to 200° of Fahrenheit; any of these being absent, the organic substance resists decay. All preservative processes must, therefore, depend on an application of one or other of these principles; and perhaps we may add a fourth—namely, the action of chemical agents. Let us review them in detail.

1st. *The preservation of substances by drying them* is of very ancient date. In our anatomical museums we have long known that specimens of the animal body may be preserved for an indefinite time by drying them, and then varnishing them so as to exclude moisture. Here is a dissection prepared in that manner, which has been used for lecture illustration at the London Hospital for more than half a century, and yet it is as sound as when it was made. In warm climates it has been a practice for ages to preserve fish, and even meat, by drying them—the meat being cut into strips and exposed to the action of warm dry air. Charqui or South American beef, which you see here, is an example of it. It is obtained from animals that are grass-fed, and they are killed by pithing and then bleeding them. Directly the hide is taken off, the flesh is stripped from the bones and allowed to cool. It is then placed on a table, and jerked, or cut up into thin slices, which are piled up in heaps with alternate layers of salt. After standing twelve hours the meat is turned, and fresh salt is added where necessary. The next day the salted strips are placed upon hurdles, and exposed to the sun to dry. It requires two or three days to dry the meat thoroughly, and, for fear of damp, it is always taken in-doors at night. There are several varieties of this meat, as *pato*, which is the best and most free from sinew; *manta*, the second quality; and *tasajo*, the third, which is very thin and full of sinews. All the varieties require to be well soaked in water, and then to be cut small and cooked by prolonged boiling. But animal foods are not well preserved in this manner, as they lose their flavour, and become tough and indigestible; the fat also gets rancid, and in damp weather the meat absorbs moisture and becomes mouldy and sour. Perhaps the lean parts of meat, as the heart, tongue, and strips of muscle might be advantageously preserved in this way, especially in warm and dry climates. The Food Committee of this Society reported favourably of a specimen of dry powdered beef from Queenstown, which they said was in excellent condition, and contained about four times as much nutritious matter as ordinary meat. Generally, however, the fat is very rancid, even when pains are taken to prevent the substance from getting mouldy. It is for the same reason that all attempts to preserve milk and the yoke of eggs by drying have failed, although the dried white of egg will keep well, as in the process of Mr. Charles Lamont, where the albumen is dried in thin scales—forty-four eggs making about one pound of the preparation. Absorbent substances mixed with the fatty food will obviate the difficulty, to some extent, as in the preparation of *pemmican*, where sugar and spice are added to the dry powdered meat; and in the several processes for preserving milk by evaporating it and mixing it with sugar, &c., as in the patents of Newton, (1835), Grimwade (1847 and 1855), Louis (1848), &c.; as well as the process of Davison and Symington (1847) for preserving eggs by mixing the yokes and whites with flour, ground rice, or other farinaceous substance, and drying. Extract of meat also may be preserved in the same manner, as in the patent of Donaldson (1793), of Robertson (1851), and of Borden (1851), where the extract, after the separation of fat, is mixed with farinaceous matters; in the last case it is also baked in the form of biscuits. In the year 1854, MM. Blumenthal and Chollet obtained their patent for combining meat and vegetables in the form of tablets, by first drying the meat and vegetables and pressing into cakes, and then submitting them to successive immersions in rich soup—allowing them to dry in warm air after each immersion. When the extract of meat is made without fat or gelatine, as in the case of Liebig's extract, it may be kept for a long time in a pasty condition, without mixing it with farinaceous matters, although the preparation of it with baked flour, as already described, is a great improvement.

The process of drying is, however, best adapted for the preservation of vegetable substances, and it has been so used from time immemorial, as in the keeping of pot-herbs, in preparing the tea-leaf, in making hay, &c. In this country, the first recorded patent for preserving vegetables by drying them, was granted in 1780, to John Graefer, who sought to retain the flavours of vegetables by first dipping them in boiling salt and water, and then drying. Forty years later (1820) John Vallance obtained a patent for preserving hops by drying them, and then compressing them into a small space. Then came the patents of Edwards (August, 1840), for boiling, granulating, and drying potatoes; and of Grillett (November, 1840), for preserving both cooked and uncooked potatoes by drying. Ten years afterwards (in November, 1850) Masson obtained his patent for preserving vegetables by drying them and forcibly compressing them, so that they were reduced to one-seventh their original bulk—a cubic yard containing rations for 16,000 men. This process has been very successful, and it is still practised by Devaux, Chollet, and others, for it serves for the preservation of all kinds of vegetables, as potatoes, cabbages, carrots, cauliflowers, beans, apples, &c.; and when steeped in water they reabsorb their natural proportions of moisture and swell out to their original size. They are, however, somewhat deficient of flavour, and they require prolonged boiling, as from one and a-half to one and three-quarter hours, to cook them.

By a more careful process of drying, Mr. Makepiece has managed to preserve both the colour and the flavour of vegetables, especially of pot-herbs, as you may see from these specimens.

Altogether there are, or have been, about thirty-one patents in this country for the preservation of various articles of food by drying them.

2nd. *The preservation of organic matter by excluding atmospheric air* is, like the last, a very ancient process. The old practice of burying the dead in leaden coffins, and the still more ancient custom of swathing them in resinous bandages or waxed cloths (called cerements, owe their preservative powers to the exclusion of atmospheric air; and it is remarkable, seeing the efficacy of the process, that the scientific principle of it was not long ago recognised and applied to the preservation of food. The first patent of the kind that I am acquainted with in this country, was granted to Francis Plowden, in June, 1807; and he describes it as a process for "preserving butchers' meat, animal and other comestible substances, by encrusting them with a substance, which must not only resist the effects of atmospheric air, but must not communicate any noxious quality to its con-

tents," and for this purpose he employed essence or extract of meat—the substance being dressed, so that it may preserve the longer, is wiped dry, and put into a wooden vessel, and the hot extract is poured over it in a fusible state, so as to find its way into every vacuum. Three years later (in February, 1810), Augustus de Heine took out the first patent for preserving meat, by exhausting the air from the vessel containing the meat, and he contrived a machine for the purpose, as the action of the common air-pump was tedious. Six-and-thirty years after this (1846) the late Mr. Warington, of Apothecaries' Hall, obtained his patent for the preservation of animal substances, by coating them with common glue, gelatine, or concentrated meat gravies, or otherwise by dipping them in warm solutions of such substances; or by wrapping them in waterproof cloth, or covering them with caoutchouc, gutta-percha, or varnish. These mark the starting-points of the various processes now in use; for example :—

(*a*). Of those which owe their operation to the exclusion of air, *by filling up the vessel with something hot*, there are the patents of Plowden (1807), who used rich gravy or extract of meat; of Granholm (1817), who used hot fat, or hot animal jelly; and of Wothly (1855), who used oil, as in preserving anchovies. I am rather surprised, considering how easily the exclusion of air is effected by surrounding the substance with hot fat, that this method of preserving meat has not been adopted in Australia and South America; for as the fat which they prepare from their wild stock is sent to this country in casks, there would be no difficulty in sending with it the finer descriptions of joints, as legs of mutton and good pieces of beef. The process should be conducted as follows :—When the fat is melted, and is at a temperature of from 240° to 250° Fahr., the fresh joints should be plunged into it, and kept there for a few minutes, so that the superficial moisture might be thoroughly evaporated. They should then be immediately packed in sound dry casks, and filled up with hot fat, at a temperature of 212° or thereabout. In this manner the fat and the joints might be transmitted to this country, and on their arrival there would be no difficulty in melting the fat while in the casks, and then removing the preserved joints.

Vegetable substances are frequently preserved in bottles filled up with hot syrup, and the practice is a very old one. Hot water is also used for the same purpose, and this method dates from the year 1807, when this Society gave a premium to Mr. Saddington for his method of preserving fruits without sugar. His process was to gather the fruit a little before ripening, and to put it immediately into clean bottles,—filling the bottles with the fruit to the neck. They were then placed in a vessel of cold water, and heat was applied until it rose to the temperature of 160° to 170° Fahr. After standing exposed to this temperature for half-an-hour, the bottles were filled up to within an inch of the top with boiling water, and were then immediately corked and covered at the top with cement. The action of the heat was not merely to expel atmospheric air from the bottles, but also to coagulate the vegetable albumen of the fruit. Fruits and green vegetables are still preserved in this manner, a little alum being generally added to the water in the bottle, for the purpose of hardening the tender skin of the fruit, and so preventing its disfigurement by bursting.

(*b*). A process not very unlike the preceding, is that which consists in *the destruction of the oxygen of the air in the vessel, by heating the substance in it.* This is the plan of M. Appert, who, in 1810 (three years after the publication of Mr. Saddington's method), obtained the reward of 12,000 francs, offered in the preceding year by the French Government, for the best method of preserving food. Here is the book which M. Appert wrote at the time, and he tells us to cook the food to some extent, and put it into strong glass bottles—filling them almost to the top. The bottles are then to be securely corked, and exposed for some time to the action of boiling water. To guard against accident from bursting, the corks are to be wired down, and the bottles wrapped up separately in cloths. After this the corks are to be well covered with pitch, to exclude atmospheric air. A like process was patented in the autumn of the same year (1810), by Mr. Peter Durand, who, no doubt, derived it from the published account of M. Appert, dated nine months before; and since then, many such patents have been obtained, which I need not describe. Attempts have frequently been made to preserve milk by this process. Appert recommended that the milk should be boiled down to about half its bulk before putting it into the bottles; and in 1847 Bekaert tried to improve the process by adding carbonate of soda to the milk. Later still, in the same year, Martin de Lignac obtained a patent for preserving milk, by evaporating it to one-sixth of its bulk before bottling it. Then there were the patents of Symington and of Moreau (1853), but all these methods have failed in practice, on account of the difficulty of preventing the separation of the butter.

(*c*). The preservation of food *by exhausting the air from the vessel containing it* dates, as I have said, from the year 1810, when Augustus de Heine proposed to use a vessel with a valve in the top of it, which allowed the air to be drawn out by means of a special apparatus, but not again to enter. The exhaustion, however, was so imperfect that the process did not answer. In 1828 Mr. Donald Currie improved it by admitting carbonic acid gas into the vessel after it was thoroughly exhausted; and later still, in 1836, M. Leignette still further improved it, by filling the vessels containing the food with salt and water, and then letting out the liquid through the aperture, which remained open for that purpose, while carbonic acid gas went in. Six years after this (in 1842), Mr. John Bevan patented a process for drawing out the air by an exhausting apparatus, and then admitting a warm solution of gelatine; and in 1846 Mr. Rettie employed, in the like manner, a solution of common salt. But none of these methods were successful; nor was the patent of Mr. Ryan, in 1846, for using gases, chiefly acetic acid vapour, and carbonic acid gas. The most perfect process of this kind was patented by Messrs. Jones and Trevethick. It consists of an apparatus whereby the exhaustion of the vessel containing the raw food is effected in an air-tight trough of water, and thus the entrance of air and the collapse of the sides of the vessel are completely prevented. After the exhaustion pure nitrogen is admitted into the vessel, for the purpose of diluting the residuum of air, and it is again exhausted. Lastly, a charge of nitrogen, containing a little sulphurous acid, is let into it, and thus the last trace of oxygen is chemically absorbed. The vessels are now in a proper condition for removal from the air-tight water trough, and for having the apertures sealed with solder. Meat, fish, and poultry preserved in this manner has been found good after seven or eight years; and specimens of them were exhibited in the London exhibition of 1862.

(*d*). The most common method of driving out the air *is by means of steam.* The food is put, with a charge of water, into a tin case with a hole in the top, and when the water is boiling actively, and steam has displaced the air, and is escaping freely, the hole is stopped with solder. This process dates as far back as 1820; but the first patent for it was granted to M. Pierre Antonie Angilbert, in 1823. He had, however, a very rude method of applying heat to the tin vessels, and this was improved by Wertheimer in 1840. In the month of January of the year following Mr. Gunter improved it still further; and later in the same year both Goldner and Wertheimer obtained patents for using a bath of muriate of lime for heating the vessels. This, in fact, is the practice at the present time by Goldner, McCall, Richie, Morton, and others, who are largely engaged in the preservation of food. The details of the process for

effecting it are as follows:—The raw meat and vegetables are put into the canisters and soldered down—a pin-hole aperture being left in the lid. The canister is then subjected to the heat of the bath (a little above 212°) until the contents are about two-thirds cooked; and then, while the steam is blowing freely out, the aperture is dexterously sealed tight with solder. The canister is then painted over with a stiff oil paint, and is exposed for some time in the testing-room to a temperature sufficiently high to promote decomposition. If the canister shows no sign of bulging out from the generation of putrefactive gases, it is considered sound. Messrs. Hogarth and Co., of Aberdeen, use steam instead of the muriate of lime bath.

Meat preserved in this manner will keep for a considerable time. At the exhibition of 1851 vouchers were given for some of the samples that had been preserved for twenty-five years; and at the exhibition of 1862 I examined specimens of food that had been kept for more than thirty years. To-night, through the kindness of Messrs. Crosse and Blackwell, I am able to show you a specimen of preserved mutton, which has been in the case forty-four years, and you will perceive that it is in excellent condition. It formed part of the stores supplied by Messrs. Donkin and Gamble in 1824 to his Majesty's exploring ship *Fury*, which was wrecked in Prince Regent's Inlet in 1825, when the cases were landed with the other stores, and left upon the beach. Eight years afterwards (in August, 1833), they were found by Sir John Ross in the same condition as they were left; and he wrote to Mr. Gamble at the end of that year, saying, "That the provisions were still in a perfect state of preservation, although annually exposed to a temperature of 92° below and 80° above zero." Some of the cases were left untouched by Sir John Ross; and after a further interval of sixteen years, the place was visited by a party from H.M.S. *Investigator*, when, according to a letter from the captain, Sir James Ross, "the provisions were still in excellent condition, after having lain upon the beach, exposed to the action of the sun and all kinds of weather, for a period of nearly a quarter of a century." Messrs. Crosse and Blackwell have placed the original letters in my hands for perusal, and they show, beyond all doubt, that meat preserved in this manner will keep good for nearly half a century —in fact, the case of boiled mutton now before you has been preserved for forty-four years. There can be no question, therefore, as to the success of the process; and hence it is largely practised, not only in this country, but also in our colonies, where food is abundant. In this way preserved salmon and lobsters are sent to us from Newfoundland, turtle from Jamaica, beef and mutton from Canada, and the dainty tail of the kangaroo from Australia. There are, however, two serious objections to the process—namely, that the meat is nearly always overcooked, and the cases are likely to buckle and crack from the constant pressure of the atmosphere —there being a vacuum within them. The over-cooking arises from a desire to ensure the complete exclusion of atmospheric air by the steam. Mr. Nasmyth has proposed, in his patent of 1855, that a little alcohol should be mixed with the water, so that the boiling-point may be reduced; while Mr. McCall, taking advantage of the absorbent action of sulphite of soda on oxygen, recommends a less prolonged boiling and the use of a little of that salt. The salt is contained in a small capsule, fixed by means of soft solder to the inner surface of the cover of the case. When the food is about two-thirds cooked, and steam is freely escaping, the hole in the lid is stopped with a very hot iron, which melts the soft solder of the capsule within, and so sets free the little pellet of sulphite of soda, which speedily absorbs the remnant of oxygen left in the case.

The other difficulty, namely, the cracking of the case from atmospheric pressure, is obviated, as I have already explained, by the introduction of inert gases, as carbonic acid, nitrogen, &c., and with a little sulphurous acid, and these have been the subject of many patents, as of Currie (1828), Leignette (1836), Ryan (1846), Nasmyth (1855), and others.

(*e*). The last method of any importance for excluding atmospheric air from food, is *by coating it with some impervious material.* This plan, as I have already stated, was first suggested by the late Mr. Robert Warington, who, in March, 1846, obtained a patent for the use of "common glue, gelatine, or concentrated meat-gravies; or thin cream of plaster-of-Paris, which, when set hard, was to be saturated with melted suet, wax, stearine, &c." "The things were then to be wrapped in water-proof cloth, or covered with caoutchouc, or gutta-percha; or coated with a varnish of these substances; or kept submerged in glycerine, treacle, elaines, oils, or other such matter not liable to oxydation." Nine years after this, in January, 1855, a patent was obtained by Messrs. Delabarre and Bonnet, for preserving meat, bread, eggs, vegetables or pastry, by coating them with a varnish, made from the flesh and bones of animals, by boiling them, and obtaining a rich syrup. This, when clarified, was used to cover the parboiled meat or vegetables. In the month of February in the same year, a like patent was granted to Mr. Hartnall, for a process of preserving animal and vegetable substances by immersing them in baths, consisting of gelatine and treacle dissolved together in certain proportions; then drying, redipping, and covering with charcoal powder. Later still, in the same year, Mr. Brooman patented the use of albumen and molasses, as a coating for meat, after the meat had been partially dried, and then suspended in an air-tight vessel, charged with sulphurous acid. Lastly, in the month of December of the same year, Messrs. Bouëtt and Doucin obtained provisional protection for the use of collodion, either alone or mixed with other suitable substance.

But the best example of this method of preserving meat is the process of Dr. Redwood, whereby the meat is first covered with paraffin, and then with a flexible coating of gelatine, mixed with glycerin or treacle. The joints are dipped into a bath of paraffin, having a temperature of from 240° to 250° of Fahrenheit, and are kept therein until the surface moisture is evaporated. They are then transferred to a colder bath of paraffin, from which they receive two or three coatings, prior to their being covered with the last flexible covering of gelatine, &c. When the meat is required for use, the paraffin is easily removed from it, by plunging it into boiling water, which dissolves the flexible coating and melts the paraffin. The paraffin floats upon the water, and, when cold, may be collected for future use.

The common methods of preserving foods by forcing them into skins, as in the case of German sausages, lard, &c., is of very ancient date; although a patent was granted to Mr. Palmer, in 1846, for the preservation of the fat of beef, mutton, veal, or lamb, when fresh, by melting them, straining, and then packing in bladders.

3rd. *The preservation of food by cold* is a well-known process, for every one is acquainted with the fact that meat will keep for a long time in the winter-season without deterioration; but the extent to which this preservative power may be carried is not well known. Animals, we are told, have been found in a perfect state of preservation in the frozen earth of the arctic regions, where they must have been buried for centuries. Last year, indeed, a communication was made to the Royal Society, by Dr. Carl von Bear, of the fact that the entire body of a mammoth was found in the frozen soil of arctic Siberia. How long it had been so preserved it is hard to conjecture, but it must have been there for ages. Another good example of the preservative power of cold was observed in Switzerland in the autumn of 1861, when the mangled bodies of three Chamounix guides were found at the lower part of the Glacier de Boissons. The flesh of the bodies was perfectly preserved, notwithstanding that 41 years had elapsed since the unfortunate men lost

their lives. They were carried away by an avalanche from the grand plateau of Mont Blanc, in the month of August, 1820, while attempting to ascend the mountain with Dr. Hamell; and no trace of them was discovered until the corresponding month of 1861, when, by the slow descent of the mountain ice, their remains were brought to the lower glacier. So well is this preservative power of cold known to the inhabitants of Russia, Canada, and other northern climates, that it is a common practice to slaughter fat animals on the approach of winter, when fodder is getting scarce, and to preserve their carcases by burying them in the ice or frozen earth; and they are thus preserved from the middle of November to the early part of May. We also have a practice of packing salmon in ice; and we receive game and poultry from America, and send the like to India in boxes surrounded with ice. The application of this method of preserving food is almost without limit, for not only can we obtain a stock of ice for such a purpose in the winter season, but it may be brought to us at any time from colder regions of northern Europe, or it may even be manufactured at a cost of less than half-a-guinea a ton. There is a machine of Mr. James Harrison, of Australia, made in this country, which is said to be capable of producing 8,000lbs. of ice a day, at a cost, including all expenses, and with a good margin for profit, of ten shillings a ton. Why, therefore may we not use ice in the summer months for the preservation of food? Dealers could easily provide themselves with close rooms containing ice, in which the food might be placed; and we ourselves might use ice-boxes more commonly in our households. It might interest you to know that the first patent for the preservation of food in this manner was granted to John Lings, in 1845.

Again, a temperature of from 200° to 212° will also arrest putrefaction; and joints of meat may be preserved for a time by dipping them every now and then in boiling water.

The 4th and last method of preserving food is *by the use of chemical agents, called antiseptics*, which act by destroying infusorial and fungoid life, and by forming compounds which are not prone to decay. Foremost of these is *common salt*, which has been used from the earliest time; but it is not a good agent for the preservation of meat, as it renders it tough, gives it a bad flavour, extracts the soluble constituents of it, and makes it hard and indigestible. The process, however, is much better managed at the present time than formerly, when the hard junk of the navy was the common diet of our sailors; and, considering how easily it is applied, it is not surprising that it is almost universally practised. In some parts of England and Wales it is the custom of the better classes of agricultural labourers to fatten a pig during the summer, and kill it and salt it for the winter. Hams and tongues are treated in like manner; and so are fish when they are plentiful among the inhabitants of our coasts. As far back as 1800 a patent was granted to Mr. Benjamin Batley for curing and preserving herrings and sprats by salting them; and it would seem that his process was very successful, for in the following year he obtained a patent for the like treatment of other fish. The dainty *caviare* of the Russian is nothing but the salted roe of the sturgeon. Even vegetables may be preserved in salt and water, as in the case of olives.

Other saline substances, saltpetre, acetate of ammonia, sulphite of potash, or soda, muriate of ammonia, &c., are also good preservative agents, and are the subjects of several patents. Here is a specimen of meat preserved by wetting it with the solution of one part of acetate of ammonia and nine of water; and here another, which has been similarly treated with a weak solution of sulphite of soda. It is only necessary to brush the solution over the surface of the fresh meat, and when dry it will leave the meat in such a state as to resist decay. Instead of covering the meat with the solution, it may be injected with it, as in the patents of Long (1834), Horsley (1847), Murdoch (1851), and others.

After meat or fish is salted, it is frequently dried and smoked by exposing it in close chambers to the vapours of smouldering peat, wood, straw, &c., and in this manner it becomes impregnated with the dark-brown empyreumatic oil of the burning wood. The chief agent concerned in the preservation of food thus treated is the creosote of the empyreumatic oil, and this it is which gives the food a smoky flavour. A like effect may be produced by dissolving the creosote of wood-tar in vinegar, and brushing it over the salted joint. The creosote of coal-tar (*carbolic acid*) is also a powerful antiseptic, but its flavour is not agreeable, and therefore it is not used in the preservation of food; although it is extensively employed, in the form of coal-tar, dead-oil, or creosote, in the preservation of wood, canvas, &c.; and the perfection of purity to which it is now brought by Dr. Crace Calvert and other manufacturers, encourage its use in medicine and surgery.

Spirit of wine and *vinegar* are other preservative agents which owe their antiseptic power to their destructive action on infusorial life, and to their combining with the albuminous constituents of food. Cherry brandy and pickles are good examples of this.

Lastly, I may state that the fumes of burning sulphur (*sulphurous acid*) are very powerfully antiseptic; and many patents have been taken out for their employment in the preservation of food. In the spring of 1854, Laury obtained a patent for it, the gas being introduced into the vessel containing the substance to be preserved. Later in the same year, Bellford received provisional protection for the use of sulphurous acid with about one-hundredth of its volume of hydrochloric acid—the object being to prevent the sulphurous acid combining with the alkaline salts of the meat, and so giving it an unpleasant taste. The acids were to be used in solution, and the meat immersed in it for twenty-four hours. In the following year (1855) there were three patents—those of Brooman, Demait, and Hands, for the use of the acid in a gaseous form; and in the specification of Demait it was directed that the substance should be preserved by hanging it up in a chamber, and exposing it for a time to the action of the gas. Professor Gamgee has revived this process in a recent patent, and with certain modifications. He recommends, for example, that the animal should be made to inhale carbonic oxide gas, and when it is nearly insensible, it should be bled in the usual way. After the carcase is dressed, it is to be suspended in an air-tight chamber, which is to be exhausted of air, and then filled with carbonic oxide gas, to which a little sulphurous acid has been added. It is to remain exposed to these gases for twenty-four or even forty-eight hours, and is then to be hung up in dry air; after which it is said that the carcass will keep for many months, without perceptible change in taste or appearance. The process has been tested by killing meat in London, and sending it to New York; and after the lapse of from four to five months, the meat has been pronounced good by a practical butcher. I am very much inclined to think that the real preservative agent is the sulphurous acid, and that the highly-poisonous carbonic oxide gas might be advantageously excluded from the chamber.

And now, in leaving this part of the subject, I cannot refrain from saying that the history of these patents for the preservation of food affords very striking instances of the necessity for an amendment of our patent laws; for not only is there a frequent disregard of all scientific principles in the construction of the patents, but in many cases there is also a total disregard, or else profound ignorance, of what has already been done in the matter. Repetitions, therefore, occur again and again of the same process, nearly always imperfectly specified; and, on the other hand, the most ridiculous propositions often assume an importance as if for no other object than that of obstructing invention. Out of the 121 patents for

the preservation of food, which I have had an opportunity of examining, there are hardly a dozen that can be regarded as either useful to the community or profitable to the patentee.

(*To be continued.*)

Proceedings of Institutions.

UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.

A conference of members of the Council of the Union of Lancashire and Cheshire Institutes and Science Teachers was held on Wednesday evening, the 9th Sept., at the Mechanics' Institute. Dr. Pankhurst, the hon. secretary of the Council, presided, and there was a numerous attendance.

The Chairman, in opening the proceedings, said the first duty which he had to discharge was to welcome, on the part of the Council, the teachers at that conference. He was sure that they would all regret the absence of the chairman of the Council, Mr. Alderman Rumney. Nothing but the necessities of the distance would have prevented him from being with them upon that occasion. The business of the evening was to hear a paper from Mr. Thomas Brown, upon the following subject:—"The Government Scheme of Technical Instruction and Examination, and the Future Prospects of Science Schools and Science Teachers." It must be gratifying to know that the pre-eminence of Lancashire and Cheshire, in the diffusion amongst the artisan class of science and instruction, had been more than maintained during the past year. Last year there were under instruction in connection with the Union, 1,930, while this year there were 2,769. In the past year 1,019 passed the examination, while in this year 1,493 had passed. Last year there were 59 classes in operation; this year 19 new schools had already been formed, and 13 were in course of formation, principally, he ought to say, through the zealous activity and enthusiastic zeal of their visiting agent, Mr. Lawton. In the presence of the amount of business they had to get through, it was undesirable to offer from the chair any observations. He ought, however, to direct attention to three points. They ought to have a sound theory about the relation of science to the productive arts; they ought to have a scheme of instruction adequate to realise, as far as might reasonably be expected, the theory which they had conceived; and, finally, they ought to be in possession of that amount of teaching power which should be able to give to the machinery the greatest amount of efficiency.

Mr. Thomas Brown (Chorley) then read the following paper:—Mr. Chairman and Gentlemen,—I fear that, having had so short an experience in science teaching, it may appear presumptuous on my part to attempt to read a paper before you on the subject. This fear nearly induced me to decline to do so, but I remembered that but for the Council of this Union of Institutes and their agent, I should not have become a science teacher at all, nor as yet would there have been a science school formed in the little town in which I reside. I therefore felt it my duty not to allow any little delicacy to stand in the way of making a humble attempt to aid them in their efforts to attain the grand object they have in view. In these they have hitherto been so far successful as to receive well-merited compliments from the officers of the Government Science Department. Moreover, I have been an elementary teacher under government inspection about 20 years, and have during the last two years passed examinations in 21 different subjects in science and art, under the Society of Arts and the Science and Art Department. This is a guarantee that I have necessarily pretty extensively studied the various schemes and codes in existence for the education of the working classes, and will, I trust, render further apologetical remarks unnecessary. I shall be compelled to treat the subject dogmatically rather than argumentatively. I will state my opinions boldly and fearlessly, hoping that, whether you agree with me or not, they will bring out the opinions and the results of the experience of the gentlemen present in the after discussion. The object of the government scheme of Technical Education is to make provision for the instruction of the more intelligent and enterprising members of our artisan classes in the scientific principles to be applied in their various trades, so as to make them more intelligent workmen, and to fit the best of them to fill efficiently the posts of foremen and managers in our workshops. The majority of them are thus expected to repay the expense of their instruction, by helping forward an increased prosperity in trades, manufactures, and commerce, and others more indirectly by saving certain expenses to the community, in regard to public health, &c. The scheme necessarily includes a very large number of subjects, and is generally well adapted to the end in view. Certain modifications might, however, prove beneficial. In the examinations in mechanical drawing and building construction, the success of the candidate depends too much upon his expert manipulation, cleverness in copying drawings to the same or a larger scale, and in being able to correct errors or omissions in detail, intentionally made, in the copies. All this is very good in its place, and speaks well for a candidate who is able to do it, but he should also be tested in his ability to draw simple subjects, from general dimensions and instructions. In addition to nimbleness of fingers, the candidate who takes the second or difficult paper should always have an opportunity to show evidence of a knowledge of curves of penetration, development of surfaces, and some of the more difficult problems belonging to the higher departments of the subjects. Such problems as the following, for instance, might be given:—1. To draw the curve of penetration of two pipes unequal in diameter intersecting at right angles. 2. To draw an oblique section of an elliptic tube at a given angle, having only the original diameters given. 3. To develope the surface of the arch of a skew bridge. 4. To draw the hip or angle rib of a domed roof, having only dimensions of some other parts given. 5. To draw the plan of a lobby and staircase rising 11 ft. in a space of 11 ft. by 6 in. No doubt teachers include such problems as these in their lessons given to their more advanced pupils, and it will be wise for them not to treat them with comparative neglect because they have produced few results in the late examinations. It is possible that they may occupy the most prominent place in the papers of the next or some succeeding year. Elementary mathematics, as the handmaid of geometrical, mechanical, and architectural drawing, theoretical and applied mechanics, steam navigation, and nautical astronomy, is one of the most important subjects on the list. It should be made as attractive as possible; but it is rather repulsive, both to teachers and pupils, from its extent and difficulty. It includes arithmetic, mensuration, geometry, algebra, and plane trigonometry, which form four and a half subjects in the scheme of the Society of Arts. In the Government pupil teacher scheme for elementary schools, three years are allowed for a thorough grounding in about half the mathematical matter which is here crowded together for a science teacher to wade through with his pupils in from twenty-five to forty lessons. This simply tends to produce a system of cramming, where there ought to be a solid groundwork laid, to serve as a sure foundation whereon to build a superstructure of sound knowledge from cognate sciences. The value of geometry can scarcely be overrated, both on account of the logical training its study gives to the mind, and of the important aid its problems and propositions afford in the study of the majority of scientifics. It is generally placed in the background in this examination, one or two questions only out of twelve, of which only eight can be taken, being devoted to pure geometry. Surely, if such pairs of subjects as vegetable physiology

and systematic botany, or mining and metallurgy, or navigation and nautical astronomy, or geology and mineralogy, ought not to be simplified and grouped together, there is reason to assert that the subjects now crowded under the name elementary mathematics ought not. It might be split into two parts:—1. Geometry and mensuration. 2. Algebra and plane trigonometry. Or the 6th and 11th book of Euclid, with the higher parts of algebra and trigonometry, and the theory and calculation of logarithms, might form a second course of elementary mathematics. The examination in applied mechanics has hitherto proved nearly a failure. Comparatively few students have attempted the subject, and of these too large a percentage have failed. This year we have been favoured with a new examiner and a new style of questions. The thoroughly practical nature of the last paper may be admired, but it would take many students and their teachers disagreeably by surprise. This subject, like some of those in art, should be subdivided, leaving the student the option of taking that division most suitable to his wants. There might be three divisions:—1. Mechanics applied in the construction of machinery used in carding, spinning, and weaving cotton, wool, and silk, and in millwrights' work generally. 2. Mechanics applied in the construction and use of tools, embracing screw-cutting and other lathes, planing, punching, morticing, rolling, slotting, sewing, and sawing machines, steam hammers, hydrostatic presses, and hydraulic and other cranes, and agricultural implements. 3. Mechanics applied in the construction and use of mathematical and philosophical instruments, including air pumps, hydrometers, verniers, chronometers, clocks, watches, and all sorts of weighing and measuring apparatus. A fourth division, relating to the construction and working of steam-engines, may be considered to be embraced in the examination in steam as now conducted. The course of instruction in organic and inorganic chemistry might be supplemented by one in chemistry, applied to the arts and manufactures. This might be subdivided thus: — 1. Chemistry applied in dyeing, calico printing, bleaching, tanning, and lithography. 2. Chemistry applied in glass-making and staining, pottery manufacture, enamelling, electro-metallurgy, photography, and the manufacture of paints, varnishes, and stains for wood. 3. Chemistry applied in brewing and distillation, in the manufacture of gas and other products from coal, and in those of sugar, starch, alum, soap, and other articles of commerce. 4. The application of chemistry and geology to agriculture. A few good and inexpensive handbooks are required for the use of students in such subjects as mechanical drawing, building construction, and applied mechanics. There will always arise some disappointment in the results of examinations, but science teachers still have a right to complain that this is unfairly increased by the irregularity of the papers as to their hardness. That in geometrical drawing and others might be quoted as an example this year. There are also still many students who receive a fair amount of instruction from their teachers, who, from sickness and other causes, never present themselves at all. These facts tend to show that it would be fairer to teachers, and render their remuneration more certain and uniform, if the payments to them included a capitation grant for the average attendance. The fear that the schools might be crowded with incapables will prevent the adoption of this principle. The use of a harder and easier paper in each subject may have its advantages, but the system of one paper still seems preferable. The proposition of the recent commission on technical education to introduce into day schools an examination in science similar to the first grade one in art is worthy of adoption. It should be extended to night schools, and should take place in the beginning of March. The grants made on this account may be deducted from the payments to the science teachers, but they would be repaid by a large attendance of pupils better prepared to receive their instruction. The Government exhibition scheme will not for some time produce much effect, and the want of science colleges should be attended to. The necessity of a sound and superior elementary education has been more than once pointed out to the Government authorities from the city of Manchester, but we are still under the new code, and likely to be. The effect of that code has been, as Mr. Lowe has boasted, to reduce the grants, but not, as he has dogmatically asserted, to improve the education of the children of the working classes. Its effect has simply been to cause increased attention to be paid to the lower classes, and to the duller children, owing to the adoption of a uniform standard. It has, however, lowered the standard of attainments in many of the best schools, and has ruined the first-class in the majority of cases. So far as preparation for technical education in the after lives of the pupils is concerned, its adoption has been a retrogressional step. The rescinding of the rule which took away from a teacher part of his payments if he had a pupil who passed in more subjects than one in one year, is an act of justice for which teachers will be grateful. It may be that the standard may be raised a little, but that is better than the old unjust rule. A low standard would render certificates comparatively useless. There is not much fear of that becoming a subject of complaint. It would be much more satisfactory to students if certificates were actually sent to the successful candidates. The lessons which the Paris Exhibition taught last year have done good, and have had a tendency to make people set a higher value upon technical education. They have tended to induce the artisans and master manufacturers to co-operate more with the science and art department. The discussions which have taken place on the subject have made the Government scheme better known and appreciated. Still there is much to be desired in this respect, for, as science inspectors have complained, even science committees often very imperfectly comprehend the scheme they are helping to carry out. There can be no doubt the Government scheme is progressing in extent and usefulness, although the disappointments and the uncertainty of results to which reference has been made, will have an unfavourable effect upon its development. The prospects of science schools and science teachers may fairly be considered to be improved and improving. As elementary teachers appear to be sitting for science certificates pretty extensively, we may hope that in a short time there will be no difficulty in obtaining teachers for some subjects in all small towns, and even in villages. It will be a relief from the monotony of their daily routine and secluded life to teach a science class or two in winter evenings. For many subjects there is no reason why they should not easily qualify themselves and become good teachers. For such subjects as mechanical drawing, building construction, applied mechanics, steam, and navigation, they are not generally so well adapted from lack of practical knowledge.* The magnificent example set by Mr. Whitworth will, it is to be hoped, be followed by others on a smaller scale. There is ample scope for the benevolence of the friends of the working classes to be exercised in the establishment of museums and public libraries. Many of our towns, large and small, are destitute of anything worthy of the name. An essay might be writttn on this subject, but time will not permit further reference to it here. It is, indeed, perhaps, futile to discuss it, when in some of our smaller towns it is not easy to get even the ordinary apparatus for science classes. We must not let obstacles like these discourage us, but hope for better days. As Britons we know we have pluck, energy, brains, and that wonderful engine of power, wealth. And if once aroused to do our duty we will not allow ourselves to be pointed out in the

* The rule compelling teachers to sit with their pupils if they want a certificate will never be popular with them, but it is a great convenience to some.

rear ranks of civilisation; nor will we suffer the land of the illustrious Newton to occupy a second or third rate place among the nations of the earth in regard to the scientific status of its people.

A discussion followed, in which Mr. Cope, Preston; Mr. Spriggs, Manchester; Mr. Plant, Salford; Mr. Isherwood, Blackburn; Mr. Angel, Manchester; Mr. Sutcliffe, Church; and other gentlemen took part.

Dr. John Watts said he had listened with pleasure to the paper read by Mr. Brown. He looked upon it as a very valuable contribution to the science class of literature, and he hoped it might get a wide circulation, and be considered as it deserved to be considered. He agreed with the necessity pointed out by Mr. Brown of the subdivision of the subjects upon which examinations were now held, because there was no doubt that the great mass of subjects which were crowded into a paper, and the great variety of questions in the same paper, tended to confuse the student and to prevent his passing in many cases, and if the subjects were subdivided and systematised it would be better for the pupil as well as the teacher. He had heard it stated that it was utterly impossible to take a student through a particular named subject in one year, so as to secure a first-class certificate; and he should like to ask whether it was an absolute necessity that a youth should travel through a subject in one year, and whether the proportion of the failures would not be less, and the pecuniary remuneration of the teacher more, if the subject were spread over two or three years? It seemed to him that if that course were adopted the certainty of success would be very much greater than it was now. He was sure the meeting that evening would be found, before another twelve months, to have borne fruit in the way of making the position of the science teacher more satisfactory.

Mr. Traice (Manchester) urged the adoption of some more efficient means for the preparation of the pupils. If that were secured he believed it would remove four-fifths of the existing difficulties, and remove them far more completely than any coercive system.

Mr. Gee (Hyde) moved a vote of thanks to Mr. Brown for his excellent paper. This was seconded by Dr. Bahin (Rochdale), and carried unanimously.

Mr. Brown acknowledged the vote of thanks; and a similar compliment to Dr. Pankhurst for presiding closed the proceedings.

Yorkshire Board of Education.—The scarcity of teachers in Yorkshire duly qualified to give instruction in science in accordance with the regulations of the Department of Science and Art, has led the Council of the Yorkshire Board of Education to concert measures for the supply of the deficiency. One important step is the organisation of schoolmasters' science classes to meet on the afternoons of Saturday during the winter, for the study of special branches of science. The movement was brought under the notice of the schoolmasters in the Leeds district, at a public meeting held on Saturday, in the Civil Court of the Town-hall, under the presidency of Sir Andrew Fairbairn, mayor of Leeds, who was supported by Mr. J. F. Iselin, M.A., Government Inspector for Science; Rev. A. Pickard, M.A., and Mr. J. G. Fitch, M.A., Her Majesty's Inspectors of Schools; Mr. E. Huth, Chairman of the Yorkshire Union of Mechanics' Institutes; Mr. W. H. J. Traice, Member of the Council of the Lancashire and Cheshire Union of Institutes; Rev. W. G. Henderson, D.C.L., Head Master of the Leeds Grammar School; Mr. S. Sharpe, LL.B., Head Master of Huddersfield College; Dr. Haigh, of Bramham College; Mr. L. W. Scudamore, B.A.; Mr. T. Hick, B.A.; Mr. G. Jarmain; Mr. E. Ison; Mr. Henry H. Sales, Hon. Sec. of the Yorkshire Board of Education; and other influential gentlemen connected with education. The first class will be opened in Leeds on Saturday, October 3rd, and the course will consist of twenty-eight lessons in inorganic and organic chemistry, by Mr. G. Jarman, head-master of the Science Schools at Halifax and Huddersfield, and will include all the subjects contained in syllabus of the Department of Science and Art, Subjects X. and XI. Each lesson will be about two hours in length. Classes of a like character will be formed forthwith in Sheffield and Stockton-on-Tees. By providing a staff of men qualified to conduct evening science classes for adults, the Council of the Yorkshire Board hope to be able to bring instruction in science within the reach and means of the industrial population of the county.

EXAMINATION PAPERS, 1868.

(*Continued from page* 736.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

POLITICAL AND SOCIAL ECONOMY.

THREE HOURS ALLOWED.

1. How are guardians appointed, and what are their rights and duties?
2. What are the rights of a husband to the property of his wife, with a distinction between that which is personal and that which is real?
3. What is the law as to apprentices, and what changes have at different tmes been made in it.
4. What was the conflict between the law of England and that of the civilians and canonists as to the legitimacy of *antenati?*
5. Describe the "Act of Settlement."
6. What are the privileges of Parliament, and what is their foundation?
7. What is the English law of naturalisation, and what inconveniences have arisen or may arise from it?
8. What are letters of marque and reprisals, and under what circumstances may they be granted?

Questions from Professor Fawcett's Manual for those who aspire to a first-class certificate.

1. Of what elements does profit consist, and on what does the rate of profit depend?
2. What are the restrictions put by trades' unions on the employment of apprentices? What can be said against such restrictions, and what if any thing for them?
3. Describe the different forms of co-operation; the merits and defects of each.
4. In what way do you divide commodities in reference to the circumstances that determine their price?
5. Describe the different forms and the different purposes of credit. In what case is credit beneficial, and in what is it otherwise?
6. What do you understand by equality of taxation, and how is it best secured?

GEOGRAPHY.

THREE HOURS ALLOWED.

1. Write a brief description of the physical features of either England, Scotland, or Ireland, with reference especially to the distribution of the high grounds and the direction of the river-basins.
2. Specify the principal seats of manufacturing industry in England and Scotland, naming the more considerable towns within each, and the description of manufacture carried on.
3. What conditions of outline, climate, and physical geography in general, distinguish Europe from other parts of the globe?
4. Draw (from memory) an outline map of either France, Spain, Italy, or Russia. Show on it the direction of the high grounds, the courses of the principal rivers, and a few of the larger towns.
5. Give some account of the natural features of Germany, as a whole—its mountains, river-basins, &c.—without reference to its political divisions.
6. What are the main conditions in the present political

division of Germany? What changes in this respect were consequent on the war of 1866? What number of German States are there at the present time, and which is most powerful amongst them?

7. In which of the German States are situated, respectively, Magdeburg, Breslau, Gottingen, Leipzig, Nuremberg, Carlsruhe, Heidelberg, Weimar, Darmstadt, Rostock, Kiel, and Frankfort-on-the-Main? Describe briefly the locality of each.

8. Name twelve of the largest cities of the United States; specify which amongst them are on the Atlantic seaboard, which within the valley of the Mississippi, which beyond the Rocky Mountains.

9. Describe briefly the physical features of the Australian continent as a whole. What colonies does it now include?

10. Draw (from memory) a map of one of the Australian colonies, or of New Zealand.

11. Give some account of the currents of the Atlantic Ocean, and particularly of the Gulf stream. How are the currents accounted for?

12. To what regions are the following respectively indigenous:—coffee, cocoa, sugar-cane, clove and nutmeg, cassava (mandioca), tobacco, potatoe, maize, yam, bread-fruit, date-palm, cocoa-nut palm? Give some instances of the changes effected by human agency in the distribution of these or other productions of the Old and New Worlds respectively.

ENGLISH HISTORY.

THREE HOURS ALLOWED.

GENERAL QUESTIONS.

1. Give an account of the social condition of the Britons at the time when this island fell under the notice of Cæsar; and show what improvements were introduced at its conquest by the Romans.

2. How long did the Roman occupation last? State briefly some of the main events which happened during that interval.

3. Write a brief account of the life of Alfred, with the dates; and state what laws and institutions have been attributed to this king.

4. What were the judicial methods in use among the Anglo-Saxons for detecting and punishing civil offences?

5. Give the dates of the Norman Conquest, and the succession of the different Norman kings. Show their relations to each other.

6. What was the subject of dispute between the Norman kings and the Archbishops of Canterbury, and between Henry II. and the Archbishop Thomas à Becket?

7. Give the dates of the following events:—The accession of John—Magna Charta—The Barons' wars—The battle of Lewes—Meeting of the first House of Commons—Conquest of Ireland—Reduction of Wales—Battle of Bannockburn.

8. When did the Plantagenet dynasty commence? When did it close? Mention the names and give the dates of the accession of the most eminent kings of this line.

9. What constitutional advantages were gained under the Plantagenet and Lancastrian kings?

10. How were the claims of the contending factions reconciled by the accession of Henry VII.?

11. Give the dates of the accession of Henry VIII.—The separation of this country from Rome—The death of Cardinal Wolsey—The accession of Edward VI.—Of Elizabeth—The Spanish Armada—The establishment of the Court of High Commission.

12. What was the purpose of the Hampton Court Conference?

13. By what ministers were the counsels of Charles I. successively directed? What were the distinct aims of each, and what the final result?

14. Place these names under the reigns to which they belong:—Lord Bacon, Locke, Burke, Dryden, Spenser, Robert Earl of Essex, the two Pitts, Sir Isaac Newton' Sir Humphrey Davy.

SPECIAL.

(a.) When did the Long Parliament commence and end? How many parliaments were summoned by Charles II.? What were the chief questions in debate between the king and the House of Commons?

(b.) What circumstances tended to foment that jealousy of the Roman Catholics which broke out in the reign of Charles II.? In what actions did that jealousy display itself?

(c.) Give an account of any one of the following statesmen:—The first Earl of Shaftesbury; Edward Hyde, Lord Clarendon; Lord William Russell.

(*To be continued.*)

THE SANCHI TOPE IN CENTRAL INDIA.

The members of the Society will be glad to see the first-fruits of the discussion which followed Mr. Fergusson's lecture on Indian Architecture. This tope is one of the most ancient and remarkable Buddhist architectural remains in India, dating 250 B.C.; and recently an application was made to the Begum of Bhopal, in whose territories it is, by the French Consul-General, M. Place, to allow the principal gateway of the tope to be carried off and set up in Paris!—a cool satire on the apathy with which the Indian Government has hitherto viewed the curious, very ancient, and comparatively unknown architecture of India. But the Begum, who, being a Mahommedan, is indifferent to Buddhist buildings, before consenting to M. Place's proposal, offered the gateway to the Indian Government, to be sent to England. The Indian Government, with highly proper feeling, declined the gift, and recommended that the tope should be properly conserved, and suggested that it would be quite sufficient for France and England to have casts of the gateway, which is of a highly decorative character. In former years, the gateway would probably have found its way to the Place de la Concorde, in Paris. Now, the interest of the Indian Government is awakened, and has begun measures for conserving both this and the numerous other monuments in India, of which the fruits by means of photographs and casts are likely to appear in this country, due allowance being made for the slowness of Indian movements.

Fine Arts.

PALACE OF THE FINE ARTS—VIENNA.—The ceremony of laying the first stone of the Palais des Beaux Arts, in the capital of Austria, took place on the first day of the present month; the Emperor performed the archmason's office, and was attendeed by the Archdukes Charles Louis and William, the Prince Hohenlohe, and all the ministers and high officers of state. Immediately that the stone was sealed, the Society of Orphéonistes sang Mendelssohn's "Chanson des Artistes." The moment chosen for the ceremony was interesting and appropriate, being that of the opening of the general exhibition of German art, which had attracted an immense number of artists to Vienna. The authorities of the city gave a banquet in honour of this the tenth meeting of the artists of Germany, the number of guests amounting to 550, the bourgomaster of Vienna filling the presidential chair, and being supported by the ministers Giskra, Hasner, Taaffe, Herbst, Kuhn, Berger, and many other notabilities. M. Hasner, in proposing a toast, said, German art had never ceased to flourish, during adversity as in prosperity, and the artists of Germany had never ceased to be united; there was but one German school, and he asked the guests to drink to the honour of German art without

distinction or limitation. A grand entertainment was also given to the artists at the Theatre of Vienna.

Authentication of a Famous Picture.—The fine picture of the "Last Judgment," in the church of St. Marie, at Dantzic, which was for many years considered to be the work of Van Eyck, was recently pronounced, by a number of eminent judges of art, to be the production of Memling; this opinion turns out to be incorrect; the picture was, in fact, painted by the Flemish artist Stourbout, as proved by the discovery of the contract by which that painter undertook to execute the work in question for a Milanese nobleman.

Completion of the Restoration of a Cathedral.—A grand ceremony took place the other day at Auteen, to inaugurate the Cathedral of Saint Lazare, in that town, the restoration of which has just been completed, after thirty years' labour, under the direction of M. Viollet-Leduc and M. Durand.

Manufactures.

Extraction of Sulphur from the Ore. — The *Amico del Popolo* of Palermo gives an account of some experiments that were made in the neighbourhood of that city on the 5th of August and following day, for extracting sulphur from the ore, by means of steam at a high temperature. This apparatus belonged to the Sociàtà Privilègiata per li Zolfi, in Italia, and was fully described in the Society's *Journal*, page 445, and the experiments seem to have been most successful, the sulphur being obtained in about two hours from the introduction of the ore into the apparatus. These experiments were attended by the principal proprietors of sulphur-mines in Sicily, and by others engaged in this industry, and seems to have given great satisfaction to all present.

Silvering Glass.—A French chemist, named Dodé, has been engaged for many years in perfecting a new method of preparing looking-glass, and is said to have succeeded. In place of mercury he uses platinum, but so finely divided, that his method is only half as costly as the ordinary one. The platinum is dissolved in nitro-muriatic acid, the excess of the latter being got rid of by evaporation, and the metal left in the state of chloride, and to this is added a certain quantity, not stated, of essential oil of lavender; the platinum immediately abandons the aqueous solution for the essence, which holds it in suspension. Small quantities of litharge and borate of lead are then added, and this mixture is laid on the glass by means of a brush. Finally, the glass is placed in an annealing furnace, which is heated to redness, the litharge and borate of lead are melted, and the platinum adheres firmly to the surface of the glass. In the notice concerning this new process in the *Moniteur Scientific* of Paris, it is stated, that for the application of the new method any kind of glass may be used, even bottle-glass, for the platinum causes all faults to disappear, and, which sounds more extraordinary still, that glass thus prepared is transparent, and may therefore be used for windows. It is difficult to imagine a glass at once transparent and reflecting.

The Mineral Productions of the Zollverein.—In 1866 there were 198 gold and silver mines in the Zollverein, employing 10,212 workmen, and producing 641,001 cwt. of gold and silver ore. The greater part of these mines (viz., 176) are in Saxony, and produced 598,546 cwt. of ore, which may be valued at 1,267,052 dollars. The Prussian mines produced 30,090 cwt. of ore; those of Bavaria 2,850 cwt.; and those of Hainault 17,515 cwt. The total value of the metals obtained from all the German mines (with the exception of those of Hainault), in 1866, amounted to 1,301,431 dollars. The average yearly production from 1861 to 1865 was about 679,039 cwt. In 1867 the gold mines only furnished 310,132 lbs. of ore, valued at 141,791 dollars; of this quantity the mines of Prussia and Brunswick furnished 9,630 lbs., and those of Saxony 234,502 lbs. The production of silver was more important. In 13 smelting works, employing 2,000 workmen, 157,084 lbs. of silver were obtained.

Commerce.

Railways in America.—The American journals give the following statistics of the railways in the United States in 1867:—

	Length.	Opened.
	Miles.	Miles.
Maine	638	512
New Hampshire	667	667
Vermont	661	588
Massachusetts	1,479	1,400
Rhode Island	151	119
Connecticut	793	637
New York	3,820	3,182
New Jersey	964	911
Pennsylvania	4,682	4,192
Delaware	177	160
Maryland	855	606
West Virginia	586	364
Virginia	1,973	1,494
North Carolina	1,367	1,000
South Carolina	1,109	1,007
Georgia	1,750	1,547
Florida	606	439
Alabama	1,577	850
Mississippi	897	897
Louisiana	872	333
Tennessee	1,508	1,326
Kentucky	1,012	634
Arkansas	1,921	113
Texas	2,590	495
Ohio	3,726	3,387
Indiana	2,606	2,306
Illinois	3,607	3,224
Michigan	1,851	1,063
Wisconsin	1,467	1,036
Minnesota	1,646	419
Iowa	2,146	1,209
Nebraska	988	555
Missouri	1,494	984
Kansas	835	494
California	1,098	392
Nevada and Utah	545	30
Oregon	259	19
Total	54,325	38,605
Total in 1866	51,606	36,896
Increase in 1867	2,719	1,709

Export of Oil from Gallipoli.—The exports of oil during the first half of each year, for the last five years, is as follows:—

	Exported.	In store at Gallipoli.
	Salmas.	Salmas.
1864	30,760	12,000
1865	27,950	39,500
1866	41,449	11,800
1867	9,000	10,500
1868	18,352	8,500

Commerce of Albania.—The *Osservatore Triestino* gives the following statistics of the commerce and movement of shipping in the ports of Upper and Central Albania during 1867. The imports at the ports of

Antinari, Scutari, Durazzo, and Vallona amounted in value to 11,142,650 frs., and the exports to 6,367,627 frs. The imports were divided as follows:—Austria, 6,876,405 frs.; Italy, 1,635,547 frs.; Greece, 1,251,727 frs.; Turkey, 1,378,971 frs. The exports were:—Austria, 3,654,399 frs.; Italy, 1,502,853 frs.; Greece, 698,218 frs.; Turkey, 512,152 frs. Manufactured goods figure for about half the amount of the imports, and colonial products for a quarter. The first consist principally in cloths, linens, cottons, fez, and stuff of every kind. The cloths are principally imported from Venice, and the other stuffs from Trieste. Austria and Greece furnish the colonial articles; Italy a great quantity of paper, hardware, glass, rice, and pastes; Tunis, articles of silk and iron; Marseilles, varnished leathers, looking-glasses, and fowling-pieces. Cereals form nearly one-half of the export trade, and are shipped principally from the ports of Durazzo and Vallona. The next in importance are skins, oil, salt, wax, silk, and flax. With the exception of a small quantity which is shipped to Greece, nearly the whole of the Albanian wool is exported to Trieste and Venice. The greater part of the cereals are exported to Austria, and a small quantity is exported to the southern provinces of Italy on the Adriatic. The movement of shipping during 1867 was as follows:—

Steam-ships.

		Tonnage.
Arrivals	452	77,399
Departures	450	70,329

Of these, 444 belonged to the Austrian Lloyds, and 4 to an Albanese Company. The departures of sailing vessels amounted to 1,112, of a total tonnage of 30,349; of these, 94, of 3,241 tons, sailed for Austria; 84, of 2,966 tons, for Italy; 398, of 2,579 tons, for Greece; and 540, of 14,558 tons, for Turkey. The arrivals from Austrian ports were 95 vessels, of 3,308 tons; 82, of 2,898 tons, from Italian ports; 397, of 9,481 tons, from Greece; and 528, of 14,706 tons, from Turkey.

THE VINTAGE IN FRANCE.—The production of wine in France, according to the *Constitutionnel*, was 68 millions of hectolitres (1,496,657,356 gallons) in 1865; in 1867 it was 65 millions of hectolitres (1,430,628,355 gallons); and this year the vintage is estimated to be 72 millions of hectolitres (1,584,696,024 gallons).

Colonies.

HARBOURS AND RIVERS.—The residents of Paramatta are agitating for the stationing of a steam dredge in the river Paramatta, to deepen the course of navigation; and their claim is based principally upon the advantage it would confer upon the residents on the north bank of the river, who are producers of fruit to a large extent, and which could be conveyed to market easily by the natural highway. The plant recently employed in the improvement of the Wollongong Harbour has been removed to Kiama, and the work of dredging will be immediately commenced there. The snagging operations on the Murray are being energetically carried out. There are now on that river two steam-winch parties and two hand-winches, under the pay of the New South Wales Government, besides the Victorian party. As the result of one season's work of the New South Wales party, it may be stated, that by the time the navigation opens, about seventy miles of water, from Wahgunyah to Albury, will have been rendered navigable with ordinary care on the part of the steamboats' crews. It is the general opinion that the snagging system now used on the Murray is one that is sufficiently good for all practical and economic purposes.

NEW ZEALAND.—The whale fishery is commenced, and if the season continues as well as it has commenced it will be a very successful one. Numbers of whales were seen in the Straits during rough weather, but it was much too dangerous to attempt to follow them.

REVENUE.—The quarterly return of the revenue for South Australia show the receipts have been £170,360, being a falling off of £10,000 on the corresponding quarter last year. The expenditure was £183,000.

LABOUR IN NEW SOUTH WALES.—The colony is just now undergoing depletion of a very injurious kind, its most useful workmen deserting it by hundreds and thousands. A new gold field has been discovered in Queensland, and as it is about 1,200 miles distant, and very little is yet known in regard to it, it has attractions for Victorian miners which they seem unable to resist. Accordingly, they are throwing up their work, and hurrying away to take their luck at the new diggings. The men are not leaving the colony because they are badly off, but because they have available money for the gratification of the impulse which has seized upon them, and something to support their wives and families in their absence. The emigrating miners will start with from £10 to £25 in their pockets, and leave as much behind, a sum which falls to the share of few labouring men in Great Britain. It is worthy of remark also, that these men are running away from £2 5s. a-week for eight hours' work a day, and excellent meat at 2d. a pound.

WESTERN AUSTRALIA.—Since the commencement of the administration of the present governor, in 1862, the revenue has increased from £60,425 to £77,652 in 1867; our exports from £10,708 to £157,886; our imports from £162,296 to £216,290; and the population from 17,000 to 21,719. During the period under review we have emerged from the condition of a breadstuff importing community to that of an exporter of that article, owing to the very judicious land regulations formed under Governor Kenneday's auspices, by which our agricultural lands were placed within the means of occupation of the working classes; and the price of grain has fortunately never fallen below what would remunerate the grower. During the same period also the value of wool has been unprecedentedly high; and although our stock owners met with a serious drawback in the spring, in the shape of drought, they have, on the whole, prospered greatly.

SUGAR.—The progress of sugar-growing has occupied a considerable degree of attention in the colony of New South Wales since last mail, and considerable impetus will no doubt be given to that branch of industry by the proposal of a local refining company, if sufficient inducement offer by the growth of cane, to erect mills in the central sugar-growing districts for the convenience of the planters. There is also a movement going forward for the erection of mills under partnerships, working under the law of limited liability. In the Hastings district sugar of colonial growth is coming into domestic use; and Mr. Meeres, who has sold a quantity, grown and manufactured on his plantation, at full rates, is about sending his molasses to England. It is believed that there were, in 1867, about 280 acres of ground at the Hastings River under cane crop, 250 acres on the Lower and Upper Manning. As evidence of the adaptability of soil and climate, it may be mentioned that one grower, who has been endeavouring to induce the farmers of the colony to plant cane since 1825, reports that upon good land, duly treated, from eight to twelve crops can be obtained from one planting.

Notes.

WHEAT CULTIVATION.—Mr. Read, the member for Norfolk, in a paper lately read before the British Association, says:—"There can be no doubt that the yield of wheat in Norfolk has greatly increased during the past twenty-five years. From only one part of the country have my correspondents intimated that there is but little change. This comes from some of the best land in Norfolk, where great crops of wheat were common full fifty years ago. The repetition of wheat on

these soils may be more frequent, but the yield does not seem to have perceptibly increased. And until we discover some chemical manure—some soluble silica for instance—that will strengthen the straw in moist seasons and enable it to bear a large and fuller ear, any increase of yield in these fertile districts must remain in abeyance, for already the greatest loss is incurred from the crop lodging at an early period of its growth, and the more the crop is forced the more this tendency of the straw to go down increases. Thin and early sowing, with a thorough consolidation of the land, may in a measure alleviate this increasing difficulty, but once let the chemist show us how to stiffen the straw of our cereals, and then the produce, for aught we know, may be doubled unless they should be smitten with blight and mildew—diseases which so frequently attack over-stimulated crops. On the thin chalks and light lands of Norfolk, the yield and extent of wheat is increased. Twenty-five years ago it was considered that twenty-six to twenty-eight bushels per acre was the full average yield of wheat for the county. In 1854 Sir J. Walsham estimated it at thirty bushels, and I think we may now put it at thirty-two bushels or four quarters per acre, but this is fully four bushels an acre over the average of the last four years—including, of course, the present harvest. The extraordinary difference of the yield of wheat on moderately light land farms, in dry or moist seasons, has been furnished me by more than one large occupier. I will not give the details, but simply state that the produce has occasionally nearly reached forty-eight bushels per acre, and has frequently been less than twenty, and one year barely reached twelve, while the money return has been in a good season fifteen guineas per acre, and in a very bad one little over £3."

Chinese Library at St. Petersburg.—The *St. Petersburg Gazette* says that there is now in the Russian capital the richest Chinese library in the world, It consists of 11,607 volumes; 1,168 wood engravings, and 276 manuscripts. The books are on all sorts of subjects, and amongst them there are several rare works. One or two of them are unique, there being no other copies, even in the largest libraries in China. The library was collected by M. Skatchoff, now Consul-General in Pekin, during a residence of fifteen years in the Chinese empire. Recently M. Skatchoff offered to sell it for 9,000 roubles (3s. 1½d. each) to the Imperial Library of St. Petersburg, and the Russian Academy of Sciences, but both institutions were compelled to decline the offer for want of funds.

Agricultural Exhibition at Catania.—The first agricultural exhibition, now open at Catania, extends from the 8th to the 19th of September, 1868. This exhibition consists of the agricultural produce, implements, and animals of the Sicilian provinces.

The Mont Cenis Tunnel.—During the first fortnight of the present month (August) the progress made at the Mont Cenis tunnel was 34·95 metres, of which 13·70 was driven on the Italian side at Bardonnèche, and 21·25 at Modane on the French. The position up to the 15th August was as follows:—

	Metres.
Length driven at Bardonnèche	5,132·70
" " Modane	3,549·27
Total length of tunnel driven	8,681·95
Length remaining to be driven	3,538·05
Total length of tunnel ..	12,220·00

Correspondence.

Sir,—Will you allow me to suggest, through the medium of your *Journal*, that Government might, at a small expense, greatly assist in the diffusion of information upon many important public questions and subjects, if they would forward to mechanics' institutions, through the Society of Arts, copies of some of the more interesting Blue-books that are published. At present Blue-books are practically inaccessible to the large majority of people; and as they contain most valuable and authentic information, this is to be greatly regretted. I would also suggest that the British Association for the Advancement of Science, the Social Science Congress, and other learned and scientific societies, should forward to mechanics' institutions, through the Society of Arts, copies of their printed "reports" and "transactions." Doing this would be, in some degree, carrying out the objects for which these societies are established, viz., the promotion and promulgation of knowledge.—I am, &c., Duncan A. Shaw, Hon. Sec. to Slough Mechanics' Institution.

Slough, 7th September, 1868.

Patents.

From Commissioners of Patents' Journal, September 11.

Grants of Provisional Protection.

Animal and vegetable substances, preserving—1475—W. Estor and M. Terrero.
Bedstead and travelling trunk combined—2721—A. M. Clark.
Bedsteads, metallic—2661—E. Peyton.
Boots, waterproof—2701—T. Toms.
Bottle corks—1517—G. F. Griffin.
Bottles, cases for packing—2695—L. F. A. P. Riviere.
Breakwaters—2671—R. Saunders.
Candlesticks—2559—W. J. Hinde.
Coal, &c., agglomerating—2677—W. E. Gedge.
Cotton, &c., preparing—2679—E. Jackson and J. Ogden.
File-planing machines—2413—H. Moritz and J. Reinach.
Fire-arms, breech-loading—2657—J. Hanson.
Fountains—2553—H. Reissmann.
Furnaces—2659—T. Wrigley.
Glass furnaces—2705—W. W. Macvay.
Hinges, swing-door—2685—S. Newton.
Ice, packing and storing—2719—A. C. Kirk.
India-rubber, &c., manufacturing porous or spongy substances from—2715—T. Forster and J. Heartfield.
Iron and steel tubes, finishing and welding—2713—J. Evans.
Looms—2173—W. Hadfield.
Looms—2653—W. Houghton.
Pianofortes—2703—E. Jobson.
Printing machines, lithographic, &c.—2673—C. H. Gardner.
Sewage, apparatus for dealing with—2667—W. Strang.
Sewing machines—2669—T. Henderson.
Ships' propellers—2275—R. Smyth.
Smoke-consuming apparatus—2663—D. Smith.
Steam engines—2687—T. Lester and W. Trueman.
Steam engines, working—2681—E. L. Paraire.
Stone, &c., cutting, &c.—2603—J. Elliott.
Telegraph wires, insulators for—2707—J. H. Greener.
Telegraphs—2665—N. J. Holmes.
Telegraphs—2683—C. F. Varley.
Turbines, apparatus for warding off leaves and other matters likely to clog the working of—2693—W. E. Gedge.
Windows, &c., rendering air and water tight—2655—E. Zoepfel.
Wire rigging, relieving coupling for—2691—W. R. Lake.

Inventions with Complete Specifications Filed.

Alimentary substances, regenerating certain—2706—H. A. Bonneville.
Fire-arms, breech-loading—2712—J. F. C. Carle.
Stones, &c., artificial—2759—C. Holland.

Patents Sealed.

843. F. A. Paget.	901. W. E. Gedge.
847. H. Fletcher.	907. J. and J. Thompson.
857. J. H. Maw.	919. G. Martin.
861. M. Rowand.	927. S. Wenkheim.
863. C. S. Möller.	981. W. R. Lake.
873. J. P. Knight.	1029. W. Oram.
875. F. Mulliner.	1355. J. Bernard.
879. P. F. Gubault.	1959. D. Elder.
889. F. H. and C. A. Elliott.	2091. G. Bower.

From Commissioners of Patents' Journal, September 15.

Patents on which the Stamp Duty of £50 has been paid.

2071. M. H. Blanchard.	2342. J. Dodd.
2310. J. Brigham & R. Bickerton.	2350. T. and T. L. G. Bell.
2371. J. H. Johnson.	3136. T. L. Nicklin.

Patent on which the Stamp Duty of £100 has been Paid.

2365. W. Stableford.

Journal of the Society of Arts.

FRIDAY, SEPTEMBER 25, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or " churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed " Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

"ON FOOD." By DR. LETHEBY, M.A., M.B., &c.

LECTURE IV., DELIVERED MONDAY, FEBRUARY 10TH.

Preservation of Food—Unwholesome and Adulterated Food.

(*Continued from page* 748).

I come now to the last division of our subject—namely, that which relates to the sale and use of *unsound* and *adulterated food* ; and perhaps the most important of this kind of food is *bad meat*—that is, meat which is unwholesome on account of putridity or disease. Food of this description has always been a subject of legal prohibition. Among the Jews the prohibition dates from the time of Moses, who is supposed to have received from the Lord, during his sojourn upon Mount Sinai, certain oral commandments respecting the slaughtering of animals for food, and the examination of their bodies for disease. There is no account of these commandments in the written law, but they were evidently communicated to the people of Israel by Moses, for he says, " thou shalt kill of thy herd, and of thy flock, which the Lord hath given thee, *as I have commanded thee*—(Deut., chap. xii., v. 21). It is presumed, therefore, that these instructions were very specific, and they have been practised by the Jews from that time until now. The Hebrew law is, that no flesh shall be eaten, except of animals that have been killed and searched, or examined, by the officer (*bodek*) appointed for that purpose; and the most precise rules are laid down for his guidance in these matters. In fact, he is bound by very solemn obligations to declare of every animal that he kills, whether the flesh is proper to be eaten (*caser*), or is unfit for food, by reason of its being diseased or torn (*trefa*). This expression appears to have been derived from an ordinance of Moses, that no flesh should be eaten that is torn in the field (Exodus, chap. xxii., v. 31) ; the word torn (*trefa* or *terefa*) being supposed, according to the traditions of Hebrew sages, to apply not only to animals torn in the chase, or by wild beasts, or by the bungling act of the butcher, but also to those affected with any disease that would shorten their lives ; and as it is thought that such disease is always indicated by the condition of the lungs, the utmost care is taken by the searcher or *bodek* in the examination of these organs. His rules or instructions for this purpose are very strict ; but generally it may be said that he condemns as unlawful, or unfit for food, the flesh of all animals in which the lungs present the following appearances :—Certain deficiencies, excess, or displacement of the lobes ; adhesions, or false membranes ; tubercles, or abcesses containing matter or opaque water ; discolourations which do not disappear when the lungs are inflated ; ulcers, holes, and abrasions letting air through them ; consolidations that are impervious to air, and rottenness of tissue. Many of these are, no doubt, unimportant evidences of disease, and, therefore, although the flesh of such animals is rejected by the Jew, it is freely consumed by the Christian. The Jews, indeed, make a sort of bargain with the unorthodox butcher, to take only such animals, when slaughtered by their officer, the bodek, as he considers lawful, and the rest are sold to the public. I dare say this has been the practice at all times, for there are frequent references to it in our legal and domestic records. In *Liber albus*, for example, there is a memorandum to the effect that on the 24th of June, 1274, certain discreet men of the city were summoned before the king's council, to answer the question as to what was done with the unclean flesh of the Jews, and whether it was lawful for Christians to buy and eat the same. Their answer was, that if any citizen bought such flesh of a Jew, he would be expelled, and if convicted by the sheriff he would forfeit such flesh, which

would be given to lepers or dogs, and he, in addition, would be heavily fined. To which the council replied that they commanded them in the king's name, to have the custom strictly observed. I fear, however, from the legal records of *Liber albus*, that less attention was paid in those days to the sale of diseased meat than to that of putrid meat; for, on examining the accounts of the citizens made and rendered in divers courts of the king, I find that while "judgment of pillory" is recorded in twenty-one cases for selling putrid meat, poultry, or fish, there is not a single instance of a like punishment for selling the unclean meat of the Jews.

In ancient Rome there were overseers appointed to examine the meat in the public markets before it was sold, and butchers were often fined for neglecting the law in this respect. Mr. Charles Reed has given us an example of this from the *Acta Diurna*, or Roman Gazette of 585 years after the building of Rome, which when translated, runs thus:—A. U. C. DLXXXV. Fourth of the kalends of April. The fasces, with Licinius, the consul, and Lertinus, ædile, fined the butchers for selling meat which had not been inspected by the overseers of the markets. The fine is to be employed towards building a chapel to the temple of the goddess Tellus.

In modern times, also, severe regulations have been made in all the States of Europe for the government of this matter, and in many cases particular instructions are given as to the kind of disease which renders meat unfit for human food—it being the practice to examine the animal while alive, and its carcass when dead. This examination is entrusted to properly-qualified officers, who are bound to condemn diseased and putrid meat, as well as the flesh of animals that have died otherwise than by the hand of the butcher; and no meat can be sold until it has undergone such an examination. In this country, however, although there are laws prohibiting the sale of unsound and unwholesome food, yet there is no provision for the systematic inspection of meat, even when it has reached the public shambles. All that the law declares is, that the local authority may, if it pleases, appoint an officer for that purpose; and as the appointment would cost money, and is not compulsory, it is rarely made. Practically, therefore, there is, except in a few places, an almost unchecked traffic in diseased and unwholesome meat; and the worst descriptions of it are generally sold to the poor at night.

Our forefathers made stringent rules to prevent this; for, among other things, they ordained "that butchers shall close their shops before candle-light, and shall not sell flesh meat by light of candle."—(*Liber albus.*)

Within the city of London the inspection is performed as carefully as it can be, but, nevertheless, amidst the confusion of business in the early hours of morning, a great deal of unsound meat escapes the notice of the inspectors. In fact, if it were not for the assistance afforded to them by the salesmen of the markets, it would be absolutely impossible to check, to any large extent, the sale of unwholesome meat; for, in the three markets of the city—Newgate, Aldgate, and Leadenhall, as much as 400 tons of meat are sold daily. It is brought from all parts of Great Britain and Ireland, as well as from Belgium, Holland, and France, and even from the ports of the Baltic. Of this, a large quantity is diseased, and it comes chiefly from our own country towns, where it is a common practice to forward to London everything that is unsaleable at home. I cannot tell what is the actual proportion of bad meat to good, but we seize and condemn about two tons a week, and this is in the proportion of one part to 750. Last year the amount of meat condemned as unfit for food was nearly 129 tons, and in the preceding year it was more than 152 tons. In fact, during the seven years which have expired since the inspectors were appointed under my recommendation, we have seized and destroyed 1,567,810 lbs., or just 700 tons of meat as unfit for human food. Of this quantity, 805,653 lbs. were diseased, 568,375 lbs. were putrid, and 193,782 lbs. were from animals that had not been slaughtered, but had died from accident or disease. It consisted of 6,640 sheep and lambs, 1,025 calves, 2,896 pigs, 9,104 quarters of beef, and 21,976 joints of meat; besides which, there were also seized and condemned in the city markets on account of putridity, 19,040 head of game and poultry, 207 quarters of venison, and above seven millions of fish, together with thousands of bushels of whelks, shrimps, periwinkles, &c.

It is to be regretted that in the various Acts of Parliament which relate to the condemnation of unsound meat, there are no special rules for the guidance of the officers appointed to investigate this matter—there being only a very loosely-worded general provision to the effect that the medical officer of health, or the inspector of slaughter-houses, or the inspector of nuisances, may, at all reasonable times, inspect and examine any animal, carcass, meat, poultry, game, flesh, fish, &c., exposed for sale, or deposited in any place for the purpose of sale, or in preparation for sale, or intended for the food of man; and in case it appears to the medical officer of health, or the inspector, to be diseased, or unsound, or unwholesome, or unfit for the food of man, it shall be lawful for him to seize the same, and for a justice to order it to be destroyed. In this regulation there is no particular reference to the kind of food which is unwholesome, or to the circumstances which render it so, and, therefore, much is left to the discretion of the officer who examines it. In the city of London the practice is to condemn the flesh of animals infected with certain parasites, as measles, flukes, &c.; and of animals suffering from fever or acute inflammatory affections, as rinderpest, pleuro-pneumonia, and the fever of parturition, and of animals emaciated by lingering disease, and those which have died from accident or from natural causes, as well as all meat tainted with physic, or in a high state of putrefaction. A little practice is required to distinguish meat of this description, but, generally, it may be said that good meat has the following characters:—

1st. It is neither of a pale pink colour nor of a deep purple tint, for the former is a sign of disease, and the latter indicates that the animal has not been slaughtered, but has died with the blood in it, or has suffered from acute fever.

2nd. It has a marbled appearance from the ramifications of little veins of fat among the muscles.

3rd. It should be firm and elastic to the touch, and should scarcely moisten the fingers—bad meat being wet, and sodden, and flabby, with the fat looking like jelly or wet parchment.

4th. It should have little or no odour, and the odour should not be disagreeable, for diseased meat has a sickly cadaverous smell, and sometimes a smell of physic. This is very discoverable when the meat is chopped up and drenched with warm water.

5th. It should not shrink or waste much in cooking.

6th. It should not run to water or became very wet on standing for a day or so, but should, on the contrary, dry upon the surface.

7th. When dried at a temperature of 212° or thereabout, it should not lose more than from 70 to 74 per cent. of its weight, whereas bad meat will often lose as much as 80 per cent.

Other properties of a more refined character will also serve for the recognition of bad meat, as that the juice of the flesh is alkaline or neutral to test-paper, instead of being distinctly acid; and the muscular fibre when examined under the microscope is found to be sodden, and ill-defined.

The signs of parasitic diseases are not always observable without careful examination. In the case of the fluke in the livers of sheep, and of measles in pork, and of hydatids in the brain or liver, the nature of the disease is at once discoverable, but it is not so with the smaller measles or cysticerci of beef and veal, and it is still less so with the trichina of pork—the microscope being required to reveal their presence.

And here, perhaps, we may ask, *what are the effects of*

diseased or putrid meat on the human system? The question is undoubtedly very difficult to answer, for while, on the one hand, we have abundant evidence that such meat may frequently be eaten with impunity, so on the other we have many remarkable instances of injury occasioned by it. In Scotland there is a disease called *braxy*, which attacks the sheep and lambs in spring and early summer. It is the cause of at least half the deaths in the flock during the year. The disease kills the animals very quickly by causing stagnation of blood in the most important vital organs; and as the carcass is the perquisite of the herdsman, he most invariably eats it—taking the precaution to remove the offal, and to cut away the darker portions of the flesh where the blood has stagnated. He also salts it before he uses it; and if questioned on the subject he will tell you that the meat is not unwholesome. Every now and then, however, when perhaps the diseased parts have not been entirely removed, or when the salting has not been sufficiently prolonged, or the cooking has not been thoroughly effected, the most serious consequences result from it, insomuch that many medical practitioners who are acquainted with the habits of the Scotch shepherds in this respect, and have seen the mischief occasioned by the meat, declare that braxy mutton is a highly dangerous food for man. Again, it is a common practice with farm-labourers to eat the flesh of sheep affected with staggers, which is a parasitic disease of the brain; and even of animals dying from acute inflammatory diseases. There is a story told on the authority of Dr. Brücke, the professor of physiology in Vienna, that some years ago, when the *steppe-murrain* was prevalent in Bohemia, and the infected animals were killed and buried by order of the government, the poor people dug up the carcasses of the dead bullocks, and cooked them, and ate them, without injury. In this country also, during the prevalence of *rinderpest* in 1863, enormous quantities of meat from the diseased animals were sent to market, and sold and eaten. The same has been the case with the carcasses of animals suffering acute *pleuro-pneumonia;* and if, as Professor Gamgee says, the practice of making salvage out of diseased animals is so common, that at least one-fifth of the meat which is sold in the public markets is diseased, we may well ask, in the words of Mr. Simon, how it is that some sort of pestilence is not bearing witness to the fact? How it is that cattle having all the foulness of fever in their blood, or having local sores and infiltrations, that yield one of the deadliest of inoculable morbid poisons, or having their flesh thronged with larval parasites, do not when slaughtered and eaten produce a general poisoning? Parent Du Chatelet has commented in very forcible language on the apparent immunity from disease even when the most foul and loathsome of animal foods are eaten. But is it not possible that the danger is averted by the operation of cooking? Not that the human stomach has not also a wonderful protective power in its own natural functions; for the deadly poison of the cobra or the rattle-snake may be swallowed with impunity. It is possible, however, that these safeguards may fail us occasionally, and then it is perhaps that the most serious consequences arise. I have often had to investigate cases of mysterious disease which had undoubtedly been caused by unsound meat. One of these, of more than ordinary interest, occurred in the month of November, 1860. The history of it is this: a fore-quarter of cow-beef was purchased in Newgate Market by a sausage-maker who lived at Kingsland, and who immediately converted it into sausage meat. Sixty-six persons were known to have eaten of that meat, and sixty-four of them were attacked with sickness, diarrhœa, and great prostration of vital powers. One of them died; and at the request of the coroner, I made a searching inquiry into the matter, and I ascertained that the meat was diseased, and that it, and it alone, had been the cause of all the mischief. Dr. Livingstone tells us that when the flesh of animals affected with pleuro-pneumonia is eaten in South Africa, by either natives or Europeans, it invariably produces malignant carbuncle. He says, indeed, that the effects of the poison were often experienced by the missionaries who had eaten the meat, even when the presence of the disease was scarcely perceptible; and in many cases when the Backwains persisted in devouring the flesh of such diseased animals, death was the consequence. The virus, he says, is neither destroyed by boiling nor by roasting, and of this fact he had innumerable instances. Now, it is a remarkable circumstance that ever since the importation of this disease (pleuro-pneumonia) into England from Holland in 1842, the annual number of deaths from carbuncle, phlegmon, and boils, has been gradually increasing. In the five years preceding that time the mortality in England from carbuncle was scarcely 1 in 10,000 of the deaths; from 1842 to 1846 there is no record of the disease; but in the next five years, from 1846 to 1851, the mortality rose to 2·6 per 10,000 of the deaths; and in the next five years it amounted to 6·2 per 10,000; and in the succeeding five years to 5·4. In the case of phlegmons, the increase in the mortality is still more remarkable, for it rose from an average of 2·5 per 10,000 of the deaths in the five years preceding the importation of the disease, to 81 per 10,000 in the ten years from 1847 to 1856. The Registrar-General of Scotland has directed public attention to this fact, saying that deaths from carbuncle are on the increase, and that the mortality from it has been getting larger and larger ever since the lung disease of cattle was imported into Scotland. This accords with the experience of medical practice; but as it is very difficult to trace the immediate connection of bad food with subsequent disease, there being so many circumstances to weaken the connection, it is not surprising that differences of opinion should exist as to the morbific effects of unsound meat; nothing, in short, but an experimental inquiry into the subject, as has already been done in Germany in the case of parasitic diseases, will bring the question to rest; and I see no reason why such an investigation should not be made on the persons of those who send diseased meat to the public market for sale; for, as the common defence of their conduct is, that the meat is good for food, they cannot surely object to the penalty of being made to eat it. Here, for example, is a specimen of pork covered with pustules of small-pox; it was seized by one of the City officers on the road to a notorious sausage-maker, and it may, notwithstanding its disgusting appearance, be good and wholesome food; then why not put the question to the proof by making the vendor of it eat it? In the year 1862, when small-pox was prevalent among the sheep in several parts of England it was a common practice to send the carcasses of diseased animals to the London markets for sale as human food. Later still, in 1863, there was an epidemic of what seemed to be scarlet fever among the pigs of this metropolis, and their carcasses, with all the bright crimson look of the disease, were invariably sent to market for salt as food. Since then the London pigs have been the subject of a virulent spotted fever, of the nature of typhus, and these also have been killed in the last stage of the disease, and sold for food. Abundant illustrations of this kind are constantly coming under my notice; and I feel that the question of the fitness of such meat for food is in such an unsettled state that my action in the matter is often very uncertain, and I should like to have the question experimentally determined; for, as it now stands, we are either condemning large quantities of meat which may be eaten with safety, and are, therefore, confiscating property, and lessening the supply of food, or we are permitting unwholesome meat to pass almost unchallenged in the public markets.

As regards the injurious quality of meat infected with parasitic disease there can, however, be no question; and, perhaps, of all such infections, the most terrible is the *trichina* of pork. Fortunately, it is a rare affection in this country, although it is often common in Germany. The pork infected with the worm is generally darker

than usual, on account of the irritating or inflammatory action of the creature lodged in the muscles; and when the parasite is encysted the meat presents a speckled appearance—the minute white cysts containing the worm being just visible to the naked eye. Here are specimens of it in both its encysted and non-encysted conditions; and this diagram represents the appearance of the worm when it is examined under the microscope. It is, as you see, a minute thread-like worm, about the thirtieth of an inch in length, coiled up in a spiral form; hence its name, *trichina spiralis*. It is generally found in the human subject in an encysted state, when it has passed beyond its dangerous condition, and has become harmless. In most cases, when thus discovered, there is no record of its action, and therefore it was once thought to be an innocent visitor; but we now know that while it was free—that is before nature had barricaded it up in the little cyst, its presence was the cause of frightful disorder—killing about 50 per cent. of its victims in terrible agony. In Germany, there have been frequent outbreaks of the disease, which, for a time, baffled the skill of the most experienced physicians; in fact, we hardly know how long or how often the disease has attacked the pork-feeding population of Europe, for its actual nature was unknown until the year 1860, when Dr. Zencker, of Dresden, discovered the pathology of the disease. Since then there have been several visitations of it, as at Plauen, in Saxony, in 1862; at Hettstadt, near Eisleben, in 1863; and at Hedersleben, near Magdeburg, in Prussian Saxony, in 1866. In all these cases the same symptoms, or nearly the same, were observed; there was sometimes immediate disturbance of the digestive functions, but more commonly a day or two elapsed before any particular symptom was noticed, and then there was a feeling of lassitude, with a loss of appetite, and pains in the head and back. Then followed a serious disturbance of the alimentary canal, with vomiting and diarrhœa. This lasted for a day or two; and by the end of a week after the worm had been eaten fever had set in, which became more and more severe, and by that time the young worms which had been hatched in the body had migrated to the distant muscles, causing the most excruciating pains, so that the patient, fearing to move his inflamed muscles, would lie motionless upon his back; and if he did not die in this state of the disorder nature came to the rescue, and imprisoned the creature by surrounding it with a fibrinous cyst, where it lives for years, being ready at any moment to acquire activity when it is swallowed and released from its cell. Indeed, the way in which it becomes dangerous is this —flesh infected with the parasite is eaten; and the cyst being quickly dissolved by the gastric juice, the creature is set free. Finding itself in the midst of nourishing food it rapidly grows, so that in two or three days it is three or four times its original size, and may be easily seen, like a bit of fine thread, with the naked eye. The worms are of different sexes, and they rapidly come to maturity—each female giving birth to from 300 to 500 minute thread-like worms, which immediately set out upon their travels, piercing the walls of the intestines and migrating to distant parts of the body, where they produce the terrible mischief I have described. Although the pig is the animal which is most commonly infested by it, yet it has been found in the muscles of dogs, foxes, badgers, sheep, moles, hedghogs, rats, mice, frogs, and most carnivorous birds, all of which must have been subjects of the disease, but none appear to suffer from it like man; even children are less affected by it, for they seem to sleep it away. Fortunately, there is an easy method of discovering its presence in animals, for the most certain seat of the creature is in the muscles of the eye; we have therefore only to examine these muscles with the microscope to declare whether the meat is infected or not; and, at the present time, the saussage-makers of Germany have the pork examined in this manner before it is used for food.

Other parasitic creatures, as *measles* in pork, and the smaller *cysticerci* of beef and veal, are found as little sacs or bladders diffused through the lean of the meat—the *cysticercus* or *measle* of pork being easily seen, for it is as large as a hemp-seed. Here are specimens of it in a fresh condition, which were seized in the City markets to-day; but the cysticercus of other animals is much smaller, and requires careful exploration to discover it. In both cases the sac contains a little creature with a sort of tuberculated head, crowned with a coronet of hooks, and having a bladder-like tail attached to it. Soon after it is swallowed, the enclosing sac is dissolved by the gastric juice, and the creature being liberated passes into the intestines, and there fixes itself by its little hooks, and quickly grows, joint after joint, into a tape-worm. In the case of the cysticercus of pork, it forms the variety of tape-worm called *tenia solium*, and in that of beef and veal it produces the *tenia mediocanellata*. The latter is the most common variety of it in the human intestines, and it is frequently seen where raw, or nearly raw, meat is made use of, as in Abyssinia and in Russia, where children are allowed to suck a piece of raw beef, on the supposition that it has a strengthening property. Each segment of the worm is an independent creature, containing myriads of ova, and when passed by the bowels, it gets with the manure upon the land and is eaten by pigs, oxen, and goats; the ova are then hatched in the stomach, and they pass, as in the case of the trichinia, through the walls of the intestine, and migrate to the muscular tissues of the body, where they become encysted, and form the little sacs or measles, which remain dormant for years, though they are ever ready to become tape-worms directly they are eaten. In this manner the creature is perpetuated, first as a tape-worm, with joints in the intestines of one animal, and then as a measle or larva in the muscle of another, and then again as a tape-worm. By a like process the *tenia chinococcus*, or little tape-worm of the dog, becomes the *hydatid* in man and other animals. In Iceland the dogs are very liable to this infection, and the cattle and sheep, as well as man, suffer from the hydatid of it. The subject has been well investigated by Dr. Leared, who has shown that the practice of giving the diseased offal of the slaughtered animals to dogs, causes tape-worm, and the dogs drop the segments of the worm, filled with ova, upon the pastures and into running water. By this means they enter the bodies of cattle and sheep, and even of man, and then, as in the last case, the ova quickly become developed, and the young hydatid or larva tape-worm, piercing the walls of the alimentary canal, migrates to distant parts, and finding a suitable nidus for its growth, it slowly becomes a large bladder-like *hydatid*. In the case of the sheep it often selects the brain for its habitat, and produces the disease called *staggers*; in the oxen it grows in the peritoneal cavity; and in man it haunts the liver, occasioning frightful disturbance of the system, and causing one-sixth of the total mortality of that country. Here are specimens of the disease from the human subject.

Again, there is another class of parasite called *trematoda*, or *flukes*, which infest the livers and intestines of men and herbivorous animals. The most common of them is the *distoma hepaticum* or *liver-fluke* of the sheep. In wet seasons the animal is so constantly infested with them, and suffers so much emaciation from them, that the disease is called the rot. You have before you infected livers which were seized in our public markets this very day, and there is no difficulty in obtaining specimens of them at almost any time. A few years ago (1863), when Professor Brown was lecturing on the liability of animals to disease from the present mode of feeding them, he said that once, when he wanted some animals for dissection, and applied for them to a large butcher, he received back five or six animals, which, though in a bad state of rot, were dressed for the market; and he was told by a certain individual not far from

London, that within the space of six months he had killed no less than 750 of such animals, in a state of extreme disease, and he believed they were all sent to market and sold for food. What becomes, he says, of the hundreds and thousands of rotten sheep which we see in the fields? To bury them would require whole catacombs; the real catacombs are the intestinal canals of the human body. The way in which the disease is produced in sheep is curious. Ova are passed from the gall-bladder of infected animals into the intestines, and so upon the land; finding a moist situation they are soon hatched into ciliated embryos, which swim about and become developed into cylindrical sacs of minute hydatids; these attach themselves to some mollusc, as a small snail. In wet weather the infected snails crawl upon the grass, and are eaten by the sheep, and then the hydatid speedily changes his condition and becomes a fluke. When it is found in the body of man it has, perhaps, been drunk with water or eaten with some aquatic plant, as water-cress, &c.

Our safety against these intruders is to cook the meat thoroughly.

The flesh of animals that have been excited before death, as by over-driving, or by torture, has frequently proved unwholesome. A remarkable instance of this is quoted by Liebig, in his Letters on Chemistry, where a family of five persons were made seriously ill by the flesh of a roebuck which had been caught in a snare, and had struggled violently before death.

It is, moreover, a curious fact, that meat may be even poisonous from the nature of the food made use of by animals shortly before they are killed; and this, too, without any indication of disorder in the animals themselves. Hares which have fed upon the *Rhododendron chrysanthemum* are frequently poisonous; the same is the case with pheasants in Pennsylvania and Philadelphia, which feed during the winter and spring on the buds of the laurel (*Calmia latifolia*); and I have known many instances of serious mischief from prairie birds, which are now largely imported into this country from America, and I attribute it to the food made use of by the bird. In certain districts of North America, especially on the Alleghany mountains, the flesh of all the cattle is poisonous, and so also is the milk they yield, and the cheese which is made from it. Oysters, mussels, lobsters, and crabs have frequently caused disturbance of the human system; and the probability is that they were made unwholesome by the food which they had eaten. A singular case is recorded in the medical journals of France in 1842, where a whole family at Toulouse were poisoned by a dish of snails, the animals having been gathered from a poisonous shrub (*Coriaria myrtifolia*); and it is not at all uncommon for honey to be unwholesome, on account of its having been collected by bees from poisonous plants. The honey of Trebizond, for example, has long been notorious for its deleterious properties; it poisoned the soldiers of Xenophon during the famous retreat of the ten thousand. Pliny, too, speaks of it; and to this day its intoxicating effect is frequently witnessed. It arises, no doubt, from the plants, chiefly the *Azalea pontica*, from which the honey is gathered. Mr. Barton has given us a similar account of the poisonous quality of the honey gathered by bees from the savannahs of New Jersey, where the *calmia* and *azalea* are the principal flowering shrubs. As with the followers of Xenophon, all who eat of the honey become intoxicated to a high degree; and even when made into metheglin, it poisons all who partake of it, causing dimness of sight, giddiness and then delirium, with sometimes a fatal termination.

Occasionally we have examples of food which is in itself poisonous. This is so with many of the fish of tropical seas, and especially of the West Indies. Dr. Burrows has given us a long list of them; and it would seem that the yellow-billed sprat (the Sardine doré of the French, and *Clupea thryssa* of naturalists), the toad or bladder-fish (*Aplodactylus punctatus* or *Tetraodon* of Cuvier) and the grey-snapper (*Coracinus fuscus major*) are the most venomous; and that being eaten by larger fish, as the *Baracosta*, and various species of perch, as well as the conger-eel, the dolphin, the globe fish, &c., it causes these to be poisonous also. The yellow-billed sprat is so virulent in its action on the human body that both Europeans and negroes have been known to expire with the fish in their mouths unswallowed; and the toad or bladder-fish, is scarcely less dangerous. Sir John Richardson has described the defects of it on two sailors, the boatswain's mate and purser's steward, of the Dutch brig of war, *Postilion*, while lying at anchor in St. Simon's Bay, at the Cape of Good Hope, in September, 1845. The men were warned that the fish was poisonous, but believing that the liver was wholesome, and rather a delicacy, they cooked it, and ate it directly after their twelve o'clock dinner. In ten minutes the boatswain's mate was so ill that he could not stand; his face was flushed, his eyes glistened, his lips were swollen and rather blue, his forehead was covered with a cold perspiration, and his pulse was weak and fluttering. He was, however, quite conscious, and complained of pain and constriction of the throat, and he had a desire to vomit. In a few minutes more he became paralysed, his eyes were fixed, his breathing was laborious, his face was pale though his lips were livid, and in seventeen minutes he was dead. The other man exhibited the same symptoms, and died in twenty minutes. Sir John Richardson says, the fish was not more than six or eight inches in length, and the liver of it, which they had eaten between them, could not have weighed more than half an ounce.

The symptoms occasioned by the poisonous fish of the tropics are always of two kinds—there is either great irritation of the stomach and bowels, like cholera; or there is rapid prostration of the vital powers, and death by syncope or convulsions. These effects have been long known both to natives and Europeans, and were called by the Spanish colonists of tropical America, *Siquatera*. They are more frequently observed at certain seasons of the year than at others, and hence they are thought to be due to certain physiological changes in the body of the fish, or to the food which it has eaten. In some cases the roe, in others the liver, or the digestive organs, are the most poisonous parts of the fish; and in the case of the *Maletta venenosa*, which inhabits the Caribbean Sea, it is only poisonous when the sea is covered with a green monad, upon which the creature feeds. Happily for us, these dangers are confined to the tropics, although we sometimes suffer from a milder form of disturbance, as irritation of the skin and bowels, from eating unwholesome shell-fish.

Putrid meat is, perhaps, wasteful, rather than actually injurious; but there are plenty of cases in which it has caused disease. Foderé tells us that at the seige of Mantua, those who were shut up in the city, and were obliged to eat the half-putrid flesh of horses, suffered from gangrene and scurvy; and in Czant's history of Greenland there is an account of the death of thirty-two persons at a missionary station called Kangek, from a repast on the putrid brains of a walrus. Similar cases are recorded in all the books on legal medicine. Even game, when only sufficiently tainted to please the palate of the epicure, has caused severe cholera in persons unaccustomed to it; but, as Dr. Christison observes, "the power of habit in reconciling the stomach to the digestion of decayed meat is inconceivable. Some epicures in civilised countries prefer a slight taint even in their beef and mutton; and there are tribes of savages still further advanced in the cultivation of this department of gastronomy, who eat with impunity rancid oil, putrid blubber, and stinking offal." The Zulus of Natal, according to Dr. Colenso, are so fond of putrid meat that they call it *ubomi*, which literally means to be superlatively happy. But, as a rule, there is a natural abhorrence of tainted food, insomuch, that with most

persons, the mere commencement of decay is sufficient to excite disgust; and rarely do we find, except among savages, that an entire meal is made of putrid flesh. A little game or venison, or ripe cheese, at the end of a feast, with just a piquant touch of decay, is, perhaps, not objectionable; for it may, as Liebig supposes, promote digestion, by communicating its own quality of transformation to the rest of the food; but it is another thing to fill the stomach with putrid flesh, for if the corrective power of the gastric juice should fail, the effect of it might be serious. We have, indeed, abundant evidence of the terrible consequences of admitting putrid matter into the circulation, for they were once too common among those engaged in the dissection of the human body. In fact, the mere handling of decomposing animal matter for any time, will often produce disease of the hands or other parts of the body with which it comes into contact. Our safety, perhaps, in using such food, is in the antiseptic power of good cooking; but this is not always an easy affair; for the tissues are generally so soft from decay, that they will hardly bear the common action of heat; so that if they be boiled for any time they will fall to pieces; and if they be roasted, they will shrink without forming that delicious crust of osmazome which is characteristic of good meat. Let them, however, be cooked as they may, they always require a nice adjustment of rather strong flavours to make them palatable; and those who have dined in the cheap restaurants of Paris, or at the still worse table d'hôte of a German watering-place, will have experienced the art of the cook in this respect, in such dishes as *turbot en vol-au-vent*, *Raie au beurre noir*, *sole en matelote Normande*, and in the various forms of fish *au gratin;* or game *en salmis*.

But bad as this sort of tainted food is, it is nothing in comparison to the sausage poison, which is produced by a sort of modified putrefaction, to which the large sausages of Germany, and especially those of Würtemburg, are occasionally subject. According to an official return, there have been more than 400 cases of poisoning from these sausages in Würtemburg alone during the last fifty years, and of these about 150 were fatal. The effects are generally observed in spring, and mostly in April, when the sausages become musty, and acquire a soft consistence in the interior. They have also a peculiarly nauseous and rather putrid taste, and are very acid to test-paper. If eaten in this condition, they produce dangerous effects in from twelve to twenty-four hours—the first symptoms being pain in the stomach, with vomiting and diarrhœa, and dryness of the nose and mouth; then comes a feeling of profound depression, with coldness of the limbs, weakness and irregularity of the pulse, and frequent fainting. Fatal cases end with convulsions and oppressed breathing between the third and eighth day. The precise cause of these effects is still a mystery; some have thought that rancid fatty acids are produced during the decomposition of the meat; others that in the process of drying and smoking acrid pyrogenous acids have been developed; others, that during the decay of the sausages, a poisonous organic alkaloid is generated. Liebig is of opinion that the effects are due to an animal ferment, which produces in the blood, by catalysis, a state of putridity analogous to its own, and that the molecular movements of the putrefactive change in the decaying meat are thus communicated to the living organism. M. Vanden Corput, who is one of the most recent investigators of the subject, attributes the morbific action of such meat to the presence of a minute fungus, of the nature of a sarcina, which he calls *sarcina botulina*. This view is confirmed by the fact that there is always a peculiar mouldiness of the sausages; and the poisonous property is generally observed in April, when these cryptogamic organisms are most freely developed.

Similar effects have occasionally been produced by other kinds of animal food—as veal, bacon, ham, salt-beef, salt-fish, cheese, &c., and the food has usually been in a decayed and mouldy condition. It would be tedious if I were to detail, or even to enumerate the cases recorded by medico-legal writers; but I may, perhaps, refer to a few of them. In 1839, there was a popular fête at Zurich, and about 600 persons partook of a repast of cold roast veal and ham. In a few hours most of them were suffering from pain in the stomach, with vomiting and diarrhœa; and before a week had elapsed, nearly all of them were seriously ill in bed. They complained of shivering, giddiness, headache, and burning fever. In a few cases there was delirium; and when they terminated fatally, there was extreme prostration of the vital powers. Careful inquiry was instituted into the matter, and the only discoverable cause of the mischief was incipient putrefaction and slight mouldiness of the meat. Dr. Geiseler relates an instance where a family of eight persons were made ill by musty bacon; and M. Ollivier has given an account of six persons who were poisoned by mutton in a state of modified decay—four of whom died from it within eight days. In Russia, where it is the practice to eat largely of salt-fish, in a raw condition, it is not at all uncommon to witness the dangerous effects of it, when it has become mouldy or putrid; and, in fact, it is within the experience of every one who is concerned in medico-legal inquiries, that serious symptoms are frequently traced to the use of food in a modified condition of decay. This is especially so with bad cheese, the effects of which on the constitution have been so severe, that official investigations have been called for. These effects have been noticed at Schwerin (1823), at Minden (1825), at Hameln (1826), at Griefswald (1827), Frankfort (1828), and elsewhere; and they have been the subjects of interesting essays by Henneman, Hünefeld, Westrumb, and others. At first the effects were attributed to the copper vessels used in the dairies, and therefore the Austrian, Wirtemberg, and Ratesberg States prohibited the use of that metal for such purposes; but the subsequent inquiries of Hünefeld, Sertürner, and other chemists, established the fact that no metallic poison was discoverable in the cheese. In the police report, which was published in Frankfort, in January, 1828, informing the public of numerous cases of poisoning in that city from spoiled cheese, it was declared that no poisonous principle could be detected by chemical re-agents. Professor Hünefeld, and, subsequently, Sertürner, were of opinion that the effects were due to certain poisonous fatty acids, analogous to, if not identical with, caseic and sebacic acids; and they even describe the way in which they are produced in the cheese during the process of ripening—attributing them to the imperfect removal of the acid liquor from the curd when the cheese was made, or to the putrefaction of the curd before it was salted, or to the mixture of flour with the curd; but it is far more likely that the poisonous effects are due, as Vanden Corput supposes, to the presence of a peculiar mould or fungus. I have myself seen the most terrible consequences from the use of such cheese, and have failed to discover anything unusual in the acidity or other chemical reactions of the cheese. Hünefeld says, it is commonly of a yellowish-red colour, and is soft and tough, with harder and darker lumps interspersed throughout it, and it has a disagreeable taste, and an acid reaction. The symptoms which it produces are very much like those of sausage poisoning—namely, irritation of the stomach and bowels, with great prostration of the vital powers. These effects have been witnessed not only in Germany, where the cheese is generally rancid and bad, but also in this country, and particularly among the small hill-farms of Cheshire, where the limited extent of the dairies obliges the farmer to keep the curd for several days before a sufficient quantity of it is accumulated to make a large cheese.

I have said nothing of the improper practice of killing very young animals, especially calves, for food, before the tissues have had time to change from their uterine condition. On the Continent it is unlawful to kill or to sell

calves for food, that are not more than fourteen days old, but in this country there is no such restriction, and it is a common practice to dispose of the carcasses of newly-born, or even fœtal calves to the sausage-maker; and as the flesh is sodden and insipid, he strengthens it with old, tough, and sinewy flesh. It has the advantage, moreover, of being miscible with any description of meat, and of taking any variety of flavour; in fact, it makes just that kind of sausage which is susceptible of any kind of flavour, and where, to use the expression of Dickens, "It's the seasonen as does it." I cannot say that such meat is positively unwholesome, but it is nasty, and excites the same sort of disgust as an egg with a chick in it.

(*To be continued.*)

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*Otley Mechanics' Institute.* — The building committee have selected a design for the new institute. About nineteen different designs were submitted for competition by architects from Leeds, Bradford, and other places. The committee, in their selection, have been guided principally by the amount of money at their disposal. The subscriptions already promised amount to over £3,000, and the committee are most anxious that the new building, when erected, shall be free from debt. Their object, therefore, has been to select a plan which would afford the greatest possible accommodation for the least expenditure. The design is Italian, and the following are the chief features of the internal arrangements:— On the ground-floor there will be a small lecture-room, capable of accommodating about 250 persons, and which, if found desirable, may be divided into two class-rooms. There will also be retiring rooms, reading-room, library, two class-rooms, lavatory, &c. The basement will contain kitchen, scullery, chemical class-room, heating apparatus, &c. On the first-floor will be the large hall, with gallery, platform, orchestra, and space for organ. There will also be a librarian's residence attached to the premises. The large hall, including gallery and orchestra, will be capable of seating about 1,000 persons. There will be two staircases, and three separate entrances and exits into and from the large lecture-hall. The building is to be built of stone, at an estimated cost of about £3,000. *Gargrave Mechanics' Institute.*—Through the organising agency of the Yorkshire Union, and by means of the pecuniary aid readily given by Mr. Matthew Wilson, J.P., and other resident landowners, a new Mechanics' Institute has been established in this village. A convenient house has been taken, and suitably adapted to the purposes of an institute. The village has been canvassed for members, with excellent results. The library will, at first, consist of a loan of books from the Yorkshire Itinerating Village Library, but a special subscription is being made for a permanent library. Should the present arrangements produce satisfactory results, Mr. Wilson has generously promised to erect a new building for the institute. *Lockwood Mechanics' Institute.*—A fine art, scientific, and industrial exhibition has been inaugurated at Lockwood. The proceeds are to be given to the funds of the new Mechanics' Institution. Paintings by well-known masters have been contributed, and, as far as the fine art collection is concerned, it is said to be the best exhibition ever witnessed in the neighbourhood of Huddersfield. There are specimens of natural history, geology, and antiquity; and there are numerous subjects and objects to occupy the attention of the collectors of coins and other curious articles. The Rev. T. B. Benstead, vicar of Lockwood, opened the exhibition, and said the object which the committee had in view was to increase their funds, and, at the same time, refine the tastes of those by whom they were surrounded. A band played during the afternoon. The exhibition is to remain open about a fortnight. *Gildersome Literary Institute.*—On Saturday the annual *soirée* of this institution was held, under the presidency of the Rev. J. Haslam, its founder. Amongst the gentlemen on the platform were Mr. Alfred Illingworth and Mr. Cooke, of Bradford; Mr. Councillor Barran, Leeds; Mr. George Webster, Gildersome. The report stated that at the beginning of the year arrangements were made for classes every night in the week. Several of these had been successful, but others had failed, owing to the difficulty of securing regular voluntary teachers; and the committee felt that if the teaching of elementary subjects was to succeed, a paid teacher must be engaged. The certificates and prizes awarded by the Yorkshire Board of Education were presented to the successful candidates.

EXAMINATION PAPERS, 1868.

(*Continued from page* 751.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

ENGLISH LITERATURE.

THREE HOURS ALLOWED FOR THE TWO AUTHORS SELECTED BY THE CANDIDATE.

CHAUCER.

(The Prologue.—The Knight's Tale.)

(*a*.) Lo the ook, that hath so long norisschyng
Fro tyme that it gynneth first to spring,
And hath so long a lyf, as we may see,
Yet atte laste wasted is the tree.

(*b*.) Thus ryt this duk, thus ryt this conquerour,
And in his oost of chevalrie the flour,
Till that he came to Thebes, and alighte
Fair in a feeld wher as he thoughte to fighte.

(*c*.) And sikurly sche was of gret disport,
And ful plesant, and amyable of port,
And peyned hire to counterfete cheere
Of court, and ben estatlich of manere,
And to ben holden digne of reverence.

(*d*.) The busy larke, messager of day,
Salueth in hire song the morwe gray;
And firy Phebus ryseth up so bright,
That al the orient laugheth of the light,
And with his stremes dryeth in the greves
The silver dropes, hongyng on the leeves.

(*e*.) To lyven in delite was al his wone,
For he was Epicurius owne sone,
That heeld opynyoun that pleyn delyt
Was verraily felicite perfyt.

(*f*.) For whethur that he payde, or took by taille,
Algate he waytede so in his acate,
That he was ay biforn and in good state.

1. In what connection does each of the above passages occur?—Explain every obsolete word and phrase.—Notice the words that require to be pronounced or accented differently from modern usage to meet the requirements of the verse.

2. What are the most important particulars in which Chaucer's English differs from our own?

3. What do the following words mean?—

orlogge	siththen	knarre
payen	sege	takel
sothely	sawceflem	undern
howpede	gery	stith

II.

4. Sketch the plan of the Canterbury Tales.

5. From what sources did Chaucer get many of the stories?

6. Give some account of the character of pilgrimages in the time of Chaucer.

7. Who were Chaucer's most distinguished contemporaries? Name some of their principal works.
8. On what occasions did Chaucer visit the Continent?

Shakspere.

("King Lear."—"King John."—"The Merchant of Venice.")

I.

(*a.*) A plague upon your epileptic visage!
Smile you my speeches, as I were a fool?
Goose, if I had you upon Sarum-plain,
I'd drive you cackling home to Camelot.

(*b.*) You have too much respect upon the world—
They lose it that do buy it with much care.
Believe me you are marvellously changed.

(*c.*) Take physic, pomp;
Expose thyself to feel what wretches feel;
That thou mayst shake the superflux to them,
And show the heavens more just.

(*d.*) A. James Gurney, wilt thou give us leave awhile?
B. Good leave, good Philip.
A. Philip?—Sparrow!—James,
There's toys abroad; anon I'll tell thee more.

(*e.*) Thou almost makest me waver in my faith,
To hold opinion with Pythagoras,
That souls of animals infuse themselves
Into the trunks of men.

(*f.*) Life is as tedious as a twice-told tale,
Vexing the dull ear of a drowsy man;
And bitter shame hath spoiled the sweet world's taste,
That it yields nought but shame and bitterness.

1. State the connection in which each of the above passages occurs, and the person by whom it is spoken; explain every obscurity of expression or allusion; notice every peculiar grammatical construction.
2. Explain the following words as they are used by Shakspere, and notice any peculiarities in their forms:—

counterfeit	schedule	pight
continent	jump	ghasted
bankrout	indigest	dullard
wis	importance	uncapable.

3. Explain the following passages:—

"How wildly then walks my estate in France!"

"We cannot hold mortality's strong hand."

"Beyond all manner of so much I love you."

II.

4. Sketch the plot of the fourth act of the Merchant of Venice.
5. Describe the character of Shylock.
6. Give an account of the fool in King Lear.
7. From what sources has Shakspere mainly taken the plots of these three plays? Which are the chief particulars in which he has deviated from the facts of history in King John?
8. What do you know of the early editions of Shakspere's plays?

Bacon.

(The Essays.)

I.

1. Give the substance of the essay "Of Unity in Religion.
2. How does Bacon prove and illustrate the following statements?—

(*a*) "Revenge is a kind of Wild Justice."
(*b*) "Prosperity is the blessing of the Old Testament: Adversity is the blessing of the New."
(*c*) "Those who are first raised to Nobility are commonly more Virtuous but less Innocent than their Descendants."

3. Explain the following passages, and state from whom they are quoted by Bacon.

"(*a*) "The Schoolmen were like Astronomers, which did feign Eccentricks and Epicycles, and such Engines of Orbs, to save the Phenomena; though they knew there were no such Things."
(*b*) "If it be well weighed, To say that a man lieth, is as much as to say as that he is brave towards God, and a Coward towards Men."

4. Explain the allusions in these passages:—

(*a*) "Nay you shall see a Bold Fellow many times do Mahomet's Miracle."
(*b*) "The part of Epimetheus might well become Prometheus, in the case of Discontentments."

5. Illustrate this statement by historical instances:—

"The Principal Thing that hath been the Destruction of most Plantations hath been the Base and Hasty drawing of Profit in the first Years."

6. Sketch the argument written of the essay "Of Usury," or that "Of Friendship."
7. Explain these words as they are used by Bacon:—

damosell.	civility.	defatigation.
conceit.	estivation.	scantling.
battaille.	proyning.	catchpole.
staddles.	moile.	plash.

II.

8. What do you know of the first publication of Bacon's Essays?
9. Give some account of the *Novum Organon*.
10. Sketch the character of Lord Bacon as an essayist.

Craik.

(Outlines of the History of the English Language.)

1. Give some account of the tribes of Gothic race who settled in Britain, and brought with them the language which forms the basis of our present English.
2. What traces are there in our language of a Celtic element?
3. Give instances of names of places which bear witness to the existence of different races amongst the inhabitants of Britain in former times.
4. To what class do those English words chiefly belong which have been taken immediately from the Latin? Give examples.
5. Illustrate, by examples taken from words in common use, the relative positions of the Norman and the Saxon races when the language was in the course of formation.
6. What are some of the most important points of difference between our present English and the Saxon of King Alfred's time?
7. What are the stages of progress into which the history of the language is commonly divided from the time of Alfred to the present? Name some of the chief writers belonging to each stage.
8. Turn the following passage into modern English:—

"Trew king, that sittes in trone,
Unto the I tell my tale,
And unto the I bid a bone
For thou art bute of all my bale:
Als thou made midelerd and mone,
And bestes and fowles great and smale,
Unto me send thi socore sone,
And dresce my dedes in this dale."

9. Give an account of the following words:—

minister	porch	basket
saint	monastery	parsley
preacher	street	cloister
bishop	chester	bother

10. Explain these terms:—Limes Saxonicus, Indo-European, Romance, Mœso-Gothic, Langue d'Oyl, Danelagh.

LOGIC AND MENTAL SCIENCE.

THREE HOURS ALLOWED.

LOGIC OF INDUCTION.

Mill's Logic.

1. Explain the difference between deductive and inductive reasoning, giving an example of each.
2. What is the ground on which all inductions are fundamentally based?
3. Is it an adequate explanation of causation to term it an *invariable sequence?* If not, why not?
4. What is the difference between observation and experiment? Wherein consists the special value of the latter?
5. Mill enumerates four methods of experimental inquiry. Explain the *two first,* with an example of each.
6. What is meant by the *explanation* of any law of nature?
7. How do you distinguish between a legitimate and an illegitimate hypothesis?
8. What is analogy? What is its special use in scientific researches.

MORAL PHILOSOPHY.

Stewart's Outlines.

1. Show how mental philosophy shared in the general reformation of the method of philosophical research introduced by Bacon.
2. Give Stewart's classification of the active powers of man.
3. Distinguish between appetite, desire, and affection.
4. What reason have we to believe that the moral faculty is an original principle of our nature?
5. What mental affections are we conscious of in contemplating a good or bad action performed by another?
6. What is Cudworth's and what Hutcheson's theory of the manner in which we become cognisant of moral distinctions?
7. By what line of argument does Stewart propose to prove the existence of a God?
8. Enumerate and explain two or three of the most important theories on the ground of morals.
9. What is Utilitarianism? What objections may be most obviously raised against it?

MENTAL PHILOSOPHY.

Hamilton.

1. What is meant by the presentative faculty? How is Hamilton's doctrine on this faculty distinguished from those of other celebrated philosophical writers?
2. Distinguish accurately between sensation proper and perception proper.
3. Give the reasons which have been urged to show, 1st, that *touch,* and 2nd, that *sight,* is the origin of our ideas of extension.
4. What is meant by the conservative faculty? Account for the fact of our retaining ideas and impressions without being conscious of them.
5. What is the reproductive faculty? Mention the principal laws of reproduction.
6. What does Hamilton mean by the representative faculty? Why is it so called? What phenomena are classified by Hamilton under it?
7. Distinguish carefully between the elaborative and regulative faculty. What are their respective functions?

FORMAL LOGIC.

1. What are concepts? Analyse the process by which they are formed in the mind.
2. Give the rules of a good division, and examples of false ones.
3. What is meant in logic by *definition?* Show what sort of terms admit of definition, and what sort do not, and why?
4. What are the predicables, and what the predicaments? What is the purport of each of these classifications
5. What is meant by the quantity, and what by the quality of a proposition? What symbols are used to designate them?
6. How many ways are there of "converting" a proposition? Give an example of each.
7. What are contraries, subcontraries, and contradictories? Give an example of each.
8. Explain what is meant by a syllogism, what by its mood, and what by its figure.
9. How many figures are there? Give the special rules of each, and justify them.
10. In what mood and figure are the following syllogisms drawn:—

No vicious habit ought to be indulged.
Some vicious habits promote a temporary interest.
Some things which promote a temporary interest ought not to be indulged.

Whatever requires to be known in order to salvation is revealed in the Scriptures.
Whatever requires to be known in order to our salvation ought to be diligently studied.
Some things which ought to be diligently studied are revealed in the Scriptures.

11. Give examples of the Ignoratio elenchi, Petitio principii, and Fallacia consequentis.

(To be continued.)

TRINIDAD PETROLEUM.

The following dispatch, addressed by Governor Gordon, of Trinidad, to the Duke of Buckingham, has been forwarded to the Secretary of the Society of Arts, by order of the Board of Trade:—

9th March, 1868.

MY LORD DUKE,—Your Grace does not require to be informed that Trinidad contains vast deposits of pitch and asphalt, and that many efforts have, at different times and in various manners, been made to apply this material to useful objects.

2. Experiments lately conducted in England would appear to show that the bitumen of what is called the Pitch Lake may be successfully and profitably employed as a gas-producing material. With these experiments, however, I have no present concern.

3. Attention has also been, for some time past, directed to the preparation from this substance of a fuel, to be used either together with coal or in substitution for it.

4. The different asphalt fuels which have been hitherto prepared, have generally been found liable to adhere to the grating bars of the furnace in which they were consumed, and also to melt or run when exposed to a high degree of heat.

5. It occurred, nearly simultaneously, to gentlemen in England, France, and this island, that these defects might be obviated by a mode of preparing the fuel which should insure the equal action of the fire upon all its particles. The same idea had been entertained, and on a small scale successfully applied, more than seven years ago by a gentleman in this island, now dead, but his experiments do not appear, either in the island or out of it, to have attracted the attention they deserved.

6. Struck by the fact that, whilst their mode of effecting it differed, the principle was the same in several plans submitted to me, I directed the preparation, at the Royal Gaol, of a few tons of fuel, under the superintendence of a gentleman who has long devoted himself to the examination of questions connected with the Pitch Lake. The bitumen was mixed in certain proportions with charcoal, was ground, and then pressed dry into bricks, about one foot in length, four inches broad, and three inches deep.

7. Commander Chimmo, R.N., was so obliging as to allow this fuel to be tried on board H.M.S. *Gannet* during a day's cruise. I enclose for your Grace's information the report of the engineers of that vessel, made after the trial, and transmitted to me by Commander Chimmo.

8. The *Gannet* got under weigh at 8 a.m. on the 21st ult., and returned to her anchorage off Port-of-Spain at 6 p.m., having in the interval run down round the island of Patos, a distance of thirty miles, and lain-to for a short time off that island, off the entrance to the Boca Grande, and off the island of Chacachacare.

9. At first coal and the asphalt fuel were burnt in equal proportions, but the result was not equal to that produced by the consumption of coal alone. Subsequently the proportion of 35 per cent. of fuel to 65 per cent. of coal was maintained, and, thus combined, the number of revolutions obtained, and the pressure of steam raised, were fully equal to what they would have been had coal only been used.

10. The mode of preparation adopted proved completely successful in overcoming the defects to which I have alluded. The fuel showed not the smallest sign of adhesion to the bars, or of melting, any part of the day, and though a small amount of what is termed "clinker" was produced, it was not greater than may often be found in ordinary steam coal.

11. It may, therefore, I think, safely be assumed that, in these proportions, an asphalt fuel may safely and usefully be employed, whilst, as it can be delivered here at certainly half the price of coal, there is no doubt that its employment, even in these proportions, would insure a considerable saving of expense. But when it is considered that the furnaces of the *Gannet* are particularly ill-suited to the consumption of asphalt, which requires a strong draught to secure its regular and rapid consumption, and also that the whole of the fuel employed on this occasion was prepared by hand, and consequently wanted that complete and uniform pressure needed to effect its thorough compression, and to remove from it all moisture, there can be no reasonable doubt that, under more favourable circumstances, the proportion of asphalt fuel, which may with advantage be mixed with coal, might be largely increased.

12. The only unfavourable point in the report is the fact that, whilst the consumption of the mixed fuel per indicative horse-power per hour was 4·35 pounds, the average consumption per indicated horse-power per hour of six different kinds of coals in the same furnaces (but probably at sea with more wind than at the day of trial inside the Gulf of Paria, where it was nearly calm in the morning, and where only a slight breeze blew in the afternoon) was 3·61 pounds, showing a deficit of ·74, or nearly three-quarters of a pound in the mixed fuel per horse-power per hour. If, however, the ashes which the engineers found and removed, and which consisted of half-burnt asphalt fuel, had been burnt off, and sent through the chimney, which can be done with a stronger draught, or more complete exclusion of all moisture by pressure applied by machinery, these three-quarters of a pound per indicated horse-power per hour would have been also utilised, *i.e.*, the mixed fuel would have given the same average as the six different kinds of coals mentioned.

13. Contrary to expectation, the smoke produced by the fuel proved to be lighter in colour and less dense in volume than that of ordinary coal.

14. Should your Grace see no objection to such a course, I should feel obliged if your Grace would direct the information contained in this despatch to be communicated to some of the scientific bodies interested in such subjects, and to give it such publicity as your Grace may consider not inconsistent with propriety.

I have, &c.,

(Signed) ARTHUR GORDON.

His Grace the Duke of Buckingham and Chandos, &c.

REPORT ON PATENT FUEL.

1. Primed laid fires and got up steam, in port boiler, with patent fuel alone, quantity 10 cwt.; time occupied in getting up steam, one hour and thirty-five minutes. Primed laid fires and got up steam, starboard boiler, with equal portions of patent fuel and coals; quantity 6 cwt. of each; time in getting up steam, fifty minutes. After steam being up, equal portions of patent fuel and coal were used in both boilers; proceeded full speed, draught plates taken down; height of steam-gauge 10lbs.; revolutions, 69; consumption, 7 cwt. of patent fuel and 7 cwt. of coal per hour; consumption, per indicated horse-power, per hour, 4·94lbs.

2. Fires cleaned out, using 60lbs. of patent fuel to 112lbs. of coal, took out two furnace-bars in each furnace to allow a greater current of air, which was a decided improvement in the brightness of the fires; the pressure now rose to the proper working height, viz., 13lbs., and kept steady; revolutions, 73½; consumption per hour, 5 cwt. of patent fuel, and 10 cwt. of coal; consumption per indicated horse-power per hour 4·35lbs.; average consumption per indicated horse-power per hour of six different kinds of coals, 3·61lbs. No adhesion to the bars except a small amount of clinker, which caused the fires to be raked about, thereby causing about 25 per cent. of ashes. The ashes consisted of half-burnt patent fuel. It is my opinion, if greater space be left between the furnace-bars, so as to admit a greater current of air, nearly the whole of the ashes would be consumed. The amount of smoke remained about the same as when using coal alone; if anything, rather less, and of a lighter colour, the deposit of soot over the average being about six per cent.

Office of the Committee of Privy Council for Trade
Whitehall, 24th April, 1868.

SIR,—I am directed by the Lords of the Committee of Privy Council for Trade to transmit to you, for the information of the Society of Arts, the enclosed copy of a dispatch that has been received from the Governor of Trinidad relative to some experiments that have been made in the use of fuel manufactured from the bitumen of Trinidad.

I am, Sir, your obedient servant,
ROBERT G. W. HERBERT.

The Secretary Society of Arts, John-street, Adelphi.

In reference to this dispatch Mr. B. H. Paul writes as follows:—

8, Gray's-inn-square, 18th May, 1868.

SIR,—I have read the report of results obtained with fuel made of Trinidad pitch and charcoal, and herewith return it to you. If this fuel can be delivered on board at half the cost of coal in Trinidad, it will probably be useful. I would suggest, however, that its utility might be increased if the large amount of earthy material in the pitch could be separated in the manufacture of the fuel. This earthy material, which leaves an incombustible ash, amounts to about 25 per cent., according to analysis I have made of the Trinidad pitch, and it is to the presence of this material that I should ascribe the difference in the rate of consumption per indicated horse-power, of the prepared fuel as compared with coal, amounting to about ¾ of a pound per indicated horse-power per hour,

Yours, &c.,
B. H. PAUL.

P. Le Neve Foster, Esq.

PARIS SCHOOLS OF DRAWING AND SCULPTURE.

The distribution of prizes awarded to the pupils of the Municipal School of Drawing and Sculpture, directed by M. Justin Lequien, took place the other day, when M. Robert-Fleury, the artist, presided and addressed the meeting. He expressed the great interest which he felt in the Paris schools of drawing and sculpture, and especially in that directed by M. Lequien, and then proceeded to sketch the growth and working of such schools. Before 1830 only one school of art existed for the working classes; this was founded by letters-patent of Louis XV.; what has been done since in this

way was recently illustrated in the Exhibition of 1867. There are at the present moment fifty evening schools of art in Paris, where more than four thousand pupils can study; the models chosen, with care by a commission, are sent to all the schools; rewards are given by the municipal authorities, and the most meritorious pupils receive prizes of honour from the Emperor. The administration of the Beaux Arts lends its aid, and the Comte de Nieuwerkerke has presented a magnificent collection of plaster casts, figures, and ornaments, from which pupils may draw, model, and study the beautiful. Lastly, the Prefect of the Seine has caused large school-houses to be built to replace those whose accommodation had become insufficient. The school of the Rue des Petits Hotels, which is one of these, has room for three thousand pupils, and the municipality has spared nothing to render it a model establishment.

Having passed a high eulogium on the talent, the zeal, and the devotion of the masters generally, M. Robert-Fleury referred to the courses of geometric drawing, sculpture, and elementary anatomy, established by M. Lequien, and said that the education given in these schools answered all the wants of the industrial arts. The speaker then referred to the fact that M. Lequien had received medals from the Société d'Encouragement, and from the jury of one of the great London Exhibitions, and that four of the pupils of his school had received medals in London, and four at the competition of the Union Centrale des Beaux Arts of Paris. "Continue, then," said M. Robert-Fleury, "to profit by the encouragement which is offered to you; make free use of the advantages which the country and the Government place at your disposal, and all difficulties will give way before your perseverance. Imbibe as much as possible of the spirit of the best models of antiquity and of the *renaissance;* exercise yourselves in composition and invention; but remember that, though fancy is admissible in industrial art, it should never overstep the limits of good taste."

M. Robert-Fleury then uttered a wholesome warning to the pupils whom he addressed, not to abandon industry for the Beaux Arts, properly so called, without the most mature reflection, and thus run the danger of failure. "Industrial art," he added, "offers ample scope for glory; it has the sympathy of all the world—the production of a potter of Athens finds passionate admirers. Anyone may be proud to add his name to the long list of famous art workmen. Believe me, industry offers a fine field for those who know how to distinguish themselves in it. Work, for labour is honourable; it renders men better, and therefore more capable of fulfilling all the duties of life. Develop your faculties by study, and raise industry to the level of art. Remember that the grand epochs which make the glory of nations are also those in which art and industry were at their apogee."

The above will show not only what is being done by the Paris authorities in the way of general art-education, but also the views that are entertained by enlightened men on the subject and effects of such teaching.

Commerce.

RUSSIAN COMMERCE.—In the *Journal* of the 19th June we quoted the official returns of the imports and exports of the Russian Empire, for the years 1866 and 1867, under the various classes of goods; we are now enabled to give, from the lithographic sheet of M. Bogdanoff, of St. Petersburg, the totals under the heads of the various countries, by which it will be seen that the growth of the commerce between Great Britain and Russia was more marked during the past year than that between the latter and any other state, with the single exception of Prussia. The following comparative table is given in millions of roubles:—

Imports from—

	1866.	1867.
Prussia	$69\frac{3}{4}$	92
Great Britain	$59\frac{1}{2}$	$75\frac{1}{4}$
France	$10\frac{1}{4}$	$14\frac{1}{2}$
Austria	$8\frac{1}{2}$	$12\frac{3}{4}$
Hanseatic towns	$8\frac{1}{4}$	$11\frac{1}{2}$
Holland	$10\frac{1}{2}$	5
Italy	$5\frac{1}{2}$	3
Belgium	3	7
Turkey	5	$5\frac{1}{4}$
United States	$2\frac{1}{4}$	$4\frac{1}{2}$
Sweden and Norway	$2\frac{1}{3}$	3
Spain	$1\frac{1}{2}$	$3\frac{1}{2}$
Greece	$1\frac{1}{8}$	$2\frac{1}{2}$

Exports to—

Great Britain	102	$107\frac{1}{2}$
Prussia	23	30
France	$16\frac{3}{4}$	$17\frac{3}{4}$
Austria	6	$7\frac{1}{4}$
Turkey	9	6
Holland	$5\frac{1}{2}$	7
Germany	$3\frac{1}{4}$	8
Italy	6	4
Sweden and Norway	4	5
Belgium	3	$4\frac{1}{2}$
Hanseatic towns	$3\frac{3}{4}$	$3\frac{3}{4}$
Moldo-Wallachia	$2\frac{1}{2}$	$2\frac{1}{4}$
United States	$1\frac{1}{2}$	$1\frac{1}{4}$
Denmark	$1\frac{1}{4}$	1
Portugal	$\frac{1}{2}$	$1\frac{1}{2}$

Obituary.

ANTONIA VECHTE, native of France, artist in gold and silver work.—Vechte has been surnamed the Benvenuto Cellini of France, and his works have a European reputation. Vechte was entirely a self-made artist; left an orphan at the age of nine years, with a sister dependent upon him, he became a bronze chaser, and worked to the age of twenty-five without his talent being noticed. In 1826 he was engaged on the bronze bas-reliefs of the Column Vendôme. In this work his talent appeared; but his fellow-workmen ignored his pretensions as an artist, and he remained for several years more a working chaser. He studied at home, and produced some remarkable works in iron casques and pieces of armour. One of these works at length attracted, by accident, the attention of an amateur, and his original talent was at length recognised. His principal works are: a silver vase, subject, "The Passions conquered," exhibited in Paris in 1848; "The Sword of the Comte de Paris;" a vase, subject, "Centaurs and Lapithæ;" and a coupe, "Harmony in Olympus." Three of these works attained him, in 1848, the great gold medal, the cross of the Legion of Honour, and an order for a grand vase. From 1850 to 1860 he worked in London. His productions were rewarded by medals of Honour at the Paris Exhibitions of 1855 and 1867, and the London Exhibition of 1862. Vechte was a man of modest and even timid disposition, and led the life of a laborious artist to the end. When asked, in 1848, what portion of his work he laid claim to, (it was entirely his own) he said, "I am a repousseur," and he is known in France still as Vechte the repousseur, just as Palissy is known as the potter. He died a short time since, at the age of sixty-nine, and leaves behind him two pupils, a daughter and a nephew.

M. PERSOZ, the elder, professor of chemistry as applied to dyeing, bleaching, &c., in the Conservatoire des Arts-et-Metiers of Paris, and director of the establishment attached to the Chamber of Commerce of Paris, for conditioning silks and wools, died at Paris on the 12th of September.

Notes.

CONSUMPTION OF WATER IN NEW YORK.—The *Engineer* says:—"The present consumption of water in New York averages 60,000,000 of gallons per day, or sixty gallons for each inhabitant This supply, after deducting the quantity necessary for extinguishing fires, for washing, and other purposes, would appear to be liberal, though not equal, if we may believe history, to that provided for the citizens of Imperial Rome, who were at liberty to use something like one hundred gallons per day each."

ERECTION OF A LIGHT-HOUSE ON THE COAST OF FRANCE.—The elegant iron light-house which was seen at the Paris Exhibition last year, is being erected on the spot for which it was constructed, the islet called the Roches Douvres, at the point of the Côtes du Nord, the scene of many serious accidents. The greatest precautions are being taken to secure the solidity of the structure, the base of which is being sunk more than three feet in the solid rock, and fastened by means of strong iron bars. In consequence of the violence of the sea, it has been found necessary to erect the station of the superintendent of the works on piles, raised several yards above the plateau, and consequently only accessable by means of a ladder.

THE MONT CENIS TUNNEL.—During the month of August the progress made at the Mont Cenis tunnel was 39·10 metres on the Italian side at Bardonnèche, and 49·65 metres at Modane on the French side, making in all an advancement of 89·75 metres. The position up to the 31st August was as follows:—

	Metres.
South end, Bardonnèche	5,161·10
North end, Modane	3,574·65
Total length of tunnel driven	8,735·75
Length remaining to be driven	3,484·25
Total length of tunnel	12,220·00

According to the report recently published by Signors Sommeillier and Graltoni, the engineers of this undertaking, the cost of the works during 1867 amounted, in round numbers, to 6½ millions of francs (£260,000), and the length driven was 1,512·10 metres. During the present year, up to 31st August, 889·10 have been driven, at a cost of about 4,850 francs per metre run.

REPORT ON THE WORKING OF A FRENCH LABORATORY OF RESEARCH.—M. Wurtz, dean of the faculty of medicine of Paris, has made a report on the working of the laboratory under his charge. The report is dated in May last, but is just published. It appears that nineteen young chemists frequented the laboratory, and occupied themselves in researches and experiments of the most varied kind, the greater part of which resulted in discoveries or observations found worthy of being communicated to the Academy of Sciences and the Chemical Society; the total result being eighty notes or memoirs which are not without influence in the progress of chemical science. A list is given of the researches made by twelve pupils, of whom three or four appear to be English or American. The dean notices some of the most remarkable results of these experimental investigations. The researches of two of the students relate to what is called the phenomenon of isomerism, that is to say, the state of substances which present like composition with different qualities. One paper refers to chloride of allyl. Another student succeeded in separating and clearly distinguishing two classes of ethers, the *cyanhydrique* and the *nitriles*, which had previously been considered identical, and also in discovering the base of cyanhydric acid. Other students succeeded in demonstrating the truth of the connection or resemblance supposed to exist between carbon and silicium, and even in obtaining new compositions in which an atom of carbon replaces and serves the purpose of an atom of silicium. A young German chemist, studying in the laboratory, proved that the brain and nerves contained an abundance of a definite and crystalisable substance, which he has named *protagon*, which seems to play an important part in nervous action. This substance is complex, and when treated with alkalies yields a basic substance, which M. Liebreich has named *névrine*. This same substance may be obtained from the liver, in which it exists in a separate condition. *Névrine* has also been produced artificially by the action of oxygen and olefiant gas on ammonia and other substances. Results such as these certainly give immense importance to the establishment of laboratories with which France now, as well as Germany, is occupied.

Patents.

From Commissioners of Patents' Journal, September 18.

GRANTS OF PROVISIONAL PROTECTION.

Aërated beverages, &c., apparatus for supplying the syrup in the manufacture of—2775—J. Adams and H. Barrett.
Aniline, preparation of a blue colour from—2725—J. H. Johnson.
Capstans—2753—W. T. Carrington.
Card cases—2749—H. M. Lee.
Compasses—2743—W. E. Newton.
Coppers or boilers—2757—J. C. Walker.
Engines, expansion—2769—J. Stewart and J. Nicholson.
Furnaces, &c.—2761—J. Jones.
Heckling and carding machines—2765—G. Lowry.
Jewellery, &c., indivisible pin to be used in fastenings for—2767—P. I. Soulage.
Knitting and knitting machinery—2755—A. V. Newton.
Looms—2723—T. Atherton and J. Atherton, jun.
Looms—2731—W. G. Cooper and R. Harrison.
Muffs—2751—J. Joynson.
Muffs, cuffs, and collars—2773—E. Johnson.
Packings, metallic spring—2777—A. M. Clark.
Pumps for lubricating and other purposes—2727—T. Butterworth.
Railroad tracks, frog-plates for the intersections of—2747—J. Wood.
Reaping and mowing machines—2739—T. Howcroft & A. McGregor.
Thermometers—2733—W. E. Newton.
Weights, raising and lowering—2737—J. Pickering.

PATENTS SEALED.

797. R. M. Chevalier.
836. F. Winser and I. Swindells.
850. T. Barnes.
856. E. K. Dutton and J. and H. Holme.
858. S. Bates and W. Redgate.
868. W. G. Beattie.
872. J. B. Handyside.
874. J. Petrie, jun.
880. J. Norman.
882. A. Baumann.
890. D. Greig.
902. J. Macneill.
906. J. M. Poisnel.
908. J. M. Poisnel.
914. W. Smale.
916. W. Clarke and E. Walker.
922. R. Townsend.
928. P. Hill.
934. E. Rowland and J. Dalton.
937. W. Richardson.
938. F. Warner & H. Chopping.
939. W. Hooper.
941. R. W. J. Trueman.
944. H. F. Shaw.
951. W. and C. E. Taylor.
953. J. H. Cooper.
954. C. Gunner.
966. J. G. Jennings.
968. R. G. Greenhow.
969. E. K. Dutton.
971. T. Pope.
972. W. R. Lake.
976. J. Brönner.
978. G. F. Guy.
979. C. N. Leroy.
982. C. de Bergue.
984. A. Barclay.
988. G. B. Paterson.
992. T. W. Fuller.
994. E. Gray.
995. E. Gray.
1000. R. Smith.
1002. J. Antill.
1004. R. Smith, jun.
1005. M. P. W. Boulton and J. Imray.
1009. A. McGlashan & J. Hendry.
1010. A. B. Wollaston and F. Stanbridge.
1011. J. Warburton, jun.
1013. W. Buck.
1014. T. Lane.
1015. C. E. Brooman.
1016. S. Fisher.
1019. W. Richardson.
1022. J. Anderson.
1023. J. Jameson.
1025. A. P. Price.
1026. W. P. Piggott.
1032. T. Bettney.
1052. G. Davies.
1056. W. E. Newton.
1080. F. Wirth.
1097. T. Couldrey, jun.
1105. J. Norris and T. Quarm.
1111. J. H. Dufort and D. Gance.
1120. W. E. Boardman.
2340. C. D. Abel.

From Commissioners of Patents' Journal, September 22.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2372. W. Esson.
2383. J. C. Broadbent.
2426. J. Davidson.
2384. R. Fox.
2393. L. Villette.
2398. W. Porter.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2285. G. Dixon.
2340. W. Clark.
2358. G. T. Bousfield.

Journal of the Society of Arts.

FRIDAY, OCTOBER 2, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans:—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

HARVESTING CORN IN WET WEATHER.

The Essay by Mr. W. A. Gibbs, of Gillwell-park, Sewardstone, Essex, for which the Gold Medal of the Society and a prize of Fifty Guineas were awarded, is now ready. Published by Messrs. Bell and Daldy, York-street, Covent-garden, publishers to the Society of Arts; price one shilling, illustrated by woodcuts.

SUBSCRIPTIONS.

The Midsummer subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of the Society.

CANTOR LECTURES.

"ON FOOD." By DR. LETHEBY, M.A., M.B., &c.

LECTURE IV., DELIVERED MONDAY, FEBRUARY 10TH.

Preservation of Food—Unwholesome and Adulterated Food.

(*Continued from page* 761.)

As regards vegetable foods, they are not so liable to decay or even to parasitic infection, as animal foods; for the *acori* or *mites* of flour and sugar, or even the *weevels* of biscuit are harmless; indeed, the most important infection of grain is the fungoid disease of it, called *ergot.* This is the *muttercorn* or *roggenmutter* of the Germans, and as it chiefly infests the rye, it is named, from its appearance, *spurred rye;* but it also attacks barley, oats, wheat, maize, rice, and most of the grasses. It always appears as a black grain, of a larger size than usual, and it is mostly found in plants which grow upon moist clay soils, in damp situations, especially in the neighbourhood of forests. The district of Sologne, in France, between the rivers Loire and Cher, was once notoriously infested with the disease, and the Abbé Fessier, who was deputed in 1777 to investigate the causes of the extraordinary prevalence of ergot in that district, attributed it to the poorness and wetness of the land, and to the dampness of the air from the numerous forests. In bad seasons, as much as a third or a fourth of the crop was infected with ergot, and even in good seasons it constituted about two per cent of it. The disease in the grain is due to the growth of a peculiar fungus, which the late Mr. Quekett named *ergotetia abortifaciens;* and the effects of it on the human body are very serious. It acts chiefly on the nervous system, causing giddiness, dimness of sight, loss of feeling, and twitching of the limbs, and death by convulsions; or it produces a creeping sensation over the surface of the body, with coldness of the extremities, followed by insensibility and gangrene. These effects are no doubt referred to by Ligebert in his "History of Gaul and France," when he says that the year 1089 was a pestilent year, especially in the western parts of Lorraine, for many persons became putrid in consequence of their inward parts being consumed by St. Anthony's fire. Their limbs were rotten, and became black like coal, and they either perished miserably, or, being deprived of their putrid hands and feet, were reserved for a more miserable life. Bayle, too, in his account of this sickness, says that the bread was of a deep violet colour. The like effects have been observed in other parts of the Continent, as in Silesia, Prussia, Bohemia, Saxony, Holstein, Denmark, Switzerland, Lombardy, and Sweden, where the creeping sickness, as it is called, has attacked whole districts of the country, sparing neither old nor young, rich nor poor.

The remedy for the disease is in the hands of the miller, who should separate the ergotised from the healthy grains. Fortunately we have a ready test for its presence, not merely in the microscopic appearances of the flour, but in the circumstance that as it is the lightest of all the constituents of flour, it will float upon a mixture of one part of chloroform and six of alcohol, and will appear as a scum of dark-brown particles.

Another source of danger is the presence of poisonous grasses in the flour. The most important of these is darnel (*lolium temulentum*), which the careless or slovenly farmer will sometimes permit to overrun his fields, and the seeds becoming mixed with the corn, are ground into flour by the equally careless miller. The effect of the grains on man is to cause a species of intoxication, with headache, giddiness, somnolency, delirium, convulsions, paralysis, and even death. Occasionally it excites vomiting, with irritation of the alimentary canal, and then its effects are not so serious. Many instances are

recorded of the poisonous action of the flour. Christison, for example, tells us, that a few years ago almost all the inmates of the poor-house at Sheffield, to the number of 80, were attacked with analogous symptoms, after breakfasting on oatmeal porridge, and it was supposed that the effects were caused by the presence of darnel in the oatmeal. A similar accident is mentioned by Perleb, as having occurred at the House of Correction at Freyburg, and still more recently the same effects were produced on 74 persons at the workhouse of Beninghausen. Dr. Taylor states, on the authority of Dr. Kingsley, of Roscrea, that in the month of January, 1854, several families, including about 30 persons, suffered severely from the effects of bread containing the flour of darnel seeds. Those who partook of the bread staggered about as if they were intoxicated, and although they all recovered, yet they experienced a good deal of distress from giddiness, coldness of the limbs, and great prostration of vital power.

Unripe grain, as well as grain affected with the *rust*, and *mouldy flour* and *mouldy bread*, have also produced disturbance of the human system. M. Bouvier attributed the epidemic of dysentery, which occurred in the department of the Oise, in the autumn of 1793, to the use of *unripe grain;* and corn affected with *brown* or *black rust* is thought by many to be unwholesome. *Mouldy flour* or *mouldy bread* is certainly injurious, for several instances are on record where not only men, but horses, have been poisoned by mouldy bread; and M. Payen has given a graphic account of the distressing effects of the mouldy ammunition bread supplied to the troops who were encamped near Paris, in 1843; the mould on that occasion was a yellow fungus, the *oidium aurantiacum*, but at other times is has been of a green colour, from *pennicillum glaucum*.

Mouldy food of every description is dangerous to use, and considering to what an extent the *spores* or *sporidia* of poisonous fungi are floating in the atmosphere, it is surprising that they do not more frequently taint our food and cause disorder of the system, for air washed with distilled water will always yield abundance of these germs, which are ready at any moment to spring into activity when they come into contact with a proper nidus for their growth. A remedy for these hidden sources of danger is good and effective cooking.

And now, in conclusion, let me make a few remarks on the subject of the *fraudulent sophistications of food*—a subject which has been very popular for the last fifty years, or rather, I should say, since the year 1820, when Mr. Frederick Accum published his treatise on "Adulterations of Food, and Culinary Poisons," with the startling motto from the Book of Kings—"There is death in the pot." As you may easily imagine, such a terrible announcement by a well-known writer, could not fail to excite alarm in the public mind, and to provoke anxious curiosity. The book, therefore was eagerly sought for, and a thousand copies of it were sold within a month of its publication; so that, to use the words of the author, in his advertisement to the second edition—"there was sufficient inducement to reprint the work." The singular success of Accum's undertaking has been such a temptation to others, that the press has literally groaned with the efforts of sensational writers on this subject. And although I am ready to admit the importance of it, yet I am bound to state that it has often been grossly exaggerated, especially by those who have had but little practical knowledge to guide them.

The objects of fraudulent adulterations of food are three-fold:—

1. To increase the bulk or weight of the article.
2. To improve its appearance.
3. To give it a false strength.

Among the first of these adulterations are the following:—

(*a*) The addition of *inferior starches*, as potato-starch or English arrow-root, curcuma or East Indian arrow-root, jatropha or Brazilian arrow-root, tacca or Tahiti arrow-root, canna or Tous-les-mois starch, sago-meal, &c., *to true maranta, or West Indian arrow-root*—of which Bermuda arrow-root is the most esteemed variety. A microscopic examination of the starch or fæcula will always discover the fraud.

(b) The mixture of *starch-sugar* or even *starch* itself *with common cane-sugar*. Starch-sugar, or as it is sometimes called, grape-sugar, or glucose, is manufactured both in this country and on the Continent to a considerable extent. It is made from any description of starch, by boiling it for half-an-hour or so in water containing about one per cent. of sulphuric acid. The acid is then neutralised with chalk, and the liquor evaporated to a density of 1·28. While hot, it is run off clear from the insoluble precipitate of sulphate of lime, and on standing in a cool place for a few days it crystallizes or sets into a solid mass. This description of sugar has a low sweetening power—not half so great as that of cane-sugar—in fact it is produced from the latter by the action of vegetable acids and heat, when cane-sugar is added to fruit in making a tart or fruit pie, and in making jellies and jams. It is false economy, therefore, to sweeten to any extent before the tart is baked. The sugar is known by many characters, as a want of sparkle from the absence of well-formed crystals; its less solubility in water, and greater solubility in alcohol; and by its giving a deep port-wine tint to a solution of potash, when it is boiled with it.

(c) The dilution of *milk*, *vinegar*, &c., with *water*. This fraud is easily detected by the specific gravity of the liquid, and in the case of milk by the proportion of cream in the lactometer, and by the poor appearance of the milk when under the microscope.

(d) The mixture of *dripping* and *other fats* with *butter*, and *water* and *starchy* matter with *lard*. Butter and lard should always furnish, when melted, a clear-looking oil, with but little deposit of water or other substance.

The addition of *gelatine* to *isinglass*, which is sometimes so well managed that it requires a skilful analysis to detect it. Isinglass is an organised substance, and when examined with the microscope, exhibits a peculiar structure which is very characteristic of it; not so, however, with gelatine. A particle of isinglass put into cold water remains opaque, like a piece of white bread, and does not swell out; whereas gelatine becomes transparent, and enlarges a good deal in bulk. Jelly made from good isinglass has a slightly fishy smell, and is neutral to test-paper, but that from gelatine has a distinct odour of glue, and an acid reaction. Lastly, if a few grains of isinglass be burnt in a metal spoon until the ash alone remains—the ash will be very small in quantity, and of a reddish colour, while that of gelatine will be much larger in amount, and of a white appearance. Gelatine never agrees with the delicate stomach of an invalid like isinglass; and, therefore, it is often important to discover the difference.

(f) *Coffee* adulterated with *chicory* is readily detected by sprinkling the mixture upon water, when the coffee, which is slightly greasy from volatile and fixed oil, floats while the chicory sinks, and gives a brownish tint to the water. The experiment is easily made, as you here see, in a tumbler of water, and you may, with a little tact, determine the proportions of the mixture.

(*g*) *Wheaten flour* is frequently added to *flour of mustard*, and when the quantity passes beyond a certain amount, it is undoubtedly an adulteration, for the intention of it should be only to reduce to an agreeable extent the pungency of the mustard.

Of the second class of adulterations, where the object is to *improve the appearance of the article*, there are many examples, as:—

(*a*) The addition of *alum* to *bread*, by which, as I have already explained, inferior, and even damaged, flour may be made into a tolerable looking loaf. It is the property of alum to make the gluten tough, and to prevent its discolouration by heat, as well as to check the action of the yeast, or ferment upon it. When, therefore, it is

added to good flour, it enables it to hold more water, and so to yield a larger number of loaves; while the addition of it to bad flour prevents the softening and disintegrating effect of the yeast on the poor and inferior gluten, and so enables it to bear the action of heat in the process of baking. According to the quality of the flour will be the proportion of alum, and hence the amount will range from 2 oz. to 8 oz. per sack of flour. These proportions will yield from 9 to 37 grains of alum in the quartern loaf, quantities which are easily detected by chemical means. Indeed, there is a simple test by which much smaller quantities of it may be readily discovered. Infusion of logwood, as you here perceive, acquires a rich purplish carmine, or claret tint, when it is brought into contact with alum; you have, therefore, only to dip a slice of the bread for an instant, as I am now doing, into a weak, watery solution of logwood, and if alum be present the bread will speedily acquire a purple, or reddish purple, tint. I have already described to you the other properties of good bread, as that it should not exhibit any black specks upon the upper crust; it should not become sodden and wet at the lower part by standing; it should not become mouldy by keeping in a moderately dry place; it should be sweet and agreeable to both taste and smell; it should not give, when steeped in water, a ropy acid liquor; and a slice of it taken from the centre of the loaf should not lose more than 45 per cent. by drying.

Sulphate of copper is found to act like alum in improving the appearance of bread; and, according to Kuhlmann, Chevallier, and others, it is commonly used by the bakers of the Continent, notwithstanding the severe penalties attached to it. In this country, however, it is but rarely employed.

(*b*) *The bloom, or glaze, or facing*, of green and black tea is generally artificial. In the case of green tea, it is ordinarily a mixture of Prussian blue, turmeric, and sulphate of lime, or China clay; and in that of black tea it is not unfrequently a coating of black-lead. The tea prepared for the English market is notoriously subject to these adulterations; and it seems that it arises entirely from our own fancy, and not from any desire on the part of the Chinese to pursue such a practice. The adulteration is easily discovered by shaking the tea with cold water, and then straining through muslin, and allowing the fine powder to subside.

(*c*) *Pickles* and *preserved fruits* are often made green with a salt of copper, it being the peculiar property of that metal to mordant, or fix in an insoluble form, the green colouring matter or *chlorophyll* of vegetables. If, therefore, the pickling operation is conducted in copper vessels, or if a little verdigris or sulphate of copper is added to the vinegar in which the vegetables are boiled, the colour of them will be retained. In some cases the quantity added has been so large as to give a coppery look to a steel fork or knife plunged into the pickle. In such cases, as might be expected, severe symptoms of poisoning have been occasioned by it.

(*d*) *Ferruginous earth*, or *red oxide of iron*, is frequently added to sauces, to anchovies, to cocoa preparations, and to preserved or potted meats, to improve their appearance.

(*e*) *Mineral pigments*, often of a poisonous nature, are used in colouring confectionary.

And lastly, with the view of giving a *false strength to the article*, we have instances of *sulphuric acid* added to *vinegar*, *black-jack* or burnt sugar to *coffee* and *chicory*, *catechu* or *terra japonica* to *tea*, *cocculus indicus* to *beer*, *cayenne* to *peppers*, &c.

That many of these sophistications are dangerous there can be no doubt, and all of them are frauds on the public. Parliament has therefore attempted to deal with the matter by legislation, as in the "Act for Preventing the Adulteration of Articles of Food or Drink" (23rd and 24th Vict., cap. 84) of 1860; but as the act is only permissive, little or no effect has been given to it. Even in those places, as in the City of London, where it has been put into operation, and public analysts have been appointed, no good has resulted from it; in fact, it stands upon the statute-book as a dead letter. Speaking for the City, I may say that every inducement has been offered for the effective working of the act, but nothing has come of it. In olden time the remedies for such misdemeanours were quick and effectual. In the *Assisa panis*, for example, as set forth in *Liber albus*, there are not only the strictest regulations concerning the manner in which the business of the baker is to be conducted, but there are also the penalties for failing in the same. "If any default," it says, "shall be found in the bread of a baker in the City, the first time let him be drawn upon a hurdle from the Guildhall to his own house through the great streets where there be most people assembled, and through the great streets which are most dirty, with the faulty loaf hanging from his neck; if a second time he shall be found committing the same offence, let him be drawn from the Guildhall through the great street of Cheepe, in manner aforesaid, to the pillory, and let him be put upon the pillory, and remain there at least one hour in the day; and the third time that such default shall be found, he shall be drawn, and the oven shall be pulled down, and the baker made to forswear the trade within the City for ever." It further tells us that William de Stratford suffered this punishment for selling bread of short weight, and John de Strode for making bread of filth and cobwebs. One hoary-headed offender was excused the hurdle on account of his age and the severity of the season; and it would seem that the last time the punishment was inflicted was in the sixteenth year of the reign of Henry VI., when Simon Frensshe was so drawn. A like punishment was awarded to butchers and vintners for fraudulent dealings; for we are told that a butcher was paraded through the streets with his face to the horse's tail, for selling measly bacon at market, and that the next day he was set in the pillory with two great pieces of his measly bacon over his head, and a writing which set forth his crimes. In the judgments recorded in *Liber albus* there are twenty-three cases in which the pillory or the thew was awarded for selling putrid meat, fish, or poultry; thirteen for unlawful dealings of bakers, and six for the misdemeanours of vintners and wine-drawers. Of a verity we have degenerated in these matters.

And now, in conclusion, having directed your attention to the nutritive values of different kinds of food; to their functional and dietetical powers; to the modes in which they are associated; to the quantities required for ordinary labour; to the manner in which they are digested; to the effects of culinary and other treatment; to the way in which they may be preserved; and to the causes of their unwholesomeness, we may finally ask if any great generalisations can be deduced from our inquiries?

In the first place, you will, I think, have observed that there are very striking evidences of design in the way in which organic matter is constantly kept in motion, for, whether living or dead, it is always in a state of molecular activity—either advancing towards the highest state of organisation, or retreating to the confines of the mineral kingdom. The result of this is that, with a comparatively small amount of material, and with but little expenditure of force, the work of the living world is fully and effectively performed. Starting from the mineral kingdom, as carbonic acid, water and ammonia, the elements of organic nature pass through a succession of changes, first in the vegetable and next in the animal, until they reach the summit of organization, when they again return to their primitive condition. In this manner a never-ending round of change is perpetuated, and the same material and the same force are kept moving in the same continuous circle. Through the efforts of the plant the crude materials are formed into vegetable acids, sugar, gum, starch, fat, albumen, and tissue; and then the animal converts them into higher forms of structure, as gelatine, muscle, and brain;

the two extremes, therefore, of these changes are, to use the words of Gerhardt, carbonic acid, water, and ammonia at one end; albumen, gelatine, fat, and cerebral matter at the other—but the transitions to these extremes are countless, and are as yet beyond the reach of science. Broadly, however, we may say that the chemical functions of the plant are those of reduction or deoxydation, whereby carbonic acid and water are deprived of their oxygen and moulded with nitrogen into food; while those of animals are of an opposite nature, for they destroy this food by oxydation. The plant, therefore, is the machine or medium whereby carbonic acid, water, and ammonia, are converted into new compounds, and light and heat are transformed into chemical affinity; and the animal is the medium or machine whereby these compounds are destroyed, and their affinities changed into other manifestations of force, and finally into heat. In this way, the circuit of change is completed; and it is not difficult to trace the phenomena of vitality to the cosmical forces which the plant had imprisoned. But shall we ever be able to follow, through all the intricacies of change, the countless transitions of both matter and force in their passage from the mineral kingdom to the animal, and then back to the mineral again? It is easy to connect, by a correlation of force, the muscular movements of the animal body, and even the highest efforts of the human mind, with the sunbeam which the plant had arrested; but shall we ever be permitted to unravel those mysterious functions, those intermediate changes which constitute the phenomena of life? Why is it, for example, and how comes it, that the living cell of the plant is able to aggregate mineral matter in opposition to the common laws of affinity, and can transform light and heat into cell-force? How is it, too, that the animal, in reversing the process, and so restoring the play of affinity, is able to transmute it into other manifestations of force? At present, the utmost we can say of it is, that organic matter is the appointed medium of all these changes, and is designed for the exhibition of vital phenomena, just as mineral matter is the appointed medium for the phenomena of electricity and magnetism; and yet to some extent, perhaps, we are able to penetrate the mystery; for by finding the clue to the peculiar action of the vegetable in reducing chemical compounds, we can, by operating on such substances as carbonic acid, water, and ammonia, produce a large number of organic principles; in fact, of the three great classes of alimentary substances, to which I have so frequently directed your attention—namely, the oleaginous, the saccharine, and the albuminous—it may be said that the first is already within the manufacturing power of the chemist, and the second is nearly within it; so that there is abundant proof that the agency of a vital force is not necessary to the formation of organic compounds; and there is even hope that the fabrication of food may not be altogether beyond the capabilities of man.

Proceedings of Institutions.

Yorkshire Union of Mechanics' Institutes.—*Bradford Mechanics' Institute.*—On September 28th the annual soirée was held in the lecture-hall of the institute, the Rev. Dr. Campbell, president, in the chair. The attendance was large. The chairman opened the proceedings by drawing attention to the fact that the institute was now 36 years old. It had passed through the difficulties of early life, and was flourishing in all its departments, the only difficulty now being the want of room, which would be remedied in the new building proposed to be erected, which, whatever name might be given to it, would perhaps be found to be the People's College, open for all classes of the community. After a reference to the classes, the lectures, the news-room, and the prizes, he proceeded to discharge the duty of presenting the prizes and certificates to the pupils, accompanying each with a pleasant word to the recipients. He then resumed his address, and, alluding to the new institute, he said that an offer of £500 from Mr. H. W. Ripley some years ago had spurred them on towards the erection of a new building. Mr. Ripley coupled with his offer the condition that an industrial museum should be connected with the institute, but the directors, finding that there were difficulties in the way, told Mr. Ripley, and he at once offered the money without any condition at all. A scheme was then proposed to erect a large building, costing £40,000, and to have all the literary and scientific institutions of the town under one roof. That scheme, however, fell through, although Mr. Ripley had offered a tenth of whatever they might spend, and the directors proposed to keep to the same proportion, and put him down for £1,200, or one-tenth of the sum to be spent on the building at Bowling-green. Mr. Titus Salt, ever ready and generous, offered £1,000; Mr. M. W. Thompson, M.P., £500, and more if they wanted it; Mr. James Law (the mayor), who always had taken, and still continued to take, an active part in the management of the institute, together with his partners, offered £400; Mr. W. E. Forster, M.P., £150, as a private individual, and not as member for Bradford; Mr. Ald. Brown, £100, who had offered £500 to the general institute plan, and who, it was hoped, would contribute that amount to the present scheme; the venerable Dr. Godwin, whom they all revered, and Mr. Ald. J. V. Godwin, his son, £150; Mr. C. Lund, their treasurer, who had watched with a severe jealousy over their finances for many years, gave £100; Mr. Ald. Semon, who was unavoidably prevented being present that evening, and who took great interest in the institute, £250; the junior members of the firm at Saltaire, following in their father's footsteps, contributed £500; Messrs. Kell had promised £100; and Mr. H. Harris had sent a note offering £300, and with a promise that hereafter, if it was required, more might be forthcoming. The President concluded by expressing the hope that, with almost half of the amount offered that would be required for the new scheme there was no ground to fear that the undertaking would not be fully carried out.—Mr. H. W. Ripley, who was received with applause, after alluding to the advanced classes, said that in the future it was to be hoped primary education would no longer be necessary in mechanics' institutes, but would be so completely given that the higher branches of education would alone have to be taught, and this rendered the importance of mechanics' institutes far greater. He then urged the necessity of technical education, drew attention to the successful working of polytechnic schools on the Continent, and urged the directors of the institute not to be hasty in deciding what they would spend on a building, and rather to delay, and to expend £20,000 on a structure worthy of the purpose it was intended to subserve, and of the town, than to cramp its operations by a smaller expenditure.—Addresses were afterwards delivered by the Rev. W. Kingsland, the Mayor, Mr. J. Behrens, and other gentlemen.

Rothwell Mechanics' Institute.—The Committee have advertised for tenders for the erection of a new building. It is to consist of a good-sized hall, 55 feet long by 33 feet wide, library, reading and class rooms, with ante-room to the large hall, and other conveniences. The efforts of the working classes of Rothwell are deserving of every encouragement, as the institution has, under great difficulties, steadily increased its numbers and usefulness, and now consists of 128 members, chiefly miners and artisans. The only building they at present have is an upper floor of an old malt kiln. There is no room in the town available for a concert or entertainment. The late Mr. Calverley, of Oulton-hall, very handsomely gave an eligible site for the building, also a donation of £100. The contributions from the working classes are very numerous and liberal, according to their means. There still remains a considerable sum to be raised, and it is hoped the well-wishers of the cause will see the institution opened free of incumbrance.

EXAMINATION PAPERS, 1868.

(*Continued from page* 751.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

LATIN AND ROMAN HISTORY.

Section I.

Translate:—

Sic ubi deseruit madidos septemfluus agros
Nilus, et antiquo sua flumina reddidit alveo,
Aetherioque recens exarsit sidere limus,
Plurima cultores versis animalia glebis
Inveniunt, et in his quaedam modo coepta sub ipsum
Nascendi spatium, quaedam imperfecta suisque
Trunca vident numeris, et eodem in corpore saepe
Altera pars vivit, rudis est pars altera tellus.
Quippe ubi temperiem sumpsere humorque calorque,
Concipiunt, et ab his oriuntur cuncta duobus.
Cumque sit ignis aquae pugnax, vapor humidus omnes
Res creat, et discors concordia fetibus apta est.
Ergo ubi diluvio tellus lutulenta recenti
Solibus aetheriis altoque recanduit aestu,
Edidit innumeras species, partimque figuras
Rettulit antiquas, partim nova monstra creavit.
Illa quidem nollet, sed te quoque, maxime Python,
Tum genuit, populisque novis, incognite serpens,
Terror eras; tantum spatii de monte tenebas.

1. Parse fully, giving both accidence and syntax, the words deseruit, nascendi, numeris, aquæ, fetibus, nollet.
2. Give the present and perfect tenses indicative and the supines of the verbs exarsit, concipiunt, rettulit, tenebas.

Section II.

Translate:—

Redeuntem colle Lycaeo
Pan videt hanc, pinuque caput praecinctus acuta
Talia verba refert—Restabat verba referre,
Et precibus spretis fugisse per avia nympham,
Donec arenosi placidum Ladonis ad amnem
Venerit; hic illi cursum impedientibus undis,
Ut se mutarent, liquidas orasse sorores:
Panaque cum prensam sibi iam Syringa putaret,
Corpore pro nymphae calamos tenuisse palustres;
Dumque ibi suspirat, motos in arundine ventos
Effecisse sonum tenuem similemque querenti.
Arte nova vocisque deum dulcedine captum
"Hoc mihi concilium tecum" dixisse "manebit."
Atque ita disparibus calamis compagine cerae
Inter se iunctis nomen tenuisse puellae.
Talia dicturus vidit Cyllenius omnes
Succubuisse oculos, adopertaque lumina somno.

1. Parse fully, giving both accidence and syntax, the words caput, precibus, illi, querenti, compagine, succubuisse.
2. Turn the following four lines into the *oratio recta*:—

Dumque ibi suspirat, motos in arundine ventos
Effecisse sonum tenuem, similemque querenti;
Arte novâ vocisque Deum dulcedine captum,
Hoc mihi concilium tecum, dixisse, manebit.

Section III.

Translate:—

Ego autem, etsi vereor laudare praesentem, iudico tamen de re obscura atque difficili a te dictum esse dilucide, neque sententiis solum copiose, sed verbis etiam ornatius quam solent vestri. Zenonem, quem Philo noster coryphaeum appellare Epicureorum solebat, quum Athenis essem, audiebam frequenter et quidem ipso auctore Philone, credo, ut facilius iudicarem quam illa bene refellerentur, quum a principe Epicureorum accepissem quem ad modum dicerentur. Non igitur ille, ut plerique, sed isto modo, ut tu, distincte, graviter, ornate. Sed quod in illo mihi usu saepe venit, idem modo, quum te audirem, accidebat, ut moleste ferrem tantum ingenium—bona venia me audies—in tam leves, ne dicam in tam ineptas, sententias incidisse. Nec ego nunc ipse aliquid adferam melius. Ut enim modo dixi, omnibus fere in rebus et maxime in physicis quid non sit citius quam quid sit dixerim.

1. Parse fully, giving both accidence and syntax, the words sententiis, auctore, refellerentur, veniâ, incidisse, sit.
2. Give the present and perfect tenses indicative and the supines of the verbs accepissem, dicerentur, accidebat, adferam.

Section IV.

Translate:—

Etenim si semel, Vellei, suscipimus genus hoc argumenti, attende quo serpat. Tu enim sumebas nisi in hominis figura rationem inesse non posse: sumet alius nisi in terrestri, nisi in eo, qui natus sit, nisi in eo, qui adoleverit, nisi in eo, qui didicerit, nisi in eo, qui ex animo constet et corpore caduco et infirmo, postremo nisi in homine atque mortali. Quod si in omnibus his rebus obsistis, quid est quod te una forma non turbet? His enim omnibus, quae proposui, adjunctis in homine rationem esse et mentem videbas. Quibus detractis deum tamen nosse te dicis, modo lineamenta maneant. Hoc est non considerare, sed quasi sortiri quid loquare. Nisi forte ne hoc quidem attendis, non modo in homine, sed etiam in arbore quidquid supervacaneum sit aut usum non habeat obstare. Quam molestum est uno digito plus habere! Quid ita? quia nec ad speciem nec ad usum alium quinque desiderant. Tuus autem deus non digito uno redundat, sed capite, collo, cervicibus, lateribus, alvo, tergo, poplitibus, manibus, pedibus, feminibus, cruribus.

1. Parse fully, giving both accidence and syntax, terrestri, adjunctis, sortiri, digito, cervicibus.
2. Account for the mood of serpat, maneant, loquare, sit.

Section V.

1. Give an account of the Servian Constitution.
2. What was the origin of the Tribunate?
3. Give an account of the capture of Rome by the Gauls.
4. By what successive steps did Rome rise to supremacy over Italy?
5. Write a short history of the Roman navy down to the end of the Third Punic War.
6. Give an account of Cincinnatus.

Section VI.

1. Give an account of the War with Jugurtha.
2. Describe the duties, powers, and mode of appointment of the consul, censor, prætor, quæstor, curule ædile.
3. How did the later aristocratic and democratic parties differ from the earlier?
4. Write a short life of Pompey.
5. Describe the character of Cicero.
6. Describe the struggle between Octavius and Antony.

FRENCH.

THREE HOURS ALLOWED.

Part. I.

Candidates for a third-class certificate are to translate the following extract into English, and to answer the grammatical questions thereto annexed, in the order in which they are placed. This first part is all that is required of them.

Dire que la poudre à canon a été la première cause qui ait rendu les guerres plus rares, semble une proposition qui a droit d'étonner; cependant l'invention de la poudre est le premier des faits intellectuels qui ont amené ce résultat. Quand le premier coup de canon eut retenti, il se fit un grand changement dans la pratique de la guerre. Alors commencèrent à disparaître ces armées indisciplinées, mal préparées, mal équipées, qui se composaient non d'une classe d'hommes, mais de tous

les hommes pouvant porter une arme. Ce coup de canon qui ébranla le premier le sol d'un champ de bataille mit en fuite la tourbe de ces demi-soldats avec lesquels on faisait la guerre. Il fallut désormais des arquebuses, des mousquets, des canons, des bombes, des mortiers, des grenades. Il fallut des hommes à part pour manœuvrer les nouveaux engins; il fallut beaucoup d'armes pour équiper une armée, de longs exercices pour l'aguerrir; il fallut des troupes permanentes. Jusque-là tout homme qui n'était pas d'église était plus ou moins soldat; dès lors il y eut une masse considérable d'hommes qui ne furent ni d'église ni soldats; il y eut une ligne intermédiaire qui devint une large voie entre la théologie et la guerre, une carrière vaste qui renferme désormais la nation tout entière, dévouée aux arts de la paix, vivant de l'intelligence, représentant la civilisation moderne, répandant les bienfaits de l'éducation, enseignant ses législateurs, contrôlant—elle en a du moins le droit—ses chefs et ses rois, établissant avant toute chose sur une base solide cette suprématie de l'opinion publique devant laquelle non-seulement les princes constitutionnels, mais encore les souverains absolus sont strictement responsables.

Quand les classes commerciales repoussent l'idée de la guerre, elles obéissent confusément à une loi intellectuelle. C'est le second fait qui explique la décadence de l'esprit guerrier: ce fait, qui est tout entier du domaine de l'intelligence, s'appelle l'économie politique. Sans doute il n'y a pas un marchand sur cent qui soit familier avec les principes de cette science; pourtant ils obéissent à ces principes comme s'ils les connaissaient, comme s'ils les comprenaient. Ils se soumettent à l'esprit de leur temps, et cet esprit n'est autre que l'ensemble des connaissances humaines. L'économie politique en forme une part considérable; c'est la seule branche de l'art de gouverner les hommes qui ait été amenée à la rigueur d'une science. Or, l'économie politique est une exhortation perpétuelle à la paix.

* * * * *

Parmi les bienfaits dont nous sommes redevables au progrès, il convient de faire une bonne place à la facilité des communications. C'est le troisième fait intellectuel qui diminue les chances de guerre entre les nations civilisées. La vapeur a été plus puissante qu'aucun précepte moral pour restreindre l'amour de la guerre. D'où venaient le mépris et la haine qui éloignaient l'un de l'autre les deux peuples les plus civilisés de la terre? Ils ne se voyaient pas, ils ne se connaissaient pas. . . . . En rapprochant les nations, la vapeur les a forcées à se connaître et à s'estimer. Elle a été un lien de charité internationale; elle vaut à elle seule autant que bien des leçons de moralistes pour apprendre à un peuple à aimer son prochain.

L. Étienne.

1. Parse the first two sentences of the above extract (down to "*de la guerre.*")

2. Give the five primitive tenses of the verbs:—*Dire, se fit, disparaître, pouvant, mit, fallut, devint, vivant, obéissent, connaissaient, comprenaient, restreindre, voyaient, vaut, apprendre.*

3. "Le premier des faits" (4th line). "Il fallut des arquebuses, &c." (13th line). Explain the meaning and nature of "des" in either case, and state, with examples, when the partitive article "des" must be changed into "de."

4. "Ces demi-soldats" (12th line). Why does not "demi" agree with "soldats" here? State the rule, and name the other adjectives to which the same rule applies.

5. Give the adjective corresponding to each of the following nouns that occur in the above extract:—*Guerre, pratique, champ, soldat, église, théologie, nation, art, paix, bienfait, prince, idée, loi, esprit, économie, science, temps, rigueur, progrès, mépris, haine, terre, charité.*

6. Give the adverb corresponding to each of the following adjectives:—*Premier, grand, tout, demi, nouveau, long, large, entier, solide, public, absolu, familier, seul, bon, puissant, moral.*

7. Translate into French:—"A marble table," "Burgundy wine," "a writing table," "olive oil," "lamp oil," "a wine glass," "a glass of wine," "a windmill," "a paper bag," "a paper basket," "a four-wheel carriage."

8. Write in the plural the following words:—"Tête-à-tête," "passe-partout," "in-quarto," "casse-cou," "porte-monnaie," "serre-tête," "appui-main," "pied-à-terre."

9. Translate in French, writing it in full:—*London, May 5th*, 1868, and give the rule concerning the words *cent, vingt*, and *mille*.

10. Explain why the word *tout* varies in this sentence:—"Tout habile et toute spirituelle qu'est cette personne, elle ne réussit pas."

11. Show the modifications which certain words undergo in French for the sake of *euphony*. Give as many different instances as possible.

12. Conjugate the imperfect indicative, and the imperative of the verbs:—*Courir, fuir, tenir, se repentir, savoir, voir, craindre, prendre, rire, vivre.*

Part II.

Candidates for a second-class certificate are to answer questions 9, 10, and 11 in Part I., together with those in Part II., and to translate the English extract and idiomatic expressions which follow.

Grammar.

1. In the first sentence of the French extract in Part I. there occurs this apparent anomaly—that whilst in "la première cause qui *ait* rendu, &c.," the verb is construed in the subjunctive mood, the indicative mood is used in "le premier des faits intellectuels qui *ont* amené, &c." Can you explain this difference?

2. When are you to translate "it is" by "*ce* sont," and not by "c'est"? Give examples.

3. When should "it is" immediately before an adjective be rendered by "il est," and when by "c'est"?

4. Give, with suitable examples, any three important rules on the syntax of personal or possessive pronouns in French.

5. Distinguish between "les César et les Napoléon," "les Pitt et les Cobourg," and "les Césars et les Napoléons," "les Pitts et les Cobourgs."

6. Explain the difference of meaning between "Il se plaint qu'on l'a volé," and "Il se plaint qu'on l'ait volé." Distinguish also between "Cela impose" and "Cela en impose," between "participer à" and "participer de,"—and between "servir à rien" and "servir de rien."

Translation.

It is an extraordinary thing that man, with a mind so wonderful that there is nothing to compare with it elsewhere in the known creation, should leave it to run wild in respect of its highest elements and qualities. He has a power of comparison and judgment, by which his final resolves, and all those acts of his material system which distinguish him from the brutes, are guided: shall he omit to educate and improve them when education can do much? Is it towards the very principles and privileges that distinguish him above other creatures he should feel indifference? Because the education is internal, it is not the less needful; nor is it more the duty of a man that he should cause his child to be taught than that he should teach himself. Indolence may tempt him to neglect the self-examination and experience which form his school, and weariness may induce the evasion of the necessary practices; but surely a thought of the prize should suffice to stimulate him to the requisite exertion; and to those who reflect upon the many hours and days devoted by a lover of sweet sounds to gain a moderate facility upon a mere mechanical instrument, it ought to bring a blush of shame, if they feel convicted of neglecting the beautiful

living instrument wherein play all the powers of the mind.— Faraday.

Idioms.

1. Il a pris fait et cause pour moi ; sans quoi on m'aurait donné du fil à retordre.
2. Nous avons eu maille à partir ensemble.
3. Il est resté sur le carreau.
4. Je suis au bout de mon latin.
5. Je n'y suis pour rien.
6. Vous n'y êtes pas à beaucoup près.
7. Vous trouverez chaussure à votre pied.
8. Il mesure toujours les autres à son aune.
9. Partageons le différend.
10. On lui a monté la tête.
11. Ne vous faites donc pas tant tirer l'oreille.
12. Il va toujours son petit bonhomme de chemin.

Part III.

Candidates for a first-class certificate are expected to translate the above idioms and English extract, and to answer in French the grammatical questions 2, 3, and 6 in Part II., as also the following:—

Literature.

1. State what you know of either Marot or Malherbe.
2. Trace the Italian influence through the literature of France during the reigns of the three last Valois.
3. What was the *Pléiade ?* And what do you know of the *Satire Ménippée ?*

History.

Sketch the character of Charlemagne as a legislator.

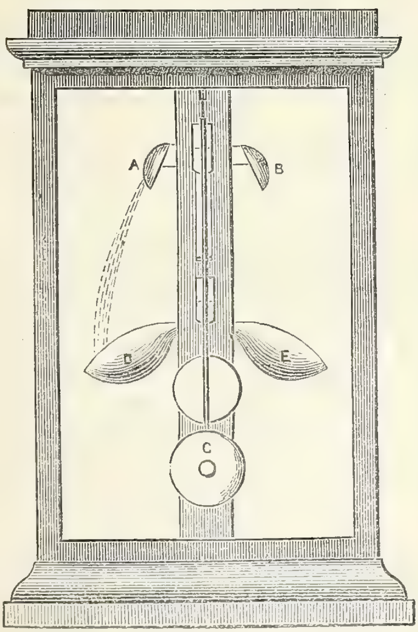
(*To be continued.*)

HYDRAULIC CLOCK.

The following particulars have been forwarded by Mr. W. A. Gilbee, South-street, Finsbury:—

This clock, according to the statements of the inventor, keeps very correct time, is extremely simple in its construction, and in no way resembles the clepsydra of the ancients.

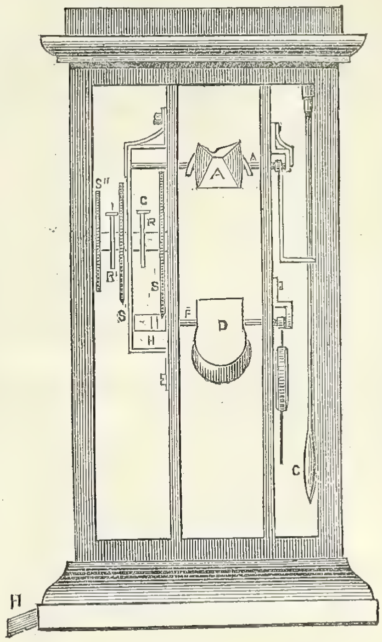
FIG. 1.



In the engravings, Fig 1 is a back elevation ; Fig. 2, a side elevation ; Fig. 3, a front elevation, the hands being shown in dotted lines) ; and Fig. 4, a plan of this improved water clock.

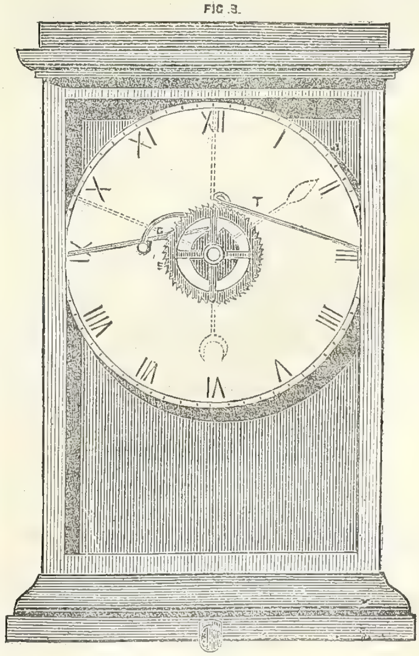
As its name implies, the motive power of the

FIG. 2



clock is water, which is maintained at a constant level in the reservoir, P, on the top, from a continuous flow; the water passes from this reservoir through a small inclined opening, *p*, into a vessel divided into two equal compartments, A and B,

FIG. 3.



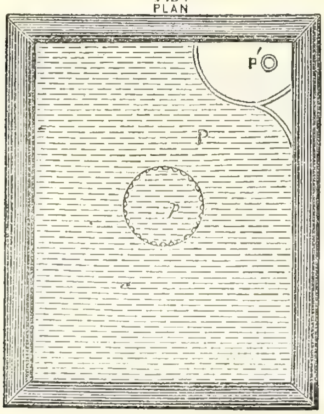
and attached at right-angles to the axis of a rod, A', acting on the pendulum, C. When the pendulum, after

losing the vertical position, begins to oscillate, the aforesaid vessel brings its two compartments successively under the orifice of the reservoir, in such a way that when one falls through the weight of the water, the other rises, thus producing the movement which maintains the oscillation of the pendulum, which in its turn regulates the rate of movement. At each oscillation of the pendulum, the water falls from the aforesaid vessel into a second vessel, D, E, causing it to oscillate isochronally with the pendulum. This vessel, D, E, by means of a click on its arbor, moves the first wheel, S (cut with 60 ratchet teeth), one tooth, and as the socket of this wheel carries the seconds' hand, the latter thus moves over a second at each vibration of the pendulum.

When this wheel, S, has completed one revolution (and the seconds' hand passed once round the dial), the cam, R, which has raised the lever, G, lets it fall, causing the click, *l*, to move the wheel, S′, one tooth, and as the socket of this wheel carries the minute hand, the latter moves over a minute on the dial. This wheel, S′, in like manner, moves the third or hour wheel, S″, by means of the cam, R′, and lever, *i*.

A spring, T, is adapted to each wheel to keep it from moving too easily. P′ is the overflow pipe from the reservoir.

FIG 4
PLAN



If desired, an aquarium may be placed in the lower part of the clock case, the falling water keeping up a running stream for fish, &c., the overflow being carried off by a pipe.

This ingeniously contrived clock, not only by its simple mechanism, but also by its continuous action (as it never requires winding up), and its extreme accuracy as a time measurer, offers (says the inventor) a prospect of very advantageous results; and the moderate price at which it can be made will place it within the reach of the humblest class. At the same time it will form an equally useful ornament for the garden, hot-house, or public places, for the drawing-room or kitchen.

AGRICULTURAL RETURNS OF GREAT BRITAIN FOR 1868.

It has not been practicable to obtain from all parts of England and Wales the information necessary for the completion of the Agricultural Returns for this year until the present date.

With the view of making known, as early as possible, the chief results exhibited by the returns, the following particulars are furnished in anticipation of the publication of the returns in detail:—

Extent of Land in Great Britain under

	Wheat.	Barley.	Oats.
	Acres.	Acres.	Acres.
1866..	3,350,394	2,237,329	2,759,923
1867..	3,367,876	2,259,164	2,750,487
1868..	3,646,260	2,149,201	2,753,840
	Increase (+), or Decrease (—).		
1868 over 1867	+ 278,384	— 109,963	+ 2,753
	or 8·2 per cent.	or 4·9 per cent.	or 0·1 per cent.
1868 over 1866	+ 295,866	— 88,128	— 6,683
	or 8·8 per cent.	or 4·0 per cent.	or 0·3 per cent.

Total No. of Live Stock in Great Britain upon 25th of June.

	Cattle.	Sheep.	Pigs.
1867..	4,993,034	28,919,101	2,966,979
1868..	5,416,154	30,685,980	2,303,857
	Increase (+), or Decrease (—).		
1868 over 1867	+ 423,120	+ 1,766,879	— 663,122
	or 8·5 per cent.	or 6·1 per cent.	or 22·3 per cent.

The acreage of land in Great Britain under potatoes in 1868 was 539,954—against 492,217 in 1867, and 498,843 in 1866.

The acreage under hops in 1868 was 64,488—against 64,284 in 1867, and 56,578 in 1866.

Statistical Department, Board of Trade,
23rd September, 1868.

APPARATUS FOR LIFTING SHIPS.

The following account of a trial of an apparatus for this purpose, invented by Mr. Maquay, is extracted from the *Geelong Advertiser*, of July 15th:—

The first public trial of Mr. Maquay's ship-lifting apparatus was made yesterday, in Corio Bay, and the success attained was so complete as to fully justify all the expectations of the company who have become the proprietors of the patent, and, on the strength of it, have, we believe, bought the sunken steamer, the *City of Launceston*. A barge was moored about a quarter of a mile from the shore, in five fathoms of water; at the stern of this barge a smaller one, twenty feet in length and ten feet broad, laden with chains and stones, to the extent of ten tons, had been sunk, and it was this heavy mass which it was proposed to lift bodily from the muddy bottom.

The following is a description of the apparatus employed:—A strong iron cylinder, 3 feet 6 inches in height, with a diameter of 2 feet 6 inches, is half filled with water; in this are placed 50 lbs. of zinc and a carboy containing 112 lbs. of sulphuric acid. The cylinder, which weighs about a ton, is then lowered on to the vessel it is proposed to raise; two large circular pieces of prepared canvas, 22 feet in diameter, having previously, by means of a network of ropes, the lower ends being gathered together round circles of rope, been formed into the shape of balloons, with a capacity of 240 cubic feet each, are lowered down, and, by means of angle-irons and chains, firmly affixed to the sunken body. All having been made ready by a diver, he strikes an iron bar passing through an aperture at the top of the cylinder and bearing upon the glass

carboy of sulphuric acid, which it smashes, and causes the acid to mix with the zinc and water, and thus coming in contact with the oxide of zinc quickly causes hydrogen gas to generate. This is then conveyed to the two balloons through two india-rubber tubes affixed to two taps on the cylinder, and the balloons becoming inflated with a gas fourteen and a-half times lighter than the atmosphere we breathe, quickly rises to the surface of the water—that is to say, if the dead weight they are fastened to is not too heavy—and it is calculated that each of them, when fully inflated, will lift ten tons of dead weight through water, though, judging by yesterday's experiment, they will lift a great deal more than this. As the weight required to be raised yesterday was only ten tons, only one balloon was called into requisition, and only half a charge of acid and zinc placed in the cylinder. Everything having been got ready for the lowering of the cylinder, Mr. Maquay—who, by-the-bye is a first-class diver—donned his 146 lb. weight diving dress. He went over the side of the vessel, and quick was the word given to the men at the air-pump to "blow away." After a lapse of a few minutes, the sign was given from below to lower the cylinder; this was done, when again there came a check, Mr. Maquay finding that the cylinder had not landed in the centre of the barge. This was, however, quickly remedied, and after the lapse of half-an-hour up comes the diver again with the information that one of the guy-ropes had broken, causing the cylinder to lie on one side, and that one end of the barge had sunk into the oosy mud. This information caused much anxiety, as it was feared the cylinder might topple over and make the carboy burst before everything was ready. After two or three such drawbacks, which always occur on a first trial, the signal was given, and the balloon was lowered into the water, and firmly fixed to the chains placed athwart the punt. A thud was heard, proving the iron carboy smasher to have been struck, and then all were on the *qui vive* wishing to see the balloon inflate. There was a great rush of air to the surface of the water, and many thought the balloon had burst, but this was simply impossible—for if too much gas came out of the tube it would escape from under the balloon; the commotion on the water was caused by the escape of the atmospheric air which the bag contained when it went down. Gradually it could be seen the balloon was inflating, but it was at the same time discerned that the stuff of which it was made, viz., canvas, with a coating of gutta-percha steeped in naptha, was not air-tight. The escape of gas was not, however, commensurate with the supply, and at the lapse of eleven minutes the balloon, having detached the punt from the bottom, came up with a jump, and rose three or four feet out of the water, the punt being suspended eighteen feet at least from the bottom, and was being kept in suspense when our reporter left, showing that it could easily be towed into shallow water and secured. The diver, on reappearing, was greeted with three hearty cheers upon his success, and all went away delighted. In fact Mr. Maquay was more successful than even he anticipated. He only guaranteed that one balloon would raise ten tons, but the manner in which it dragged up the punt yesterday, laden to the extent mentioned, and overcame the suction which must exist between a flat substance sunk into greasy mud is a pretty convincing proof that it would have raised half as much again. It is calculated that to raise the *City of Launceston* it will require twenty cylinders and forty balloons, but more of course can be used if required.

UTILISATION OF SEWAGE.

A report for the year, ending on the 31st August last, has been presented to the board of directors of the Metropolis Sewage and Essex Reclamation Company, by the Hon. Henry W. Petre, under whose superintendence the operations on the Lodge Farm at Barking, where a small portion of the North London sewage is applied, have been conducted during the past year. From fifty to fifty-eight acres of the farm have been devoted to growing Italian rye-grass during the last two years. The crops thus obtained have not only been extremely heavy, but the quality has been good. Some sort of prejudice on this point seems to have existed, for the report says—"It is satisfactory to be able to state that the value of sewage-grown grass, both for horses and cattle, is beginning to be generally appreciated." Last year there was "much difficulty" in disposing of the surplus grass, whereas this season the demand has exceeded the supply. Messrs. Pickford and Co. have taken a regular supply of this grass at their stables, and pronounce it an excellent horse fodder. On the farm itself from fifty to sixty milking cows have been fed entirely on sewage-grown grass, with the most satisfactory results. Two young steers have also been fed exclusively on this produce since May 18th, and have increased greatly in weight while subject to this regimen. Still more important are the experiments which show the value of town sewage in producing crops of wheat, oats, and rye. Here, again, both quantity and quality were secured, the grain fetching a high price in the market. The experience gained at the Lodge Farm shows that sewage is fully applicable to cereal as well as to grass crops. It is suggested, however, in the case of wheat, that sewage should not be applied after the formation of the ear has commenced. This limitation does not appear necessary in regard to oats. Another valuable result relates to turnips. As soon as the oats and rye were removed, the land (so hard as to be impervious to the plough) was flooded with sewage, after which it was ploughed up and sown with white turnips. Within the week, without any rain, the turnips were up, and they have already been sold at £11 per acre. In the "experimental field" of the farm a piece of potatoes was planted on February 22, and twice flooded with sewage. This produced at the rate of 4½ tons, 5 tons, and 8 tons respectively, being dry during the months of June, July, and August, and fetching the top market price of the day. Red cabbage, planted out on April 10, and dressed with sewage three times, has been sold in August at the rate of £33 per acre. An acre and a-half of drumhead savoy, planted out in May, was valued in August at £35 per acre. Two or three floodings of sewage will produce such a crop of cabbage as can only be obtained by very heavy dressings of farm manure and the necessary amount of rain. Mangold-wurtzel sown in April has been calculated in August at 40 tons per acre. Two acres of strawberries actually produced £150, the quality of the fruit being attested by the award of the bronze medal at the Royal Botanical Society's show. The plant most reluctant to acknowledge the mixture of town sewage has been the onion, but even this has yielded to judicious treatment.

As to the value of sewage manure, Mr. Petre dispenses with the help of chemical analysis, and appeals to the agricultural results. With respect to grass, he observes that no amount of ordinary manure could produce six or seven crops in a season, weighing from six to twelve tons each. In the case of mangold wurtzel, two floodings of sewage, of two or three hundred tons per acre each, produce a crop weighing from fifty to sixty tons per acre; whereas a good dressing of farm-yard dung would only realize a crop weighing from twenty to twenty-five tons. Wheat also showes a decided advantage in favour of sewage.

Fine Arts.

Artistic Discoveries in France.—A portrait of Henry IV. of France, painted in the year 1599, by an artist named Jean Le Clerc, has recently been discovered in an old curiosity shop in Paris. At the back of the canvas is the following quaint quatrain:—

"Cy du bon roy Henry l'exacte pourtraicture,
Paincte en l'an mil six cents moins huict mois du Seygnieur,
Par maistre Jean Le Clerc, d'apres franche nasture,
Gardez-en, bonnes gens, limayge en vostre quieur."

Those who have not studied old French will scarcely recognise the last word as *cœur*. The discovery has a double interest, first, on account of the life-like expression of the famous monarch's face, and, secondly, from the fact that the picture is the only known work of Le Clerc, who is believed to have been a pupil of Jean Cousin. Another discovery is that of a fine head of Christ, by one of the most remarkable artists of the sixteenth century, Ligier-Richier, born at St. Mihiel. Amongst this artist's works were a fine "Calvary," in the collegiate church of Hattonchâtel, in the Meuse. Scarcely anything remains of his productions; the head in question belonged to a large altar-piece in the church of St. Vierge, in the native town of the artist, of which only a fragment is now in existence.

Manufactures.

Ozone for Bleaching.—It is stated, on the authority of the *Produce Markets Review*, that ozone, one of the remarkable discoveries of Schönbein, whose death is recorded in this *Journal*, is being practically applied for the purposes of industry, an electric machine being actually employed in Whitechapel for the production of ozone on a large scale, to decolorise sugar, in lieu of filtration through animal charcoal, as hitherto employed.

Commerce.

The Brindisi Route.—A correspondent, writing to the *Perseveranza* of Milan, in answer to the question, "Why do not the English take advantage of the Brindisi route, which is the shortest and least expensive way to India?" says:—"The English do not travel by the Brindisi route because the greater part of them do not know that this route exists, or that it is shorter than the Marseilles route, and those few who do know of it are unable to obtain through tickets from London to Calcutta or Bombay or *vice versa*. Passengers from London to India, China, or Australia, prefer to take a through ticket, and to name their berths, consign their luggage, and to have no further trouble till they reach their destination. By the Brindisi route, on the other hand, passengers are obliged to take four or five tickets during the journey, to look after their luggage, and are subject to various other little annoyances, and, to save all this trouble, prefer the Marseilles route, which is longer. Until the Italian government has agencies in London and in India, where travellers would be able to book themselves and their luggage through to their destination, no one will prefer this route to the other. Out of 140 passengers on board the steamer from Suez to Ceylon six months ago, only one had come by the Brindisi route; and on the return voyage only two took this route from Egypt to London. Having frequently spoken with English travellers, both outward and homeward bound, on this subject, the reply has always been that they would be happy to avail themselves of the Brindisi route if agencies were only established in London and the various ports in the east, where they could take a through ticket. The Austrian Lloyd's, who do not neglect their own interests, have already opened agencies at Bombay, and at the principal ports in the east, where passengers can take through tickets *via* Trieste; and many travellers now pass by Trieste and the Brenner. One constantly sees passengers' luggage labelled *via* Marseilles, *via* Southampton, *via* Trieste, but rarely *via* Brindisi. If once agencies, where through tickets could be taken, were established in London, Bombay, and in the other parts of India, China, and Australia, there is no doubt that the Brindisi route would become the most frequented, but until this is done, and the railway service through Italy better organised, travellers will prefer the Marseilles route."

Colonies.

Victoria.—Metals raised.—The following is an estimate of the value of the metals and minerals raised in the colony from the first discovery of the gold fields to 31st December, 1867:—

Gold, 33,910,052¾ ozs.	£135,643,811
Silver, 12,591 ozs.	3,462
Tin	195,045
Copper	4,673
Antimony	30,426
Coal, 1,933 tons	2,899
Lignite, 235 tons	205
Kaolin, 1,757 tons	7,028
Flagging	18,663
Slates	508
Magnesite, 6½ tons	12
Diamonds, about 50 carats	80
Sapphires	150
	£135,906,962

The quantity of gold exported during 1867 was 1,433,687 ozs., of which 560,527 ozs. were from quartz veins, and 87,316 ozs. from alluvial workings.

Chinese in Victoria.—There were on December 31st, 1867, 15,629 Chinese miners in Victoria, principally engaged in alluvial mining. Last year, 1866, the number was 20,134, showing a decrease of 4,450. The following is a statement of the average earnings per man per annum for the past eight years, without distinction of classes:—

	£	s.	d.
1860	79	9	3
1861	74	15	11
1862	67	17	10
1863	70	4	2
1864	74	1	9
1865	74	4	2
1866	80	8	3
1867	87	1	7

The mean for the eight years is nearly £76 1s.

Revenue of New South Wales.—The following is the comparative statement of the revenue of the colony for the years ending 30th of June, 1867 and 1868 respectively:—

	1867.		1868.
Customs	£1,243,688	..	£1,376,140
Excise	48,732	..	57,665
Territorial	854,743	..	678,643
Public works	645,940	..	624,514
Ports and harbours	17,661	..	15,659
Postage	110,787	..	112,489
Fees and fines	73,151	..	66,372
Miscellaneous	44,192	..	40,360
	£3,038,894		£2,971,842

Obituary.

The Very Rev. Henry Hart Milman, Dean of St. Paul's, died on Thursday, September 24th, at Sunninghill, near Ascot, in the 77th year of his age. He was the youngest son of Sir Francis Milman, Bart., one of the physicians to George III. He was born in London, in 1791, and after passing a few years at Dr. Burney's Academy, at Greenwich, he went to Eton, and from there to Brazenose College, Oxford, were he graduated in due course. He was from the first destined to the Church, and in 1817, took orders, and soon afterwards received an appointment to the vicarage of St. Mary's, Reading. In 1821 he was elected Professor of Poetry in the University of Oxford, and about the same period was made

rector of St. Margaret's Church, Westminster. In 1849 Lord John Russell appointed him to the deanery of St. Paul's—a dignity which he held for nineteen years. Among the earlier fruits of his literary genius is a tragedy, entitled "Fazio," which was brought upon the stage, at Covent-garden, and in which Miss O'Neil took the part of the principal heroine. Another drama, but not adapted for the stage, appeared in 1820, entitled "The Fall of Jerusalem. His "Martyr of Antioch" was conceived in the same strain; and among his other poems were "Samor," "Belshazzar," &c. His first historical work was his "History of the Jews," which was published by Murray, in his "Family Library." From the date of this work, down to the close of his life, the time of Dr. Milman may be said to have been devoted to researches in ecclesiastical history. In 1840 he published a History of Christianity from the foundation of the religion to the separation of the Eastern and Western Churches; and about fifteen years afterwards appeared his History of Latin Christianity, in which he follows the fortunes of the Western branch down to and through the middle ages. In addition to these works, Dean Milman wrote several articles in the *Quarterly Review*. He also annotated a new edition of Gibbon's "Decline and Fall," in which he had M. Guizot as a coadjutor. His last published work was a splendid illustrated edition of Horace, much prized by scholars. He was elected a member of the Society of Arts in 1851, and so early as 1847 he took a special interest in the movement then set on foot for the erection of a "Memorial of the introduction of printing into England, and in honour of William Caxton." He has also presided on more than one occasion at the evening meetings, and in other ways shown his interest in the Society's objects.

William Meadows, the Prince Consort's Prizeman in 1867, was the son of Mr. J. D. Meadows, of Liverpool-street, Bishopsgate, and was born in October, 1847. He died on Tuesday, August 18th, 1868. He was educated at St. Thomas Charterhouse Schools, and was happy in the encouragement he received from the Rev. Wm. Rogers, M.A., the founder of those schools, to whose careful supervision during their scholastic career, and continued interest in their subsequent advancement, so many young men are indebted. Mr. Meadows had the pleasure of enjoying an agreeable intercourse with this gentleman till the period of his untimely death. In 1861 Mr. Meadows took the Silver Medal at St. Thomas Charterhouse. From that time till his death he obtained no less than nine certificates from the Science and Art Department, five from the City of London College, and fifteen from the Society of Arts, besides various prizes, as well as the Prince Consort's prize of 25 guineas. He entered the Customs in his 17th year, but was almost immediately transferred to the Educational Department, Privy Council Office, and his relatives have received from gentlemen in that office many tributes to his honourable and upright character.

Christian Friedrich Schönbein died a few weeks since. He was born at Metzingen, in Würtemberg, on the 18th of October, 1799. As a young man he passed some time in England and in France. In 1828 he was appointed professor of Chemistry in the University of Bâle. His name will ever be associated with two discoveries, which play an important part in modern sanitary science, in the extension of photography, and in military and civil engineering. His discovery of ozone took place in 1839, and that of gun-cotton and collodion in 1845.

Publications Issued.

Linear Drawing, showing the Application of Practical Geometry to Trade and Manufacture. By Ellis A. Davidson. *(Cassell, Petter* and *Galpin.)* This is the first of a series of books in connection with technical education.

Notes.

Technical Education.—At the election of the Lord Mayor for the City of London, on the 29th ult., Mr. John Jones, a liveryman, is reported to have said that what he desired to see was a revival of the powers of the great City companies, and those in particular which had reference to the promotion of the industrial arts over which they were once active presidents. Had those companies used their charters aright probably no trades unions would have been established in the country. It would be the duty of the incoming Lord Mayor—if he would govern that great City well—to lead forward the necessary movement of technical education, and he asked him to lend his assistance in pushing it on when the power of the chief magistrate was reposed in him. He would then be the chief representative of the arts of civilisation in this country; and they asked if, while fulfilling that office, they might expect from him on behalf of the nation, and especially of the apprentices to the various crafts, such an amount of co-operation and energy as would bring to something like a practical use the great funds in the hands of the livery companies of the City. Alderman James Clarke Lawrence, the Lord Mayor elect, said, in reply to the questions which Mr. Jones had put to him, he had a ready answer to give. With regard to the great subject of technical education, he believed it to be a growing one, and one in which the livery companies themselves would be disposed to take a deep interest. He knew of no object to which the growing funds of those companies could be better applied than to an extension of technical knowledge among the labouring classes of the metropolis.

Congress for the Discussion of the Methods of Teaching Drawing.—This Congress met last week, in the Hall of the Academies, at Brussels, under the presidency of the Minister of the Interior; there were present a large number of Belgian notables, besides foreigners, French, Dutch, and German. The Congress is divided into sections, one occupying itself with elementary education in drawing and its manual applications, and the other with superior education in the arts of design and the general means of encouragement. At the first meeting of the first section the two following questions were discussed:—"The introduction of drawing into all the primary schools, being considered eminently useful and desirable, what should be the special character and conditions of instruction?" "What are the best means to be adopted by the Government for ensuring the teaching of the principles of design in these schools?" Amongst the opinions and proposals put forth, was a suggestion for the establishment of conferences amongst teachers, in order to systematise the teaching of drawing, local competitions, provincial exhibitions, collections of models, &c. The third question, or rather group of questions discussed, was the following:—"What methods and processes are preferable for teaching drawing? To what stage should the employment of engraved copies be permitted before the pupil is allowed to draw from the round? Is it not essential to accustom pupils from the commencement to draw without the use of compass or rule? Is it not advantageous for the professor to give short explanations respecting the theory of shadows, the rules of perspective, &c., while the pupil is engaged in practising them? What works exist which may serve as guides in teaching the first principles of drawing?" The opinion of the Congress seems to have been decidedly opposed to the use of engraved or drawn copies. M. De Taeye, director of the Academy of Louvain; M. Van Marck, of Liege; M. Hendrickx, and other professors explained the methods employed in their schools for the teaching of drawing. The sittings of the Congress continue.

Palace of Fontainebleau.—The fine old palace of Fontainebleau is about to receive an additional wing, for the accommodation of the Imperial family. The plan of

the new buildings is now marked out in the Court of the Fountains; the new wing will enclose this fine court, with the grand gallery of Francis I., which now looks upon the water. This seems to be an unfortunate arrangement, for it is almost impossible to imagine, whatever may be the talent of the architect employed on the work, that the new building will harmonize completely with the older portions. Serious damage was done to the original design of the palace when the apartments occupied by the Emperor Napoleon I., and also by the present Emperor, were erected on one side of the curious gallery, now the library, closing the whole of the windows on that side. Should the new wing be erected as proposed it would be well to restore the library to its original condition.

Cheap Dining Places. — The *Pall Mall Gazette* says:—"Mr. Corbett's cheap dining places in Glasgow have not only fulfilled the most sanguine expectations of their benevolent projector, but have apparently been productive of a happy effect in a direction not originally contemplated. The cooks and attendants are all women, and their habits of neatness and culinary skill are so highly prized by the clerks and artisans of Glasgow, that Mr. Corbett finds he can seldom keep any of his girls beyond a short period. They are eagerly sought after as wives; out of 200 girls, not fewer than 24 have been married during the present year. It is pleasant to think of the immense amount of good they may do as a sort of missionary housekeepers among the working-classes, who are so sadly backward not merely in the niceties and comforts, but also in the economies of domestic life."

Effect of Lightning on Metals.—The following curious communication has just been made to the Paris Academy of Sciences. A woman was crossing a canal-bridge, near Nantes, when a powerful flash of lightning seemed, according to her own expression, to envelope her; she was not in any way injured, but the contents of her purse underwent an extraordinary change. A ten-franc gold piece was in the small minor pocket of the *portemonnaie*, and two silver coins in the larger division of the same. A certain quantity of the silver was vaporised by the action of the lightning passed through the leather lining of the purse, and was deposited with great uniformity on the gold coin, which had all the appearance of silver, while the surface of the silver coins had assumed the appearance of having been matted or frosted. M. Bobierre, who made the communication, said that he had examined the gold coin with a microscope, and found that the silver was uniformly deposited apparently in the form of globules, without any intervals between them. Having removed a small portion of the silver by means of a weak acid, M. Bobierre found that the surface of the gold coin had been affected, and presented a very different appearance to that produced by the coining press, and was, in fact, nearly in the same condition as the deposited silver; fusion had in fact commenced, but the effect had been instantaneous, and purely superficial.

The Mont Cenis Tunnel.—During the first fortnight of the past month (September) the progress made at the Mont Cenis tunnel was 52·40 metres; the length driven at Bardonnèche on the Italian side being 24·90, and that on the French side at Modane being 27·50 metres. The position of these works up to the 15th September was as follows:—

	Metres.
Length driven at Bardonnèche	5,186·00
Length driven at Modane	3,602·15
Total length of tunnel driven	8,788·15
Length remaining to be driven	3,431·85
Total length of tunnel	12,220·00

Encouragement to Provincial Science in France.—The minister of public instruction has just announced, that in the year 1870, a prize or prizes, of the value of sixty pounds, will be given by the government for the best archæological memoirs published in the journals of learned societies in the provinces, or sent by correspondents direct to the minister.

Supply of Milk to New York.—The yearly supply of milk for New York City is stated by the *Engineer* to be about 25,000,000 gallons. Of this quantity, 15,000,000 gallons come in as freight upon the Erie, Harlem, and Hudson River railroads; and the remaining 10,000,000 gallons are brought in by wagons from the adjoining counties, where the farmers make a speciality of the dairy business.

Correspondence.

Sanchi Tope, India.—Sir,—Fergusson's "Hand-book of Architecture" treats of these remarkable edifices from page 6 to 46. He has numerous illustrations and sections, and those of Sanchi in particular. He supposes that the two pillars at Solomon's temple in Jerusalem were after the same model, and belonged to Assyrian architecture.—I am, &c., James Cadbury.

Banbury, 19th September, 1868.

Patents.

From Commissioners of Patents' Journal, September 25.

Grants of Provisional Protection.

Baskets—2500—W. H. Hunt.
Brooches, &c., fastenings for—2416—A. Taylor.
Bungs, corks, &c., cutting—2574—J. Briggs.
Fabrics, &c., plaiting, &c.—2298—P. Tassie and I. Patchett.
File-cutting machines—2414—H. Moritz and J. Reinach.
Flax spinning machinery, bosses for—2350—G. R. V. Loughton and E. B. Jackson.
Pottery, &c., actuating machinery employed in the manufacture of —2552—A. J. and E. Leak.
Steel, &c.—2418—J. Heaton.
Vocal instruction in schools, instruments for facilitating—2230—R. Couty and J. Richard.

Patents Sealed.

1027. E. J. J. Dixon.
1028. J. T. King.
1030. M. B. Orr.
1034. W. Clark, jun., & J. Clark.
1035. M. Havenhand & J. Allen.
1038. W. D. Cliff.
1039 W. S. Page and R. East.
1040. B. Browne.
1041. S. Perry and F. Brampton.
1045. A. Warner.
1046. S. Holman.
1047. I. Bates and J. Taylor.
1048. A. Scott.
1050. F. Bauman.
1051. G. Hodgkinson.
1053. P. Adie.
1059. W. W. Hughes.
1061. H. Hughes and C. Jones.
1064. H. G. Warren, S. Stuckey, and P. Froud.
1068. W. J. Addis.
1069. W. E. Gedge.
1070. W. R. Lake.
1072. O. Ormrod.
1084. J. Walker and J. Wharrie.
1086. W. Austin.
1087. F. Taylor.
1089. J. Sinclair.
1098. H. H. Doty & G. Graveley.
1099. A. Scatchard.
1104. G. Davies.
1107. G. Kynoch & W. Whitehill.
1108. W. Clissold.
1115. A. Jackson and J. Hartley.
1116. H. Lafone and J. Nicholas.
1117. J. G. Dale and E. Milner.
1119. J. Napier.
1121. J. and T. Walmsley.
1131. J. V. Jones and G. J. Williams.
1133. W. Williams.
1139. F. A. Calvert.
1147. D. C. MacIvor.
1149. H. and J. Bryceson and T. H. Morten.
1155. M. A. F. Mennons.
1159. C. Desnos.
1161. A. V. Newton.
1214. M. A. F. Mennons.
1263. A. P. Price and J. A. Wanklyn.
1313. W. R. Lake.
1336. J. Rogers.
1415. S. Chatwood.
1775. J. Nuellens & M. Neuhaus.
1839. W. Firth.
2026. W. Sowerby.
2074. G. H. Wilson.

From Commissioners of Patents' Journal, September 29.

Patents on which the Stamp Duty of £50 has been paid.

2405. W. Watkin.
2432. W. Turner, S. Shore, and W. Halliwell.
2358. J. Whitehouse.
2499. E. Cottam.
2451. E. Brooke, jun.
2501. W. Schofield and J. Smith.
2503. C. F. Cotterill.
2449. J. W. Coburn.
2464. R. A. Brooman.
2488. W. E. Metford.
2524. D. Greig and R. Burton.

Patent on which the Stamp Duty of £100 has been Paid.

2398. G. Russell.

Journal of the Society of Arts.

FRIDAY, OCTOBER 9, 1868.

Announcements by the Council.

It is with deep regret that the Council have to announce the death of Mr. HARRY CHESTER, a Vice-President of the Society, which took place on Monday last, the 5th instant.

NOTICE TO INSTITUTIONS.

The Reports on the Paris Universal Exhibition, prepared for the Science and Art Department, have been printed, in six volumes, and (with the exception of Vol. I.) are now published. Her Majesty's Government have placed a number of copies at the disposal of the Society of Arts, for distribution to the Institutions in Union, and a copy of the five volumes will be forwarded to each Institution as soon as possible. Volume I. will contain the General Report, with Tables of Statistics, &c.; volumes II., III., IV., V. contain the Reports on the various Classes; and volume VI. the returns relative to the New Order of Reward.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

SUBSCRIPTIONS.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*Armley Mechanics' Institute.*—A public meeting, to promote the establishment of science classes, was held in the lecture hall of this institute, on October 2nd. The chair was taken by Mr. J. B. Blackburn, a vice-president of the institution. On the platform was a goodly gathering of the resident employers of labour. After an address by Mr. Henry H. Sales, upon the scheme of the Department of Science and Art, Mr. Gledhill proposed, and the Rev. B. Wood seconded, a resolution, pledging the meeting to support the class about to be established in the institute. A vote of thanks to Mr. Sales for his address, and the usual compliments to the chairman, closed the proceedings.—*Northallerton Mechanics' Institute.*—The twentieth annual meeting was held on October 5th, in the Court-house, kindly lent by the justices of the North Riding. The hall was densely crowded, and a large number of persons were unable to obtain admission. The Right Hon. Lord Teignmouth occupied the chair. In addition to a long address by the chairman, the Vicar gave the history of libraries from the formation of the famed Alexandrian library; Mr. John Hutton, the candidate for the borough, advocated the cause of Mechanics' Institutes; Mr. J. W. Johns, his political opponent and rival, urged the necessity of educational classes; Mr. J. C. Buckmaster deprecated the apathetic indifference of working men in general, and the people of Northallerton in particular, to scientific instruction; and Mr. Henry H. Sales commented upon the speeches of preceding speakers. After the vote of thanks to the chairman, his Lordship said that it augured well for the peaceful character of the ensuing contest, that on the eve of an election all political parties could meet on the same platform, and co-operate in the same good cause. At the conclusion of his remarks the entire audience rose, and sang most lustily "God save the Queen."

EXAMINATION PAPERS, 1868.

(*Continued from page* 773.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

GERMAN.

THREE HOURS ALLOWED.

Each candidate is expected to translate one of the extracts in Section I., to answer four of the questions in Section II., and to turn into German twelve of the sentences

given in Section III. Candidates for a First Class must translate two pieces in Section I., one prose, the other poetry; answer (*e*) and (*f*) of Section II.; render into German 17-20, inclusive, of Section III., and work out the whole of Section IV.:—

Section I.

1. Wilhelm war drei und zwanzig Jahre alt, als Karl die Regierung niederlegte, und hatte schon zwei öffentliche Beweise der höchsten Achtung von ihm erhalten. Ihm übertrug er, mit Ausschlieszung aller Groszen seines Hofes, das ehrenvolle Amt, seinem Bruder Ferdinand die Kaiserkrone zu überbringen. Als der Herzog von Savoyen, der die kaiserliche Armee in den Niederlanden commandirte, von seinen eigenen Landesangelegenheiten nach Italien abgerufen ward, vertraute der Kaiser ihm den Oberbefehl über diese Truppen an, gegen die Vorstellungen seines ganzen Kriegsraths, denen es allzu gewagt schien, den erfahrnen französischen Feldherren einen Jüngling entgegen zu setzen. Abwesend und von Niemand empfohlen zog ihn der Monarch der lorbeervollen Schaar seiner Helden vor, und der Ausgang liesz ihn seine Wahl nicht bereuen.

Die vorzügliche Gunst, in welcher dieser Prinz bei dem Vater gestanden hatte, wäre allein schon ein wichtiger Grund gewesen, ihn von dem Vertrauen seines Sohnes auszuschlieszen. Philipp, scheint es, hatte es sich zum Gesetz gemacht, den spanischen Adel an dem niederländischen wegen des Vorzugs zu rächen, wodurch Karl der Fünfte diesen letztern stets unterschieden hatte. Aber wichtiger waren die geheimen Beweggründe, die ihn von dem Prinzen entfernten.

2. Nicht Stimmenmehrheit ist des Rechtes Probe:
England ist nicht die Welt, dein Parlament
Nicht der Verein der menschlichen Geschlechter.
Dies heut'ge England ist das künft'ge nicht,
Wie's das vergangne nicht mehr ist—Wie sich
Die Neigung anders wendet, also steigt
Und fällt des Urtheils wandelbare Woge.
Sag' nicht, du müssest der Nothwendigkeit
Gehorchen und dem Dringen deines Volks
Sobald du willst, in jedem Augenblick
Kannst du erproben, dasz dein Wille frei ist:
Versuch's! Erkläre, dasz du Blut verabscheust,
Der Schwester Leben willst gerettet sehn,
Zeig' denen, die dir anders rathen wollen,
Die Wahrheit deines königlichen Zorns:
Schnell wirst du die Nothwendigkeit verschwinden
Und Recht in Unrecht sich verwandeln sehn.
Du selbst muszt richten, du allein. Du kannst dich
Auf dieses unstet schwanke Rohr nicht lehnen.
Der eignen Milde folge du getrost.
Nicht Strenge legte Gott ins weiche Herz
Des Weibes—und die Stifter dieses Reichs,
Die auch dem Weib die Herrscherzügel gaben,
Sie zeigten an, dasz, Strenge nicht die Tugend
Der Könige soll seyn in diesem Lande.

3. Als unerfahrner Knabe kam ich her,
In einem Augenblick, da Fest auf Fest
Ferrara zu dem Mittelpunkt der Ehre
Zu machen schien. O! welcher Anblick war's!
Den weiten Platz, auf dem in ihrem Glanze
Gewandte Tapferkeit sich zeigen sollte,
Umschlosz ein Kreis, wie ihn die Sonne nicht
So bald zum zweitenmal bescheinen wird.
Es saszen hier gedrängt die schönsten Frauen,
Gedrängt die ersten Männer unsrer Zeit.
Erstaunt durchlief der Blick die edle Menge;
Man rief: Sie alle hat das Vaterland,
Das Eine, schmale, meerumgebne Land,
Hierher geschickt. Zusammen bilden sie
Das herrlichste Gericht, das über Ehre,
Verdienst und Tugend je entschieden hat.
Gehst du sie einzeln durch, du findest keinen,
Der seines Nachbarn sich zu schämen brauche!—
Und dann eröffneten die Schranken sich:
Da stampften Pferde, glänzten Helm' und Schilde,
Da drängten sich die Knappen, da erklang
Trompetenschall, und Lanzen krachten splitternd,
Getroffen tönten Helm' und Schilde, Staub,
Auf einen Augenblick, umhüllte wirbelnd
Des Siegers Ehre, des Besiegten Schmach.
O, lasz mich einen Vorhang vor das ganze,
Mir allzuhelle Schauspiel ziehen, dasz
In diesem schönen Augenblicke mir
Mein Unwerth nicht zu heftig fühlbar werde!

4. Philipp von Hessen wurde am 19 Juli in Halle vor den Kaiser geführt, der auf einem Throne sasz, umgeben von vielen deutschen, spanischen, und italienischen Groszen. Mit niedergeschlagenem Blicke kniete der Landgraf am Fusze des Thrones nieder und sein Kanzler Güntherode, hinter ihm knieend, las die Abbitte an den Kaiser ab. Sie war in sehr demüthigen Ausdrücken abgefaszt und ein Augenzeuge erzählt, es habe sich in der Verwirrung und Beschämung, die den Landgrafen in solcher Lage, vor solcher Versammlung, ergriff, auf seinem Gesichte ein Lächeln gezeigt, gleichsam als unbewuszte Hülfe seiner Natur gegen das Gefühl der Schmach. Aber dem Kaiser entging seine Miene nicht; drohend hob er seinen Finger auf und sprach in seiner niederländischen Mundart, denn er redete das Deutsche schlecht: —"Wel, ich sal juw lachen lehren." Dann las des Kaisers Kanzler, Dr. Seld, die Antwort; "Obwohl der Landgraf wie er selbst bekenne, die schwerste Strafe verdient habe, so wolle dennoch der Kaiser, aus angeborner Milde und in Betracht der für ihn eingelegten Fürbitten, Gnade vor Recht ergehen lassen, ihn von der Acht erledigen und ihm das Leben, welches er verwirkt habe, schenken." Nach der Ablesung dieser Antwort wollte sich der Landgraf, als ein freier Fürst wieder erheben, und als der Kaiser ihm keinen Wink dazu gab, auch ihm den deutschen Handschlag der Versöhnung versagte, stand er von selber auf und trat ab.

Section II.—Grammar and Idioms.

(a.) Give the nominative singular with the definite article of the following plural substantives, and state the different meanings of the two forms of the plural:—*Bänder, Bande; Läden, Laden; Strausze, Sträusze; Wörter, Worte; Zolle, Zölle.*

(b.) Determine by rule the gender of—*Frühling, Silber, Schlüszel, Hoffnung, Herzogthum, Schlacht, Gabel, Mädchen, Stadtthor.* Add to each the genitive singular and plural.

(c) Decline in every case, singular and plural, the German of—"Dear brother; this good book: his new hat."

(d.) Conjugate the imperfect, perfect, and first future of *haben*, and *sein*, of *es friert mich*, and *es gebricht mir.*

(e.) State the imperfect, indicative, and subjunctive, and participle past of—*werfen, helfen, leiden, müszen,* and *wiszen.*

(f.) Express in German:—1. He has written to me that he will come. 2. That he will come, he has written to me. 3. Should he come, he must wait. 4. He must wait should he come. Describe these clauses and their construction.

(g.) Das macht sich.
Das ist allerliebst.
Er hat sich schwer an ihr vergangen.
Er ist zuletzt ganz verkommen and verschollen.
Sie lebten in Saus und Braus.
Das steht ganz und gar bei Ihnen.
Er hat sich auf und davon gemacht.
Ach! warum nicht gar.
Er hat sich umgebracht.
Bekümmere dich doch nicht um ungelegte Eier.
Er zieht immer den kürzeren.
Das hält gar nicht Stich.

Section III.

[The writing, either in English or German characters, must be thoroughly legible and distinct.]

1. How many sorts of roses have you in your garden?
2. There are books which I never read.

3. At what o'clock do you go out in the morning?
4. All that I have I have given you.
5. He would sit for hours and read the newspapers.
6. Would that I had never seen him!
7. We had succeeded in overcoming the difficulties.
8. Do you remember them and their cousins?
9. One cannot always say what one will fail in.
10. Had I your knowledge, I would make good use of it.
11. Do you believe him to be honest and truthful?
12. Please tell me what day of the month it is to-day.
13. If I were to take it all, I should not have enough.
14. They were praised for what they had done.
15. An ambassador has been sent to Turkey.
16. Who has been helped in his work?
17. They went into a field, and laid themselves down on the grass.
18. He received five pounds a-week, and would not give two pounds and a-half to his poor old mother.
19. We got up at a quarter to six, and started punctually at a quarter past seven.
20. We know that time is short, but none of us know how short. We know that it will not go beyond a certain limit of years; but none of us know how small the number of years, or months, or days may be, for death is at work upon all ages. The fever of a few days may hurry the likeliest of us all from this land of mortality. The cold of a few weeks may settle into some lingering but irrecoverable disease. In one instant the blood of him who has the promise of many years may cease its circulation. Accident may assail us. A slight fall may precipitate us into eternity. An exposure to rain may lay us on the bed of our last sickness, from which we are never more to rise. A little spark may kindle the midnight conflagration, which lays a house and its inhabitants in ashes. A stroke of lightning may arrest the current of life in a twinkling. A thousand dangers beset us on the slippery path of this world.

Section IV.

Questions in German History and Literature.

(*a.*) State some of the causes which led to the Reformation in Germany.

(*b.*) Which are the dates of the Edicts of Worms and of Augsburg?

(*c.*) What is the Confession of Augsburg, and by whom was it written?

(*d.*) To which ancient epic poems can the "Niebelungenlied" and "Gudrun" be compared; and who are the principal personages in these German poems?

(*e.*) Which poems belong to the cycle of the Lombardian sagas?

(*f.*) What is characteristic in them?

German Essay.

Subject:—A visit to the Kensington Museum.

HARVESTING CORN IN WET WEATHER.

Prize Essay.*

By W. A. Gibbs, Esq., of Gillwell-park, Essex.

There is no question of more importance to the well-being of a country than the preservation of its food. A well-saved harvest means well-paid rent to the landlord, prosperity to the farmer, grist to the mill, and bread for the hungry. It means also increased capital for the merchant and manufacturer, comfort and content for the workman, large powers of defence for the State, and less taxation for the whole community. It was, therefore, in the best interests of the whole community that the Council of the Society of Arts invited public attention to this subject, indicating a course of systematic inquiry, with a view to guide and stimulate invention in the right direction. It may seem strange that, in a climate proverbially fickle as ours, so few methods of precaution have been adopted. The reason may be traced to the instinctive conviction in the minds of most practical men that it is utterly impossible to devise any adequate means of protection for so "spread" and bulky a thing as a great crop of corn. Let the most enthusiastic farmer plod through two or three twenty-acre fields of half-made hay or stooked corn on a wet evening, and he cannot but be struck by the impracticable *bulk* of the thing to be dealt with; he cannot but acknowledge that it is a kingdom with too wide a frontier ever to be guarded in its whole extent; and he will be apt to think that it is useless to attempt to protect it at all. A more common reason for this apparent apathy on a vital question is the pressure of business upon the owner of a large farm. The modern farmer, even though possessing all ordinary advantages, cannot be expected to adopt any improvement until it has been thoroughly tested and proved to be practical. Having to live by and upon his farm, and to superintend its daily duties, he has little leisure to make systematic and costly experiments, and not much inclination to investigate carefully the modes of husbandry practised in other countries; hence the advantage of bringing into prominent notice, from time to time, the results obtained by scientific investigation, and collecting in a concise form such hints and suggestions as may be derived from foreign customs. This, then, following the programme suggested by the Council of the Society of Arts, I now propose to do, as briefly and clearly as possible, pointing out, to the best of my ability, the reasons for and against each plan or custom as it comes under notice.

Of the expedients proposed or practised in our own country for partially averting the effect of unfavourable weather, the first and best is early reaping. It has been proved, by very accurate experiments, that wheat reaped "raw," say a fortnight before it is fully ripe, gave analytically, in weight and quality of produce, twenty per cent. advantage over that which was left till fully ripe; part of which advantage goes to the consumer, in the shape of better flour and more useful straw, and part rewards the grower by the higher market price absolutely realised; for, by further practical experiments, it was found that the produce of an acre cut early realised £14 18s., while that of a corresponding acre cut late only brought £13 11s. 8d., and this without any fluctuation of market prices to account for the difference.* Early cutting has also these recommendations—that the seed is not so likely to shake out; the straw is tougher for use as litter, and more succulent if required for food; but, above all, the two weeks of summer thus saved will give the crop a much better chance of drying. If, therefore, a farmer grew nothing but wheat, he might always take time by the forelock and secure these results; but if he has a hay harvest to finish before he can spare his men for the wheat-fields, and if, as it so often happens, this is delayed and belated by catching weather, it is not easy to see how he can avail himself of this primary and approved precaution. Until, therefore, he is in possession of some means which will give him the power of clearing his hay-fields (be the weather wet or dry) by a certain day, he cannot start fair, nor as his judgment would lead him to do, for his corn harvest. This power of dealing with the first important crop of the season by a given time, is the starting-point of systematic husbandry; and in the course of this essay I hope to be able to show that such a power is ready to his hands if he will but use it.

Several ingenious proposals for protecting or drying corn have been recommended by enterprising experimentalists, who have recorded from time to time their methods and results. In those districts of Kent and Sussex where hop oasts, or kilns, are near enough to the wheat fields to render the carting to and fro practicable, wet wheat in the straw has been dried in these buildings with tolerable success. One trial of this plan showed

* For this essay the Society's Gold Medal and a prize of fifty guineas were awarded.

* See Stephens' "Book of the Farm," vol. ii, p. 352; and "Quarterly Journal of Agriculture," vol. xii., pp. 22 and 23.

that on a kiln floor, the area of which was 540 superficial feet (less than eight yards square), the produce of 9½ acres could be dried in six days, the average time required for each charge of sheaves being twenty-four hours. In bad weather it is surely better to save part of a crop than to lose all, but an acre and a-half cleared in twenty-four hours would be rather slow harvesting for a large farm; besides, this plan, however successful, must always be merely local, and confined to the four or five hop-growing counties in the kingdom. A gentleman in Sussex, many years ago, had 30 acres of wheat cut and placed under cover, using for that purpose every barn, hovel, cattle or implement shed on his farm, and setting the sheaves upright and closely packed together on the ground; each acre of sheaves occupying thus 400 superficial feet. This wheat was cut whilst the weather was dry, and carried dry to its shelter, and he found that in ten or twelve days it was ready to be threshed out. Afterwards, as an experiment, two waggon-loads of wheat, that had been cut and carried during heavy rain, were also brought in, and placed under shelter in the same manner, and these were reported dry enough for threshing in sixteen days. If these results have been verified by subsequent experience, they would seem to indicate a valuable and partially available means of saving at least some portion of a crop. Possibly the chief reason why this method has not been extensively adopted may be found in the fact that the large area of roofed-in space requisite for the purpose is not often to be found on a farm. To accommodate even 30 acres, each acre of which needs 400 feet of standing room, a farmer must possess, and be able to clear out, twelve thousand superficial feet of shelter, that is, equal to 30 sheds measuring 27 feet by 15 feet each.

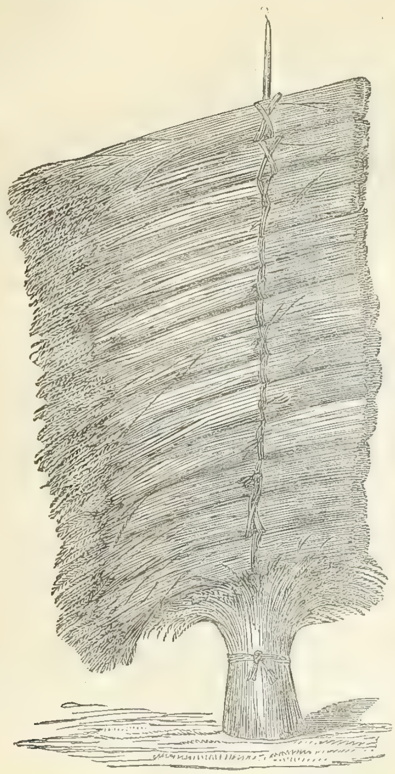
The simpler and more usual modes of protection are chiefly used in the North and in Scotland, and comprise various ways, more or less skilful, of forming the sheaves in the field into large stooks, and capping or hooding them with one or two other sheaves, either inverted or laid transversely over the rest. Sometimes the old custom of "wind-mowing" is revived; this consists in building up the sheaves into small temporary stacks, of a conical shape, about ten or twelve feet in diameter at the bottom, and carried up to a point at eight or ten feet high. The base of the cone is formed by a circle of sheaves, with their heads laid together, so as to form a mutual support, and to preserve a hollow central air-space, whilst the butts are spread slopingly outward, to sustain the superstructure that is to be raised upon them; the next course is then adjusted over these, in such a manner as to protect the heads of the first, and so on to the top, the butts of every course, as it is built up, resting on the bands of the course below it. The structure is sharply tapered as it is raised, and finally capped with one large sheaf, tightly banded close to its butt, and inverted over the top course, so as to form a high-peaked roof. There is much diversity of opinion and practice as to these customs, and also as to the best size for a sheaf, and the best form for a stook. Of course a small sheaf with a single band will dry more quickly than a large one with two, but then it will also be more easily penetrated by rain, and the same must be said with regard to large and small stooks, and the question of hoods or no hoods; it is impossible to lay down any fixed rule; the choice between one and the other must be always left to the judgment of the farmer himself, and the forecast he may have formed as to the probable weather. Any size or form of sheaves having for its object the keeping moisture out, has also the inconvenient result of keeping it in, and so retarding the harvesting; and it is clear that whatever arrangement lets the natural moisture escape most easily, also lets in heavy rains with equal facility; if, therefore, the glass should be sinking, and the clouds gathering, and the bailiff take a gloomy view of the weather, large stooks, carefully hooded, will be probably decided on; but if influences, both indoors and out, are sunny and hopeful, then small sheaves will be risked, for the chance of their being sooner ready for the stack. Small or large, capped or uncapped, there is no point that requires such constant and vigilant watching and waiting for as the exact hour when the teams may be ordered into the field, and the veritable "harvest home" commenced; and there are few scenes in rural life more cheery than either a hay or a corn field, where, after many days of doubt and hindrance, the word of command to "cart up" is given, and men and women, boys and horses, all set to work with a will to clear the field before night brings dew and darkness to stop the work.

But a mortifying reverse to this cheerful picture awaits the farmer who, in his eagerness to get on, hoodwinks his better judgment, and sends either hay or corn to the stack a day, or even a few hours, too soon. It is very tantalising when, towards the middle of an afternoon, a good crop in fine condition, is *almost* ready to cart, and a sudden shift of wind, and some ugly clouds gathering in the horizon, give omen of a wet to-morrow. At such a time it is a sore temptation to persuade oneself that the "almost" is "quite," and so run the risk of a fired hay-stack or mouldy corn-rick, rather than endure the hindrance, loss, and vexation of further delay. For lack of some simple and easy means of carrying on the work through the cool hours of a summer night, many a fair field of fragrant green hay has to be left for days and weeks spoiling in cocks; and many an acre of golden sheaves, that would have brought a rich return to the grower, wastes and "worsens" day by day, until half the corn is knocked out by the rains, or pillaged by the birds, and the remaining half, in its dingy, mouldy straw, is carried home at last so spoiled and sprouted as to be only fit for the pig trough. It is at such times that the beneficent but fickle powers of nature seem to call upon the ingenuity of man to find a means of finishing the task which they themselves have nearly completed, and urge him to seek the aid of science, by whose help so many natural difficulties have already been removed. Let us, therefore, inquire what has been done in mitigation of these losses, in countries where a still more rigorous necessity has had its usual effect of giving a stronger stimulus to invention.

Foremost in the rank stands the kingdom of Sweden. She has availed herself of her abundant supplies of wood to form, out of the thinnings of the forest, several ingenious arrangements for partially securing her cereals from the inclemency of the climate. One is, the staking into the ground at intervals in the fields, fir poles six or seven feet high; on the sharpened points of these poles the sheaves are spiked, and slid down one over another, in the manner shown in the drawing, Fig. 1 (p. 783), so that the top sheaf forms a species of protection to all those below it. It is said that one man (following the reaper) can set up five hundred of such poles in a day, and that, by practice, the sheaves can be spiked upon these stakes as readily as they could be set up in stooks. I should rather question both these assertions; and there is a striking inaccuracy in "Stephens' Book of the Farm," as to the number of sheaves each pole is supposed to hold; the diameter of an ordinary sheaf is over one foot, hence, allowing two feet for the bottom one, placed, as it is, upright, there would obviously be only room on a seven-foot pole for five more sheaves, or six in all, whereas the numbers shown in the drawing would leave the unwary to suppose that each pole would hold 15 sheaves, and some spike room to spare!* The second arrangement (Fig. 2, p. 784), is a species of rack, on a strong stand, with a roughly-boarded arris roof; this is said to be much used in Russia also. The third plan consists merely of a series of tall and long wooden

* This error has been repeated in a recent letter to the *Agricultural Gazette*, which gives 8 feet for the length of pole, and 16 or 18 as the number of sheaves.

FIG. 1.



hurdles, over the rails of which the sheaves are placed astride with the ears downward. The fourth, and probably the best, is Fig. 3 (p. 784), where the tops of the sheaves are turned in, and hooked on, as it were, to each rail of the skeleton roof; each layer of sheaves thus forming some protection both for the grain and part of the straw of the layer immediately below. Of course all these devices would be much more costly in most parts of Great Britain than in Sweden or Russia, from the greater scarcity of wood and the higher value of labour.

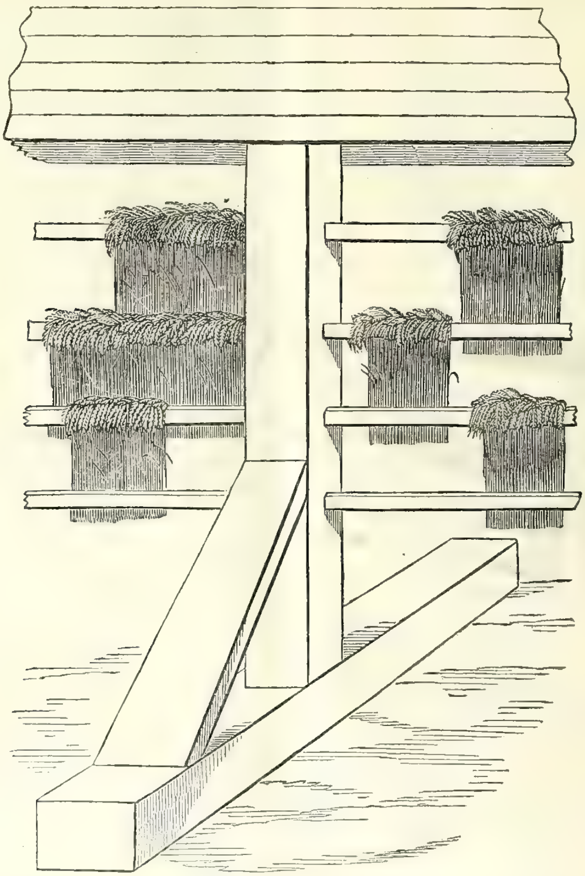
These few and meagre expedients exhaust, I believe, the whole category of invention, so far as mere protection is concerned; effort in that direction is apparently dwarfed and defied by the portentous bulk of the thing to be dealt with. The large expenditure of money and labour requisite to give even the roughest and most imperfect shelter to fields full of hay or corn, must always, I fear, operate against the success of such attempts. If, therefore, prevention does not seem hopeful, let us next consider what has been done or proposed, both here and abroad, in the way of cure.

If we must so frequently have the unpleasant alternative of heavy loss by waste and delay in the field, or mildew and spoliation in the stack, can we do anything with it in the stack to lessen the difficulty? To some extent this has been accomplished. Small stacks, built along the headland of the fields, will economise time, and enable the teams to clear a greater breadth of land than if they had to carry to a distant homestead; but such a system, besides the after-confusion and additional labour which it brings with it, involves considerably more cost for thatching.

When the stacks, either in field or rick-yard, are raised from the ground on pillars, so as to leave an air-space below, a hollow wooden prism (Fig. 5, p. 785), built in the centre is a very useful and long-practised custom. If built without the lower air-space, a conical triangle and a side tressel (as in Fig. 4, p. 785) will best give access of air to the centre, and thus counteract some of the ill-effects of dampness. Either of these "bosses," as they are called, can be quickly and cheaply put together out of small fir-poles, roughly battened across with short lengths of spare wood. Within the last few years hollow conical bosses have been made of perforated wrought-iron; and if we may take the manufacturers' statement of the number sold in one season as a guide, this substitution of iron for wood must have been widely approved and rapidly adopted. Still more recently, in 1866, a patent was taken out for sucking or forcing air, at the ordinary temperature, through stacks, with a view to expedite the drying. In this patent it was suggested that if air-pumps and force, rather than fans or suction, were employed, such air might be warmed in some manner (not specified) before being blown into the stack. I am not aware if this plan has ever been tried, but I would remark that either to blow, by means of an air-pump, or suck by the aid of a chimney stalk, *un*warmed and *un*dried air through a central cone in the stack could not greatly expedite the drying, especially when it is considered that in seasons when dampness prevails in the wheat, the air is generally saturated with moisture, and not in a condition to take up more water from anything through which it may be made to pass. If the air could be conveniently and cheaply warmed before being driven into the stacks, it would undoubtedly be more effectual, but that is precisely the part of the problem which the patentee did not attempt to solve. Hence another gentleman was induced to take out a patent, in which, whilst using precisely the same method, viz., one large central cone in the middle of the stack, and air-pumps or fanners to drive air into it, the patentee describes a very ingenious, but I should fear a very costly and somewhat cumbrous method of warming the air before driving it in. This mode consists of a congeries of metal pipes, arranged in or above the chimney of an engine, in such a manner as that the smoke from the furnace, and the waste steam from the cylinder, passes amongst them; through these pipes, thus warmed on their exterior surfaces, the outer air is drawn down by the air-pumps, and ultimately delivered up the central cone, at a temperature not higher than 120°. I am told by the patentee that he has personally tried this method upon a stack of damp wheat, and found it effective, but he is not intending (I believe) to put his patent into operation, because the two processes being precisely alike, up to the point of warming the air, the first patentee claims priority.

I should apprehend that in attempting to dry wheat in the stack by this method of one large central pipe, the air from a *fan* would not have pressure enough to overcome the obstruction of the thick mass of sheaves packed around the cone, and that, even if it did, or if pressure were obtained by the costly substitution of air-pumps, such compressed air would have a tendency to pass out of the stack very unequally, and wherever it could find the freest exit. It would form vents for itself in a few places where the grain and the straw were the driest, and where, consequently, the sheaves lay lightest; and through these more porous parts the greater volume of the air would pass, with an ever-increasing ease of outlet, *over-drying* in its passage that which was already dry, and leaving the damper and denser portions very much as they were at first; this would be especially the case when the moisture had penetrated to the centres of the sheaves before stacking; these centres, being firmly compressed by the sheaf-bands, offer a very strong resistance to the passage of air through them, so much so, that when some sheaves were close packed, upright on a kiln floor, and hot air driven through them by means of a powerful fan, the exterior of each sheaf was dried to brittleness in half an hour, but the centres at the band were as moist as ever after an hour and a-half of such exposure. It is further to be noted that this mode of stack-drying could not deal with the crop at all if absolutely *wet* instead of merely damp; and would certainly

Fig. 2.



be inoperative with wet or even damp hay, which last clamps itself down by its own pressure into so compact a mass in the stack, as to stifle and check back completely any ordinary force of air that may be attempted to be driven through it from the centre outwards. I think this will be self-evident to any practical man who will take the trouble to examine the "close" condition of a damp hay-cock after being left for only a day and a night without shaking out; it presents a succession of thick, heavy tangled mats, which would effectually cling round and gag the air-holes of a central stack tube, unless an enormous force were used, and if such force were resorted to, it would, most probably, expend itself by driving a few channels here and there through the driest parts of the stack.

There has been one other mode of ventilation recently proposed and partially adopted. This consists of a pipe let into the side of the stack in such a manner as that the one end shall reach to the centre, and the other project a few feet beyond the exterior; the central end is pointed, and perforated for two or three feet of its length, and the outer projecting end of this horizontal pipe has

Fig. 3.

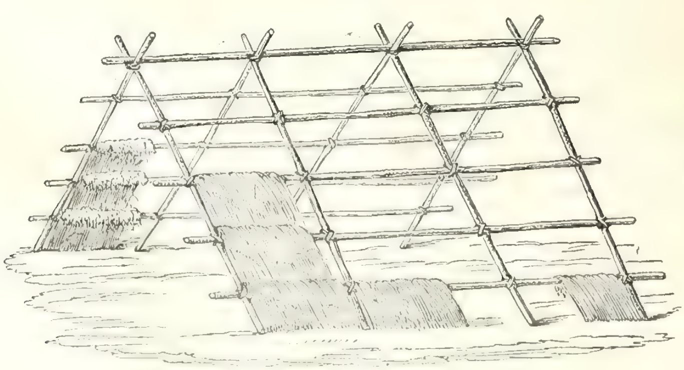
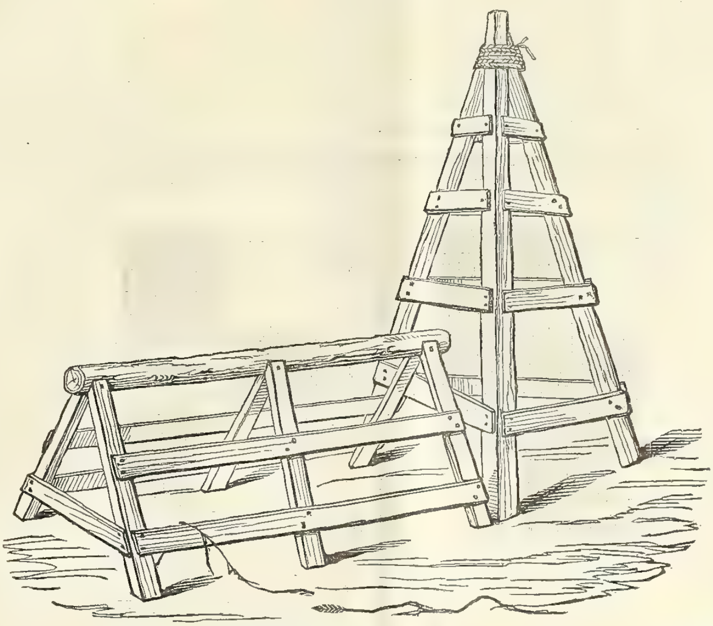
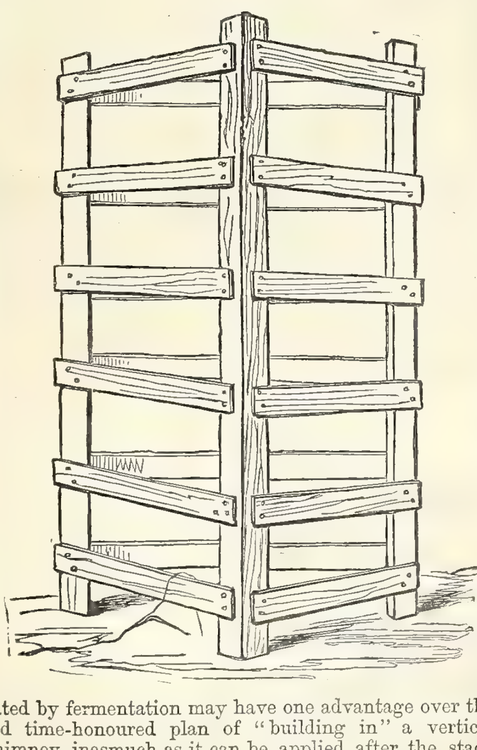


Fig. 4.



an elbow and a length of upright pipe adjusted to it, out of the top of which, in the drawing (Fig. 6), the steam from the stack is represented as issuing in a very satisfactory manner. This mode of letting off the heat gene-

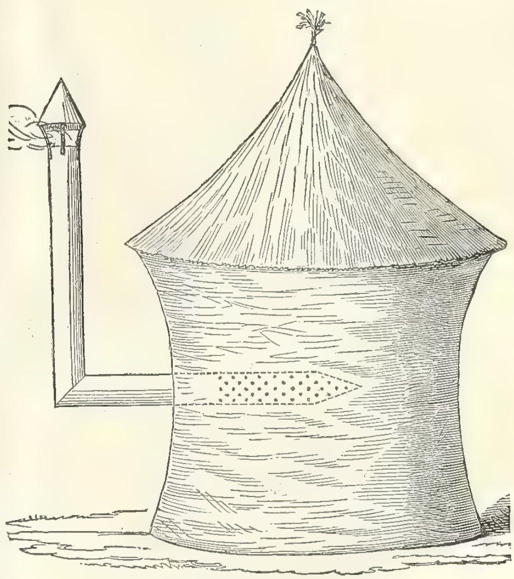
Fig. 5.



rated by fermentation may have one advantage over the old time-honoured plan of "building in" a vertical chimney, inasmuch as it can be applied after the stack is partially built, and whenever there are symptoms of an excess of heat.

(*To be continued.*)

Fig. 6.



AGRICULTURAL WAGES IN ENGLAND AND SCOTLAND.

Sometime ago, the *Gardener's Chronicle* and *Agricultural Gazette* published tables showing the wages of the agricultural classes in England and Scotland, and the Council have caused them to be somewhat re-arranged and published in the *Journal*, in the hope that members residing in different counties will be disposed to forward any additional information, pointing out among other things the causes to which may be ascribed the variation of wages, even in adjacent districts. For instance, why is the rate of wages in Dorset apparently less than in Wiltshire? Perhaps some correspondent will supply the wages in Derbyshire, Somersetshire, and any other counties not named. (See next and following pages.)

AGRICULTURAL WAGES, 1868.

	Able-bodied Ploughmen.	Shepherds.	Day-labourers.	Women.	Day-labourers in harvest time.	Women in harvest time.	Ordinary prices of tying wheat per acre.	Ordinary prices of mowing clover per acre.	Ordinary prices of mowing meadow grass per acre.	Rent of Cottage weekly or yearly.	Perquisites.
Aberdeen	£22 to £24 with victuals	£20 to £22 with victuals	13s. to 16s.	£8 to £13 with victuals	£3 to £4 with victuals	£3 to £3 5s. with victuals	...	...	...	£2	*Generally.*—Beer in harvest.
Ayr	Engaged yearly.	The same as ploughmen, with sometimes cow-keep.	2s. to 2s. 6d.	11d.	15s. and board	2s. to 2s. 4d. per day	10s. to 12s.	4s.	4s.	50s. to 60s.	*Ploughmen.*—Wages in money, from £18 to £22; oatmeal, 5 to 6 loads; free house and garden; coals carted free, &c. Equal to an average wage of about £36.
Bedford	14s.	14s.	2s.	...	£4 16s.	...	10s. to 14s.	2s. to 3s. 6d. with beer	2s. to 3s. 6d. with beer	£2 to £3	*Generally.*—Small beer all the year. *Ploughmen.*—Paid for overtime after 6 at night. He has the same in harvest as other men, with an allowance for Sundays. He has also "journey" money, besides beer for drilling. *Shepherds.*—In some instances, house and garden free. An allowance is made for each lamb, generally 2s. 6d. per score. The shearing is done by the shepherd at 1s. per score, besides day's pay. He also receives the same in harvest as other men, with an allowance for Sundays. Ale is given for threshing, drilling, shearing, and other operations too numerous to mention. In hay time the men get from 4 to 5 pints per day; in harvest from 4 to 7 pints. The beer costs the farmer for each man per week from 1s. 6d. to 2s., taking the year through.
Berks	12s.	12s.	11s. to 12s.	9d.	16s. to 18s.	1s. to 1s. 2d.	11s. to 12s.	3s. 6d.	4s. to 4s. 6d.	£2 to £3	*Generally.*—Beer in harvest. *Ploughmen.*—Table beer, £3 at Michaelmas, 1s. for every load of corn drawn out, and house rent. *Shepherds.*—House rent, £3 at Michaelmas, and 1s. a head for every double couple bred up.
	10s. to 17s.	12s. to 17s.	11s.	8d. and 10d.	12s.	10d. to 1s. and beer	10s. to 11s.	2s. 6d.	3s.6d.to 4s.6d	1s. to 2s.	
,,	14s., and 30s. or 40s. at Michaelmas.	14s. and 40s.	13s.	10d.	3s.	1s.	10s. to 16s.	4s. to 4s. 6d.	4s. 6d. to 5s.	£4	*Generally.*—Beer in harvest.
Bucks	12s.	12s.	10s. to 11s.	8d. to 10d.	16s. and beer	1s.	...	2s. 6d.	4s.	£3	
Caermarthen	12s. to 15s.	...	12s. to 13s.	1s.	As usual	As usual	...	3s.	3s. 6d.	£3 to £4	
Cheshire	14s.	...	12s.	...	18s. to 20s.	...	15s. to 20s.	3s.	3s. 6d.	£4	*Generally.*—Beer in harvest time.
,,	15s. to 16s.	...	15s. to 18s.	1s.2d.to 1s.4d	20s.	1s. 6d.	10s. to 14s.	3s. 6d. to 4s.	4s. 6d. to 5s.	£5 to £10	*Generally.*—Some beer in harvest.
Cornwall	12s.	12s., and £3 per year.	10s. to 12s., wheat at 7s.	9d.	Meat & drink	Meat & drink	8s. to 10s.	2s. 6d.	3s. 6d.	£3 10s.	*Generally.*—A quart in summer.
Devon	12s., 3 pints of cider.	15s. and many perquisites.	12s.	...	3s. 6d.	...	All by machine	All by machine	All by machine	1s. to 1s. 6d.	*Generally.*—Cider daily.
,,	10s.	12s. to 14s.	2s. and 1s. 8d., beer.	8d. to 10d.	3s. 4d. with beer	10d. to 1s. 2d. and board	6s. to 8s. and 1 gallon	2s.3d.to 2s.6d	3s.3d.to 3s.6d	£2 12s. to £3 5s.	*Ploughmen.*—Cottage free, or the same wages with firewood found, coals drawn home, potatoes ditto, manure drawn, and other assistance given in cultivation of their allotment ground. Single men, who board and lodge in farm-house, have in money wages £8 to £10 or £12 a year.
Dorset	9s.	9s.	8s.	4s. 6d.	12s.	6s.	15s. per week	15s. per week	15s. per week	Cottages are free	*Generally.*—Cider, 4 pints per day. There is some peculiarity in the amount of wages paid in this locality; the regular labourers on the farm have their cottages and gardens free, and wheat (either in proportion to their families or the number of workers) at 5s. per bushel. The shepherds and carters have in addition potato land, also free. Changes are seldom made—men working for one master or on one farm all their lives. Cottage accommodation indifferent, education not first-rate.

AGRICULTURAL WAGES, 1868.—*Continued.*

AGRICULTURAL WAGES, 1868.—*Continued.*

	Able-bodied Ploughmen.	Shepherds.	Day-labourers.	Women.	Day-labourers in harvest time.	Women in harvest time.	Ordinary prices of tying wheat per acre.	Ordinary prices of mowing clover per acre.	Ordinary prices of mowing meadow grass per acre.	Rent of Cottage weekly or yearly.	Perquisites.
Essex	14s.	14s., with cottage and £5	15s.	8s.	£7	...	10s. to 15s.	5s. to 6s.	5s.	2s. to 3s.	*Ploughmen.*—Have generally cottage and £7 for the harvest month.
,,	14s. 6d.	15s.	13s.	9d.	£7 4s. per month	24s.	10s.	4s.	4s. 8d.	£4 4s.	*Shepherds.*—4s. a week for beer during six weeks' lambing time; 20s. per 100 lambs. No harvest wages.
,,	11s.	12s. to 13s.	10s. to 11s.	...	£4 to £5	...	7s. 6d. to 12s.	2s.9d. to 3s.6d	2s.9d. to 3s.6d	55s. to 70s.	*Generally.*—Small beer. *Shepherds.*—20s., with one or two pints of ale per day in lambing season; 1s. per head for all lambs reared more than number of ewes set, and paid by the score for shearing.
,,	16s.	16s.	2s. 2d.	1s.	£5 to £6	2s. 6d.	10s. to 20s.	2s. 6d. to 5s.	4s. to 8s.	2s. to 3s.	Calculated at 4s. per £1.
Fife	14s.	14s.	13s.	1s.	3s. with victuals	2s. 3d. with victuals	...	...	...	£2 2s.	
Gloucester	16s.	18s.	10s. and beer	8s. to 10s.	...	...	10s. to 12s.	2s. 4d. to 2s. 10d.	3s.2d. to 3s.6d	£2 12s. to £3	*Ploughmen and Shepherds.*—Have besides house rent and sundry perquisites.
,,	13s., house and garden	12s., and £3 a year	12s.	5s.	15s.	6s. 6d.	7s. to 12s.	3s. 6d.	4s.	1s. to 2s.	
,,	13s. to 14s.	14s. to 18s.	11s.	8d.	12s. to 14s.	10d. to 1s.	10s. to 14s.	2s.6d. to 3s.6d	2s. 6d. to 3s.	1s.	*Generally.*—Beer in harvest.
,,	10s. to 12s.	12s.	10s. to 11s.	10d.	...	...	4s. 6d. to 5s.	2s. 6d.	3s. 6d. to 4s.	£2 to £4	*Generally.*—Beer in summer. *Shepherds.*—£1 for lambing, 6d. for every double couple, 2s. 6d. per score for clipping sheep, 6d. per score for all sheep taken to market, and cottage.
Hants	12s.	14s.	12s.	5s.	Man & wife 36s.	Man & wife 36s.	10s. to 12s.	3s.	3s. 6d. to 4s.	2s.	*Generally.*—Beer in harvest.
Hants (North)	12s., and £2 to £5	12s., and £2 to £6	12s.	9d.	3s.	...	10s. to 12s.	3s.6d. to 4s.6d	4s. to 5s.	£2 10s. to £3 10s.	
Hereford	10s.	11s.	10s.	9d. per 8 hours	2s.6d. to 3s.6d	1s. with cider and food on carting days	All by machine	All by machine	All by machine	50s. to £5	*Generally.*—Coals hauled from pit. *Ploughmen.*—£1 per year, 2s. 6d. per week in cider, 5-roomed cottage, with large garden rent free, and allotment of potato ground in the field. *Shepherds.*—£2 per year, cider, cottage, and other perquisites like ploughmen.
Huntingdon	14s.	14s.	12s.	9d.	25s.	9s.	8s. 6d. to 10s.	2s. 6d. to 3s.	3s.6d. to 4s.6d	50s. to £4 10s.	
Kent	16s.	15s., & extra for lambing	15s.	...	Double	Double	12s. to 18s.	4s.6d. to 5s.6d	4s. to 4s. 6d.	Free to ploughmen	*Ploughmen.*—Our ploughmen are mostly single men, hired by the year, wages £12 to £14, with board and lodgings.
Lancashire	16s.6d. to 18s.	18s. to 21s.	16s.6d. to 18s.	9s.	18s.	12s.	6s. with machine	6s. with machine	...	1s. to 1s. 3d.	*Generally.*—Beer in harvest.
Lincoln	9s. weekly board wages	12s. to 14s.	13s.6d. to 15s.	1s. to 1s. 2d.	...	...	14s. to 16s.	3s. to 4s.	...	2s. to 2s. 6d.	*Shepherds.*—Beer in harvest, or £1 instead; keeps a pig, if not, is allowed 15 to 20 stones of pork; has beer or money for delivering corn, hay-carting, &c.; pays rent for house and garden. Under-horse-keepers and ploughboys 11s. to 14s. per week; beer or money.
,,	15s.	£48 per year	15s.	1s.	20s.	...	10s. to 12s.	2s. 6d.	2s. to 3s. 6d.	£4 to £5	
,,	£10 to £15 and board	18s. to 19s.	2s. 6d.	1s.	£5 with board	15s.	10s.	3s. 6d.	3s. 6d. to 5s.	£5 5s. with land	*Generally.*—Beer in harvest.
Lincoln (North)	13s.	13s.	13s.	6s. 6d.	21s.	...	10s. to 18s.	2s.6d. to 3s.6d	3s. 6d. to 6s.	£4 to £5	*Generally.*—Beer in harvest.
Lincoln (South)	16s.	16s.	2s. 6d.	1s. 3d.	Doubled	Doubled	10s. to 18s.	3s. to 3s. 6d.	4s. to 5s.	£3 to £5	*Generally.*—Less beer given than formerly. *Ploughmen.*—Cottage and garden free, worth to let 2s. 6d. per week; from £3 to £3 10s. extra pay for harvest, or its equivalent in fresh pork; 9 to 12 bushels of potatoes, or land prepared to plant.
Middlesex	15s.	16s.	13s. to 18s.	6s.	Over hours	Over hours	14s. to 20s.	5s. to 7s. 6d.	5s. to 7s.	£6 to £8	*Generally.*—£1 in harvest and beer.
Norfolk	14s. 6d.	...	2s. to 2s. 3d.	9d. to 1s.	£6 10s.	...	8s. to 14s.	2s.6d. to 3s.6d	3s. 6d. to 5s.	£3 10s.	*Ploughmen.*—Harvest money and cottage rent free.
Northumberland	17s.	15s.	14s.	1s.	17s. 9d.	7s. 6d.	17s. to 18s.	4s. 6d.	4s. 6d.	1s. to 2s. 6d.	*Generally.*—Hauling of 4 tons of coals.
,,	15s.	18s. to 25s.	15s. and 16s.	1s.	4s.	2s. to 3s.	All by machine	All by machine	All by machine	Rent free	*Generally.*—Beer at harvest (carting). *Ploughmen.*—House rent free, and 400 yards of potatoes, and coals carted.

AGRICULTURAL WAGES, 1868.—*Continued.*

	Able-bodied Ploughmen.	Shepherds.	Day-labourers.	Women.	Day-labourers in harvest time.	Women in harvest time.	Ordinary prices of tying wheat per acre.	Ordinary prices of mowing clover per acre.	Ordinary prices of mowing meadow grass per acre.	Rent of Cottage weekly or yearly.	Perquisites.
Northumberland ...	16s. to 18s.	12s. 6d.	2s.9d. to 3s.6d	1s.	24s. to 28s.	12s. to 15s.	10s. to 15s.	3s. to 5s.	3s. to 6s.	£2 to £5	*Ploughmen.*—From 4 to 12 bushels of wheat, a few bushels of barley, 60 to 100 stones of potatoes, and free house. Some labourers have 16s. per week, 6 bushels of wheat, 4 bushels of barley, 80 stones of potatoes, land to plant 10 stones of potatoes (about 1-10th of acre), with free house, garden, and coals carted. *Shepherds.*—Perquisites as ploughman, and 6 ewes and 4 hogs kept.
Nottingham	£20 with rations	15s. to 20s.	15s.	1s.	5 weeks rations	...	5s. to 12s.	2s.6d. to 3s.6d	3s. to 4s.	£2 to £4	*Generally.*—Beer.
Oxford	12s. to 14s. with cottage	12s. to 15s. with cottage	12s. to 14s.	4s.6d. to 5s.6d	...	...	9s. to 16s.	2s.6d. to 3s.6d	3s.6d. to 4s.6d	£2 10s. to £4 10s.	*Generally.*—Beer or malt allowed in harvest.
,, ...	14s. to 15s.	16s. to 17s.	11s. and piecework	8d. to 1s.	3s. 4d.	1s. 6d.	10s.	3s.	4s.	1s. 6d.	No beer.
,, ...	13s.	13s.	11s.	1s.	18s.	...	11s. to 15s.	3s.	3s. 6d.	1s.	*Shepherds.*—£1 for the lambing season, £2 for shearing sheep, and harvest.
Perth	£18 to £20	...	13s. to 16s.	1s.	20s. to 25s.	2s.6d. to 2s.9d	10s. to 12s.	3s. to 4s.	...	£2 to £3	*Generally.*—In harvest half-quartern loaf and 2 bottles beer. *Ploughmen.*—With $6\frac{1}{2}$ bolls (of 140 lb.) oatmeal, and 1 ton of potatoes; 3 to 4 imperial pints milk a-day; cottage and garden free. Unmarried men, money and meal same; coals and house provided.
Stirling	£22 to £28 and board	£18 to £25	2s. 6d. to 3s.	1s.3d. to 1s.6d	4s. 6d. to 5s.	2s. to 2s. 6d.	12s. to 16s.	3s. to 3s. 6d.	4s. to 4s. 6d.	£2 to £4	*Ploughmen.*—Head married ploughmen, $6\frac{1}{2}$ bolls meal, 4 bolls potatoes, $\frac{1}{2}$ gallon sweet milk daily, free house and garden, coals carted. Single ploughmen lodge and get their meat in the house. *Shepherds.*—Head shepherds have house and garden, cow-keep, and $6\frac{1}{2}$ bolls meal. Young shepherds get their bed and board in the house.
Suffolk	13s.	16s. to 20s.	12s.	4s.	£7	...	...	2s.9d. to 3s.6d	2s.9d. to 3s.6d	£3 to £4	*Generally.*—Beer in harvest.
,, ...	12s.	13s. to 15s.	...	...	Double pay	Double pay	...	...	...	£2 10s. to £4 10s.	
,, ...	£42	£55	£37 8s. 10d.	...	£7 2s. 6d.	...	8s. to 14s.	3s. to 4s. 6d.	3s. to 5s.	£2 10s.	*Generally.*—2 to 3 pints in harvest.
Surrey	15s.	15s. to 17s.	13s.	6s.	3s. and over hours	...	10s. to 12s.	3s. to 4s.	4s. to 5s.	2s. to 2s. 6d.	*Generally.*—6 to 7 or 8 pints of beer in harvest time.
,, ...	13s.	14s. with free house	2s. 6d. to 3s.	1s. to 1s. 4d.	3s. 6d. to 4s.	1s. 6d. to 2s.	10s. to 15s.	4s. to 5s.	6s. to 7s.	Rent free	*Ploughmen.*—With free cottage and garden, valued at 2s. to 3s. per week. Wet time paid for, and in case of a month's sickness no deduction made.
Sussex	14s.6d. to 16s.	15s. to 18s. and gratuities	13s.	...	2s.6d. to 3s.6d	1s. 6d.	11s. to 15s.	3s. 3d.	3s.9d. to 4s.6d	1s. 6d.	*Generally.*—Much piece-work. Beer in harvest. *Ploughmen.*—Have 20s. to 30s. in harvest.
,, ...	14s. to 15s.	15s. and house	13s. to 14s.	...	21s.	...	12s. to 15s.	3s. 6d.	4s. 6d. to 5s.	2s.	*Generally.*—Beer in harvest.
Sussex (West)	15s.	15s.	2s.	8d.	3s. 6d. and 3 quarts	...	10s. to 15s.	4s. and 2 quarts.	3s. 6d. and 2 quarts	1s. to 2s. 6d.	*Ploughmen.*—Good cottage and garden free.
Warwick	13s.	12s.	11s. and 12s.	8d.	Doubled	Doubled	10s. to 15s.	2s. 6d.	3s.	52s. to £3	
,, ...	14s.	14s.	13s.	...	18s. to 22s.	...	10s. to 16s.	3s. to 3s. 6d.	...	50s. to £5	*Generally.*—Beer always.
Wigton	£13 to £15	£13 to £15 the same perquisites as ploughmen	2s.	9d. to 1s.	£3 with victuals	...	10s.	3s.	4s.	£2 to £3	*Ploughmen.*—120 to 130 imperial stones of oatmeal, 4 tons of coals, 2 to 3 bushels of potatoes planted on master's manure; all the manure they make planted with potatoes; house and garden; per annum. *Shepherds.*—About the same.
Wilts	12s. and many perquisites	About the same	10s.	8d.	12s. to 20s.	...	10s. to 12s.	2s. 6d. to 3s.	3s. to 3s. 6d.	30s. to 50s.	*Generally.*—Beer.

AGRICULTURAL WAGES, 1868.—*Continued.*

	Able-bodied Ploughmen.	Shepherds.	Day-labourers.	Women.	Day-labourers in harvest time.	Women in harvest time.	Ordinary prices of tying wheat per acre.	Ordinary prices of mowing clover per acre.	Ordinary prices of mowing meadow grass per acre.	Rent of Cottage weekly or yearly.	Perquisites.
Wilts	12s.	£36 to £39	10s. to 11s.	8d. to 1s.	2s. 6d. and drink	1s.	9s. to 12s.	2s. to 3s.	2s.6d.to 3s.6d	9s. to 1s. 6d.	*Ploughmen.*—Extras, 40s. for harvest, 1s. per load for delivering the corn to the miller, &c., and cartage of fagots and manure, making a total of £38 to £39 per year, besides drink.
,, ...	11s.	11s. and £5	10s.	4s.	2s.	1s.	10s. to 14s.	2s.3d.to 2s.6d	3s. to 4s.	£2 10s. to £3 3s.	*Generally.*—Small beer daily. *Ploughmen.*—With £3 for harvest, house and garden rent free, and 1s. or 1s. 6d. when out with corn. Under-men, 6s. to 9s. per week, and £1 at Michaelmas.
Worcester	13s. to 14s.	14s.	11s.	4s. 6d.	15s. to 18s.	6s.	10s. to 15s.	3s. to 3s. 6d.	3s. to 3s. 6d.	£4	*Generally.*—Beer often.
,, ...	12s. to 15s.	...	12s. to 14s.	5s. to 6s.	Doubled	Doubled,	10s. to 15s.	Machine cut	2s.6d.to 3s.6d	1s. to 1s. 6d.	*Generally.*—2 quarts in winter and 3 in summer.
York	14s. and overwork paid.	15s.	14s.	5s.	£2 extra	1s. 6d.	All by machine	All by machine	All by machine	£3 to £3 6s.	*Generally.*—Beer. Bread and cheese and ale for over-hours generally. *Shepherds.*—Cottage and garden rent free, a ton of coals, and 18 gallons of ale in the lambing season, and £2 extra wages in harvest, besides other small perquisites.
,, ...	£8 to £18 with lodgings and rations	13s. 6d.	12s. to 13s.	9d.	21s. and rations	...	...	4s.	4s.	£3 10s. to £4	*Generally.*—Ale in harvest.

Manufactures.

New Watch.—Dr. Sacc, of Neufchatel, Switzerland, writes to *Les Mondes*, that he will send, from M. Robert Theuner, one of the best manufacturers of watches in that district, a watch invented by him. This watch has two wheels less than those usually made. It is keyless, being wound up by turning a button, from left to right, and *vice-versa*. On turning another button, placed at the left of the watch, the winding apparatus ceases to act in that direction, and sets the hands backwards or forwards, as may be required. The watch is in a silver case, with a face marked for hours, and also with a separate seconds hand; they can be sold for 25 francs each (£1 sterling); they are excellent. They are patented in France, England, and the United States. They are manufactured in thousands, and are suited for people of moderate means. M. Theuner is described as a man of great inventive genius, always in advance, and ever endeavouring to improve the art of watchmaking, in which he generally succeeds.

Colonies.

Taxation in Victoria.—In the year 1863, with a population of 574,331 souls, and with a tariff which comprehended only fifteen dutiable articles, there was collected, at the Victorian Custom House, £1,175,659, while in the current year, with a population of upwards of 700,000 souls in the colony, it is estimated that there will be derived no more than £1,286,656 from that source, although the list of commodities subject to taxation is now as lengthy as it was formerly brief. It was confidently anticipated by the advocates of the new tariff that the duties levied under it would produce in the year 1867, £470,155. They actually yielded no more than £306,940, or upwards of 33 per cent. below the estimate. The weight of taxation was intended to fall upon articles of luxury, but the duties on plate, jewellery, silk, carriages, &c., contributed only £17,152, whilst the duties levied upon the necessaries of life amounted to £290,630.

Revenue of Victoria.—The *Melbourne Argus* says:—"The state of the revenue, even if we take the most favourable view of it, is an emphatic condemnation of the anti-immigration policy which has been pursued in this colony for the last few years. The tendency of the public income, under the existing state of things, is towards a decrease, because the growth of prosperity keeps pace with the growth of population, and where this is arrested there is not only a check to the former, but a retrograde movement on its part; and with declining prosperity there is a gradual contraction of the ability of the people to consume dutiable articles. On the other hand, the public expenditure exhibits an inevitable tendency towards an increase, for every year reveals the necessity for the execution of important public works, such as railways, reservoirs, jetties, &c. But if our population were annually augmented by the arrival of 40 to 50,000 industrious emigrants from the mother country, we should speedily witness a wholly different state of affairs. Each of these, besides becoming a producer of so much wealth and a contributer to the general welfare, would be a consumer of commodities liable to taxation, and would furnish his quota to the imports levied by municipal and other bodies for local improvements."

Forthcoming Publications.

Scientific Opinion.—On the 4th of November the weekly publication of *Scientific Opinion* is to be resumed under the same editorial direction as formerly.

Notes.

LOCAL SANITARY MUSEUM. — A sanitary museum, forming a department of the Town Museum, is just on the point of being opened at Brighton. The museum is principally due to the efforts of Mr. W. E. C. Nourse, a medical man of that place, who has been kindly aided by Mr. Thomas Twining, a vice-president of the Society of Arts. The articles already arranged afford instruction as to the building of cottages and model lodging-houses; also as to fittings and materials for the same. In the food class numerous diagrams are nearly ready, and many instructive samples are shown. In the sanitary class a number of interesting diagrams are displayed, besides ventilators, contrivances to prevent accidents, &c. Mr. Nourse, whose address is 11, Marlboro'-place, Brighton, would be glad to receive from inventors and others, specimens or diagrams of objects suitable for exhibition; and in an interesting report which he has recently laid before the Committee of the Brighton Sanitary Association, he asks for the aid of all interested in such matters, in procuring specimens for this useful museum.

THE BRENNER RAILWAY.—The traffic on the railway over the Brenner pass has increased considerably since the opening of the line in 1867. In the month of August, 1868, the total number of passengers was 82,786; and of merchandise, 382,407 quintals. The greatest number of passengers in a day was 4,425, on the 9th of August; the largest quantity of merchandise was 21,154 quintals, on the 14th; and the least on the 2nd, 1,727 quintals.

Patents.

From Commissioners of Patents' Journal, October 2.

GRANTS OF PROVISIONAL PROTECTION.

Advertising match boxes and spill holders—2766—I. Aub.
Aërial propulsion, apparatus for effecting—2680—J. M. Hunter.
Annealing ovens and kilns—2826—J. Fenwick.
Bale ties and wrappers—2714—J. I. Campbell.
Boilers—2658—A. Lupton.
Boilers—2774—J. Millward.
Boilers, preventing incrustations collecting on the sides, &c., of—2726—G. White.
Boot and shoe straps, &c., ornamenting—2796—A. C. Henderson.
Bottles, stoppers for—2708—J. Adams and H. Barrett.
Bottles, &c., casings for—2674—E. Richardson.
Braces, &c., fastenings for—2722—E. L. Parker.
Brick-making machinery—2762—J. Burdett.
Caps or bonnets—2812—A. W. Rodger.
Carbonic acid, generating—2820—F. Seebohm-Ultzen.
Carpets, printing—2690—J. Wilkinson, jun.
Carts, &c., apparatus for raising agricultural produce on to—2736—T. Perkins.
Cotton, &c., apparatus employed for grinding cards used in the preparation of—2678—J. and T. Tattersall and T. Richmond.
Cotton, &c., bleaching—2675—H. Potter.
Cucumbers, &c., machinery for slicing—2724—S. Grafton.
Doors and windows—2684—W. S. Fletcher.
Electric currents, producing and applying—2740—I. L. Pulvermacher.
Envelopes, instantaneously opening, and attaching them to the letters they contained—2778—A. M. Clark.
Fabrics, manufacturing certain colours employed in printing—2784—A. A. Lejeune.
Fire-arms, breech-loading—2716—W. C. Green.
Fireplaces—2770—T. E. Clarke.
Floor dog or cramp—2738—R. Banks.
Fluid meters—2752—G. Davies.
Fluid, raising, discharging, &c.—2300—C. F. Waldo.
Fog signals, placing and securing upon the metals of railways—2792—J. Challender and B. Kitchen.
Fuel, artificial—2742—W. H. Crispin.
Furnaces—2688—J. Fieldhouse.
Gas, apparatus for manufacturing—2700—W. C. Holmes.
Gas engines—2808—G. Bower and W. Hollinshead.
Gas meters—2699—F. Hudson.
Gelatine, manufacturing—2696—J. C. Martin.
Gloves, &c., cleaning—2668—G. Ker.
Gunpowder mills, &c.—2754—V. Wanostrocht.
Hair stuffing, substitute for—2818—W. R. Lake.
Horn, &c., stamping or embossing—2782—G. Davies.
Horses' shoes, &c.—2768—E. Cottam.
Human body, apparatus for introducing powders into natural or pathological cavities in the—2729—A. M. A. Laforgue.
Iron and steel, coating—2816—J. C. Coombe and G. Gregg.
Kilns for burning bricks, &c.—2750—U. A. Masselon.
Ladders, extension—2776—L. B. Covert.
Land or soil, crushing, &c.—2638—W. C. Cambridge.
Locks—2764—A. J. Fraser.
Looms—2686—J. Greenwood.
Looms—2704—W. R. Lake.
Looms, supplying weft without stoppage to—2788—J. Maynes.
Meat, preserving—2619—G. H. Barber.
Millstones, dressing—2670—B. Corcoran and W. Dunham.
Motive-power, obtaining—2772—G. Warsop.
Needles, &c., papering and packing—2689—H. Walker.
Nippers, cutting—2694—N. Thompson.
Oils, &c., apparatus for feeding and burning—2748—C. E. Brooman.
Oils, &c., treating—2356—F. Lambe, A. C. Sterry, and J. Fordred.
Pearl ornament, suitable for necklets, &c.—2756—E., E. B., J., and H. Stokes.
Pendulums—2822—M. A. Soul.
Ploughs—1829—W. E. Gedge.
Presses for stamping letters, &c.—2662—L. P. Hébert, L. A. Moulin, J. P. Couinck, sen., and E. Couinck, jun.
Presses for the manufacture of cement tiles, &c.—2794—A. Cruls.
Projectiles—2692—W. R. Lake.
Pumps—2780—A. V. Newton.
Railway breaks—2682—W. Naylor.
Railway stop blocks—2718—F. Preston and R. C. Ross.
Rotary engines—2758—S. B. Tucker.
Sewage apparatus—2666—J. Yule.
Sewing machines—2358—C. A. McCurd.
Silk, skeins of, separating and dividing, preparatory to winding—2664—B. Burrows, sen.
Steam engines—2697—J. and W. Badger.
Steam engines—2779—E. Wood.
Stoves, portable—2806—J. Roberts.
Sulphate of magnesia or epsom salts, manufacturing from dolomite or magnesium limestone—2373—F. Winser.
Swimming glove or apparatus—2618—R. D. Morgan.
Telegraph and signal posts—2672—W. McGregor.
Thread-winding machines, &c.—2824—J. Hetherington.
Trees, &c., uprooting—2720—J. Griffiths.
Umbrellas and parasols—2804—B. Gardiver and T. H. Faulkner.
Umbrellas, &c., stands for—2728—D. Jones.
Warping or beaming machines—2802—J. Bullough.
Water, raising—2632—G. S. Dracopulo.
Wood, &c., extracting pitch, &c., from—2676—J. Martin.
Wood-cutting machinery—2798—B. Dobson and W. Slater.
Wool, treating—2710—C. E. Brooman.
Wool, &c., spinning and twisting—2698—J. Ladley.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

Looms—2927—C. Heptonstall.
Steam engines, &c.—2953—H. Davey.

PATENTS SEALED.

1123. J. S. Crosland.
1125. J. Wallace.
1127. J. Harwood.
1128. C. W. Baldwin.
1135. T. Row and S. Scott.
1137. H. Cochrane.
1141. A. and H. Illingworth.
1142. F. A. E. G. de Massas.
1143. F. H. Greenstreet.
1144. R. Nabbs.
1146. G. Davies.
1153. R. Moreland, jun., and D. Thomson.
1154. C. H. Gardner and J. Bickerton.
1158. J. Perry.
1163. J. Casson.
1166. H. J. Ditmars.
1167. A. L. Holley.
1168. W. Nall.
1169. E. H. Newby.
1172. C. W. Siemens.
1175. J. Armstrong.
1177. D. Lane.
1179. J. Bedford.
1181. J. James and T. Jones.
1183. W. R. Lake.
1186. C. G. Hill.
1187. V. Gallet.
1188. E. Brasier & J. E. Hodgkin.
1193. J. Plews.
1194. J. Rae and G. Miller.
1195. A. H. Still and D. Lane.
1196. W. B. Robins.
1197. J. H. Whitehead.
1198. G. T. Bousfield.
1199. J. Leeming.
1200. W. E. Newton.
1201. R. A. Wright.
1202. L. Verstraet.
1212. S. W. Huntington.
1216. A. Barclay.
1239. W. S. Fletcher.
1262. A. V. Newton.
1277. C. D. Abel.
1300. J. H. Johnson.
1338. A. Carter.
1367. J. Atkins.
1406. R. Heathfield.
1422. J. H. Johnson.
1583. W. A. Brown and R. L. Jones.
2232. J. H. Johnson.
2344. R. Newton.

From Commissioners of Patents' Journal, October 6.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2507. J. and G. Addenbrooke and P. A. Millward.
2515. J. H. Johnson.
2518. S. Faulkner.
2514. R. Willacy.
2550. R. Tongo.
2542. J. and F. J. Jones.
25[illegible]8. J. Dodge.
2529. H. A. Bonneville.
2976. T. B. Heathorn and J. H. G. Wells.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2914. F. Johnson.

Journal of the Society of Arts.

FRIDAY, OCTOBER 16, 1868.

Announcements by the Council.

Examinations, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

Salford Working Men's College.—The annual distribution of prizes and certificates to the students of the Working Men's College was made on Wednesday evening, the 30th September, in the lecture-hall of the college, by Mr. William Fairbairn, L.L.D., F.R.S. There was a large attendance, amongst those present being Alderman Wright Turner (in the chair), Dr. J. Watts, Mr. Colin Mather, Mr. W. J. Traice, &c. After an address by the chairman, Mr. Plant, hon. secretary, observed that he had only to say, generally, that the college was in a very sound and healthy state. From the elementary schools held in the day time to the classes held in the evening, there were evidences of a sound and healthy condition. During the past session some of the classes had been distinguishing themselves more in their energies and in results obtained than was ever known before. Mr. Fairbairn then delivered the certificates and prizes to the students, accompanying each presentation with encouraging remarks. Two of the recipients were apprentices in the employment of Messrs. Mather and Plant, and Mr. Plant stated that the firm had further recognised their industry by presenting each with a handsome box of instruments. Mr. Fairbairn then addressed the assembly, and in the course of his remarks he said that we must take care that our system of education was a safe one, that it was well grounded, and that it was likely to lead to results calculated to improve the mind, enlarge the intellect, and make us better men. Much had been said and much had been written on what was called technical education, or that sort of knowledge which appertains to that college or to men who had entered upon their professional pursuits and were actively engaged in the affairs of life. In the consideration of that question—which was a very important one—they must first ascertain what process was necessary to prepare them for the reception of first principles, and those natural laws on which every trade and every profession was founded. To receive these principles and to benefit by them, they must first have the rudiments, or that elementary training which would fit them for a higher class of instruction. They must first learn to read and write, and they must have a knowledge of figures before they could exercise the faculties of a mathematician or a man of science. As well might they expect a luxuriant crop from a field that was barren as look for results in a working man's college where the members were deficient in the ordinary elements of primary instruction. A vote of thanks to Mr. Fairbairn was then moved by Mr. Somers, seconded by Mr. Traice, supported by the Rev. T. A. Stowell and Mr. Colin Mather, and passed by acclamation. Dr. Watts, Mr. Moriau (French teacher), and Mr. Le Resche (teacher of drawing) then addressed the meeting, which concluded by a vote of thanks to the chairman.

EXAMINATION PAPERS, 1868.

(*Continued from page 781.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

ITALIAN.

(three hours allowed.)

I.

Candidates for a first-class certificate must translate the following passages (poetry and prose), and answer any grammatical questions annexed to them:—

Polifonte. Chiaro mi narra
E narra il ver, come tu mai giungessi
A eccesso tanto. Ove a sperar ti avanzi
Più nulla omai, se ingenuo parli, spera.
Egisto. In altra guisa io non saprei: menzogna
Del mio libero stato non è l'arte.—
Io m'era al vecchio genitor di furto
Sottratto, incauto! e già più mesi attorno
Men giva errando per città diverse,
Quand' oggi al fin qui m'avviava. Un calle
Stretto e solingo, che ai pedon dà via
Lungo il Pamiso, con veloci piante
Venìa calcando, impazïente molto
Di porre il piè nella città, che mostra
Mi fea da lungi vaga, e in un pomposa,
D' alti palagi e di superbe torri.
Quand' ecco, a me di contro altr' uom venirne,
Più frettoloso assai: son d' uom che fugge
I passi suoi; giovin l' aspetto; gli atti,
Arroganti, assoluti: ei di lontano
Con man mi accenna ch' io gli sgombri il passo.
Angustissimo il loco, ad uno appena
Adito dà: sul fiume alto scoscende
Il mal sentier per una parte; l'altra,
Irta d'ispidi dumi, assai fa schivo
D'accostarvisi l'uomo. Il modo spiacque
A me, libero nato, uso soltanto
D'obbedire alle leggi; a ceder solo
Ai più vecchi di me: m'inoltro io quindi.
Ei, con voce terribile; "Ritratti,
O ch'io . . . ." mi grida. Ardo di sdegno allora:
"Ritratti tu" gli replico. Già presso
Siam giunti: ei caccia un suo pugnal dal fianco,
E su me corre: io non avea pugnale,
Ma cor; lo aspetto di piè fermo; ei giunge;
Io sottentro, il ricingo, e, in men che il dico,
L'atterro: invan dibattesi; il conficco
Con mie ginocchia al suol: sua destra afferro
Con ambe mani; ei freme indarno, io salda
Glie la rattengo, immota. Quando ei troppo
Debil si scorge al paragone, a finta
Mercede viene; io il credo, il lascio; ei tosto
A tradimento un colpo, qual qui vedi,
Mi vibra; i panni squarcia; il colpo striscia;
Lieve è il dolor, ma troppa l'ira: io cieco,
Di man gli strappo il rio pugnal . . . . trafitto
Nel sangue ei giace.

(Alfieri, Merope.)

GRAMMATICAL NOTES.

1. *Saprei:* Write the whole of the imperative of this verb.

2. *Eccesso tanto:* What is to be understood by *tanto* in this case?

3. *Men:* Give the complete and separate form of these pronouns and their literal meaning.
4. *Giva:* What are the other two synonymous verbs of this?
5. *Venìa:* Write the future of this verb.
6. *Fea:* What is the complete form of this?
7. *Ei:* How could this pronoun be otherwise variously rendered?
8. *Atterro:* Give the infinitive.
9. *Scorge:* Give the whole of the preterite tense and the participle past.
10. *Finta:* Give the infinitive.

II.

Io vi mando un presente, il quale, se non corrisponde agli obblighi che io ho con voi, è tale senza dubbio, quale ha potuto Niccolò Machiavelli mandarvi maggiore. Perchè in quello io ho espresso quanto io so, e quanto io ho imparato per una lunga pratica e continua lezione delle cose del mondo. E non potendo nè voi nè altri desiderare da me più, non vi potete dolere se io non vi po donato più. Bene vi può increscere della povertà dello ingegno mio, quando siano queste mie narrazioni hovere; e della fallacia del giudizio, quando io in molte parti discorrendo m'inganni. Il che essendo, non so quale di noi si abbia ad esser meno obbligato all' altro, o io a voi che mi avete forzato a scrivere quello ch'io mai per me medesimo non avrei scritto, o voi a me, quando scrivendo non v' abbia soddisfatto. Pigliate adunque questo in quel modo che si pigliano tutte le cose degli amici, dove si considera più sempre l'intenzione di chi manda, che la qualità della cosa che è mandata. . . . . .

(Machiavelli, Dedication of his *Discorsi.*)

III.

Translate freely into Italian:—

There are two very natural propensities which we may distinguish in the most virtuous and liberal dispositions, the love of pleasure and the love of action. If the former be refined by art and learning, improved by the charms of social intercourse, and corrected by a just regard to economy, to health, and to reputation, it is productive of the greatest part of the happiness of private life. The love of action is a principle of a much stronger and more doubtful nature. It often leads to anger, to ambition, and to revenge; but when it is guided by the sense of propriety and benevolence, it becomes the parent of every virtue; and if those virtues are accompanied with equal abilities, a family, a state, or an empire, may be indebted for their safety and prosperity to the undaunted courage of a single man. To the love of pleasure we may therefore ascribe most of the agreeable, to the love of action we may attribute most of the useful and respectable qualifications. The character in which both the one and the other should be united and harmonised would seem to constitute the most perfect idea of human nature. The insensible and inactive disposition, which should be supposed alike destitute of both, would be rejected, by the common consent of mankind, as utterly incapable of procuring any happiness to the individual or any public benefit to the world.

Gibbon, *Decline and Fall of the Roman Empire.*)

IV.

FAMILIAR IDIOMS.

(To be rendered by their English equivalents.)

Egli mi supera di gran lunga.
Qui ci va dell'onore.
Punger sul vivo.
Adesso adesso capiterà colui.
Se ci convenisse tornar da capo.
Fai sempre lo svogliato.
Un ritratto grande al vero.
Il poveretto è spacciato.
Si spaccia per amico nostro.
Cotesta mercanzia non si spaccia.
Non so se n'uscirete senza scapito.
Buon pro vi faccia.

Candidates for second or third-class certificates must (1) translate into English the following extracts, and (2) answer the grammatical questions given below:—

Gioas. Or che re sono,
Sarà degno del trono anche il cor mio:
Non sta il cor de' regnanti in man di Dio?
Giojada. Si; tel dissi, e mi piace
Che il rammenti o Gioas; ma spesso ancora
Cercando ad arte occasïon, t' esposi
I doveri d'un re: questo è il momento
Di ripeterli, o figlio. Oggi d'un regno
Dio ti fa don; ma del suo dono un giorno
Ragion ti chiederà. Tremane; e questo
Durissimo giudizio, a cui t' esponi,
Sempre in mente ti stia. Comincia il regno
Da te medesmo. I desiderj tuoi
Siano i primi vassalli, onde i soggetti
Abbiano in chi commanda
L'esempio d'ubbidir. Sia quel che dèi,
Non quel che puoi, dell' opre tue misura,
Il publico procura
Più che il tuo ben. Fa che in te s'ami il padre,
Non si tema il tiranno. È de' regnanti
Mal sicuro custode
L' altrui timore, e non si svelle a forza
L' amore altrui. Premii dispensa e pene
Con esatta ragion. Tardo risolvi;
Sollecito eseguisci. E non fidarti
Di lingua adulatrice
Con vile assenso a lusingarti intesa;
Ma porta in ogni impresa
La prudenza per guida,
Per compagno il valore,
La giustizia sugli occhi, e Dio nel core.
Tu compir così procura
Quanto lice ad un mortale;
E poi fidati alla cura
Dell' eterno condottier.
Con vigore al peso eguale
L' alme Iddio conferma e regge,
Che fra l' altre in terra elegge
Le sue veci a sostener.

(Metastasio, Gioas, Re di Giuda.)

II.

Queste mie sono lettere d' uomo esule, il quale scrivendo per ozio agli amici suoi intorno alla nazione a cui rifuggì, ripensava pur tanto alla patria, che gli vennero fatti de' paragoni fra l'Inghilterra e l' Italia.

E tu pure guardane alcune per ozio; e non leggere un po' seriamente fuorchè la sola dettata con animo di pubblicarla ed è questa: e la non è prefazione, da che io non presumo di darti un libro d' autore. Onde discorrerò teco quanto nelle altre lettere con gli amici miei; e con pari sincerità. E quand' anche tu non l' accolga con pari fiducia, t' accorgerai, spero, ch' è lettera d' uomo ad uomo.

I miei pareri intorno agl' Inglesi derivarono tutti da sentimenti istantanei, spassionati d' astio o d' amore; ond' io li tengo per equi:—ma a promettergli giusti bisognerebbero esperimenti più cauti e più lunghi. Se non che il troppo esaminare assedia il giudizio di dubbj, e disanima la fantasia, che, quasi ispirazione, ci muove ad esprimere ingenuamente i sensi e i pensieri destati in noi dalla presenza di cose nuove.

A quanto dico de' miei concittadini troverò forse contradittori;—non però credo che nessuno mai potrà smovere nella mia mente opinioni avveratemi da molti anni di prove, dalle calamità dell' Italia, e dal mio proprio dolore.

(Foscolo, *il Gazzettino del Bel-Mondo.*)

III.

GRAMMATICAL QUESTIONS.

1. Give the gender and the plural number, with the appropriate definite article, of the following nouns:—*monaca, tribù, legista, occhio, tempio, arte, serie, clima, bue, scoglio, giuoco, crisi.*

2. Form the adverbs from the following adjectives and participles :—*celato*, *mortale*, *leggiero*, *avido*, *vezzoso*, *militare*.

3. Write the conjunctive personal pronouns for the three persons in both genders and numbers in the dative and accusative cases.

4. Write the whole present tense of the indicative of *venire;* the preterite of *volere;* the future of *potere;* the imperative of *andare;* the subjunctive present of *aprire;* the subj. imperfect of *stare;* the participle past of the verbs *fare*, *chiedere*, *offendere*, *scegliere*, *perdere*, *rispondere*, *morire*, *conoscere*, *divenire*.

(*To be continued.*)

HARVESTING CORN IN WET WEATHER.

Prize Essay.

By W. A. Gibbs, Esq., of Gillwell-park, Essex.

(*Continued from page 785.*)

I think it is hardly needful to do more than indicate the absurdity of a recent proposition,* to revert to the old Roman plan of beheading the corn as it stands in the fields, and carrying it off in "sheets," or otherwise, to dry by itself, leaving the straw to take its chance of a future mowing when nearly spoilt. This system has been partially revived in Australia, where the straw is comparatively worthless, but in a country like ours, where it constitutes so large a proportion of the value of the crop, a plan that sacrifices this value, and involves a second mowing, is not likely to be looked upon with much favour or affection, and could only be thought of as the last resource of a forlorn hope.

The custom prevalent in those great corn-producing provinces of Russia—Courland, Livonia, and Lithuania, is somewhat better worth consideration. In those districts it is the usual and long-established practice to dry the grain-crops in a kind of wooden shed, which, by a few additions, is made to do duty as a rough-and-ready kiln; this is considered one of the most indispensable appendages to a farmery. The sketch (Fig. 7, p. 794) will show the arrangement of the under-furnace and spark-stone, above which an open flooring supports the sheaves when packed in upright and close together. A fire of wood is lighted in the furnace, and when it has burnt out its flame, and nothing remains but a large mass of red-hot embers, the sheaves are placed on the sparred floor, all the doors are shut, the end ventilator opened, and the action of this slow and gradually decreasing heat left to do its work of desiccation, which it generally accomplishes in twelve hours. It is found that this artificial drying does not in any degree impair the germinating power of the seed, whilst it improves the quality of both straw and grain for use, and enables the farmer to thresh out and export his corn at once, or to store it in the straw with perfect security against mildew or mustiness. So far, then, the plan seems eminently useful and successful, but there are great difficulties in the way of its adoption in this country. In the first place we have no supplies of wood for fuel, as in Russia; common coal would be, of course, out of the question for such a purpose, on account of its gas and smoke; and neither coke nor malting coal would burn in a shed without a chimney draught. In the second place, we have no "building wood" here, as in Russia, at a merely nominal price; hence our sheds would be much more expensive to erect, and entail a much heavier loss if accidentally burnt down; a consummation which would probably be an occasional consequence of lighting large fires in a wooden erection filled with straw; and, in the third place, a shed of this kind would require to be of a most unwieldy size, if it were desired to dry the crops of a large farm within a reasonable time. Loudon† gives the dimensions of a Russian kiln as 15 feet square, and says that such a building would hold 300 sheaves; but either the sheaves in Russia are only one-third the size of ours, or else this is a curiously wide mis-statement. I have ascertained, by absolute measurement, that 300 sheaves, such as are usually tied in this county (Essex), would require a shed of fully three times that capacity, *i.e.*, 15 by 45 feet, instead of 15 by 15. Now if we take 500 or 600 sheaves as an average produce per acre, this shed of 15 by 45 would only enable a farmer to clear about an acre in 24 hours, working it night and day; hence, if he wished to clear 10 acres in the 24 hours, which would be no very unreasonable desire, he would need ten sheds of this size, or one stupendous building of 45 feet by 150 long.

The various expedients hitherto used or proposed having thus been passed under review, and, from one cause or another, none of them appearing able to fulfil our most urgent want, viz., a means of finishing and saving our harvests in wet seasons, I may perhaps now be allowed to give a short detail of my own attempts to solve this problem. This detail will consist mainly of a "History of Failures;" and my apology for recalling some of these, before giving the final results, rests upon the hope that one man's failures may either suggest other men's successes, or save fellow-labourers in the same task from wasting fruitless labour upon methods already proved to be impracticable.

The harvests of 1860 and 1861 will be recalled with painful memory by everyone who had the misfortune to be a farmer in those years; and many a hard-working tenant, who had by dint of frugality and prudence managed to keep himself and his family upon the small farm which his father and perhaps grandfather had held before him, dates from those disastrous seasons—coming as they did, like the messengers of Job, one upon the heels of the other,—his loss of that independence which he had striven for so manfully and held so dear.

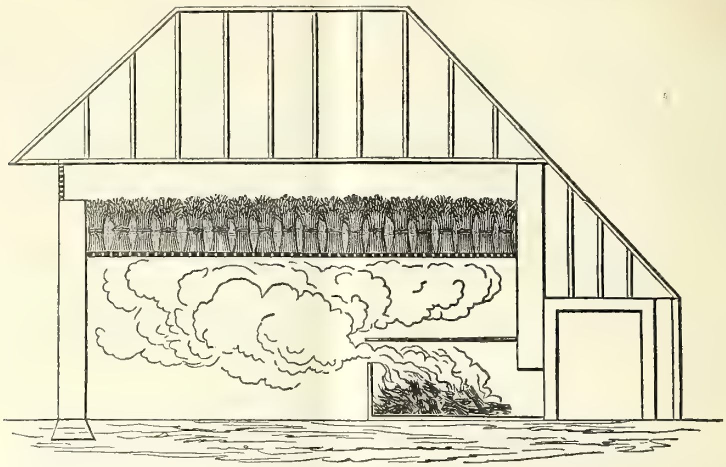
It is very hard for a small farmer, with the increasing expenses of a young family upon his hands, to lay by enough to tide him over such rainy days as those; and when it is considered that upon a little plot of 60 or 70 acres of grass-land, the loss by depreciation of quality of the hay was fully £200 on the two years, and that, in some cases, such loss would be doubled by the injury of the grain and straw also, it is easy to see why many an honest fellow lost his all, and had to turn out, and begin life again in a lower rank. However much in accordance with the principles of strict political economy it may be, that small farms should be agglomerated into large ones, and their owners reduced to the convenient dead level of day-labourers, the operation is a very painful one to witness. It was, then, with the strong desire, and a good hope, of devising some means of saving such men from such disasters, that I commenced a series of definite experiments upon the artificial drying of hay and corn in wet seasons.

The first thing to be ascertained was whether artificial heat in any way destroyed or deteriorated the quality of the thing subjected to it;—and this was easily tried as far as grass was concerned. I cut up a carefully-varied selection of grasses into half-inch lengths, and, weighing 100 grains of them in a delicate chemical balance, dried them on a sheet of letter-paper; the 100 grains of grass left only 20 grains of hay; but this hay was finer in colour and scent than any that I had ever seen made in the ordinary way; it was, however, much too dry; because I found, by comparative analysis, that well-made hay is by no means absolutely free from moisture, but contains, on an average, 18 to 22 per cent. of water; hence, in all subsequent experiments, I was careful to leave about that proportion of moisture in the artificially-dried hay, this being, indeed, essential to the beneficial fermentation and consolidation which should always take place in the stack. After repeating and verifying these and other minor experiments, the next question was as to the various ways and means of carrying out the object in view. I spent many weeks in

* See letter in *Agricultural Gazette*, 5th October, 1867.

† "Encyclopædia of Agriculture," p. 762.

Fig. 7.



investigating the powers, and calculating the costs, of both ancient and modern modes of heating and drying by stoves, hot water, steam, slow ventilation, and hot air, and came to the conclusion that the old plan of a common malt kiln (as being simple in construction, and utilizing, for the purposes of evaporation, the whole of the heating power given out by the coal) was best worth trying first. I confess I did not expect it would answer, because one would naturally suppose that the sulphurous gases would discharge the vegetable-green colour from the hay, and that the other products of combustion would impart to it a burnt and empyreumatic taste and smell; but I was weary and perplexed with deliberations, and so made a dash at it, and sent a load of rowen, that had been kicking about the fields for two or three weeks of that wet autumn, down to a friend's malt-kiln, first re-insuring him (as in fairness bound) against all hazards of fire that might follow from the experiment. I confess that when I saw an enormous fire of malting coal, only a few feet below the open-wire floor, whereon we were to spread and toss about this rubbish until it became dry and inflammable, I was half inclined to forego the trial, as rather too "risky." However, we "pitched it in" from the cart, and my man and myself took it in turn to go into the kiln after it about every five minutes, and shake it up with a hay-fork, so as to get it evenly dried. The temperature of the air was 120° to 130°, and the fume of sulphur considerable, but by no means unendurable, and we could stay three minutes at a time in it without much inconvenience; in 25 minutes I was rewarded by finding that the reeking-wet, ill-smelling, discoloured, half-made, and half-spoiled rowen, was dry enough for stacking, and had improved both in colour and scent to such a degree that, when we forked some down out of the kiln into a little meadow, where horses and cows were feeding, they all came up and ate it eagerly. Here, then, was a first and very useful fact, proving that fuel might be employed in its most economical form of application, viz., that of utilizing all the products of combustion at once, and without the intervention, cost, and waste of complicated apparatus.

Of course it was needful to repeat experiments in this form with more care and accuracy, in order to obtain positive data as to the weight of the hay before and after drying, and the loss by waste in the process. We therefore constructed an impromptu kiln, by lining a saw-pit with plate-iron, placing a furnace below, and nailing on a floor of malting wire a few feet above. Experiments with this arrangement soon indicated the weak points of kiln-drying. Of course all practical men know that if hay is to be dried it must be lifted and "lightened-up" occasionally, so as to allow the air to pass through it; and this we found to be still more essential when hot air was employed, for if it was left more than three or four minutes without being turned, the under layer matted itself down, became over-dry, and then (dry hay being a non-conductor) prevented the heat from passing up to the wet layers above. Now, however gently and carefully we moved this about, we found that the hay-seeds first shook through the meshes of the wire floor in such quantities as greatly to impair the value of the remaining hay, and then by degrees choked up the wires so as to stop the passage of the hot air entirely. Thereupon we abolished the wire and substituted a floor of thin iron-plate, moved the furnace to one end of the pit, and made a chimney of stove-pipe at the other, but with no great success, for three-fourths of the heat went up the chimney, although sixteen feet off, and the remaining one-fourth dried the hay too slowly and expensively. These two failures set aside and negatived several mechanical arrangements which I had had in view, one of which was to have been a hay tedder, either revolving on a round kiln-floor, or traversing to and fro upon a long square. Another was to lengthen the hot-plate floor and have an endless chain with tines to "creep" the hay along its surface from one end to the other, with the idea that perhaps in a length of say 30 or 40 feet the hay would go in wet at one end and come out dry at the other. I tried this plan on a sufficient scale to show its inadequacy, which arose not alone from the primary objection of the loss of heat by the necessity of a chimney draught, nor from the disappointing fact that a slow march of twice fifty feet does not suffice to make wet hay dry, but, conclusively, from the inherent defect that the mere "creep" action does not lighten and change the surface of the wet hay sufficiently to allow the heat to permeate through it. Finding this, I went next, of course, to the other extreme, and had a great plate-iron semi-circular vessel, like a half-drum, made and placed over a fire, and caused an axle with tines to revolve slowly in it, carrying up the hay and shaking it out; "shaking it out" indeed this time with a vengeance! the result being a shower of seeds, broken stalks, and clogged axles.

My next model seemed to give so fair a promise of success, that I had an apparatus constructed from it, on a sufficiently large scale to put its promise to the practical test of performance. I should like to describe with some minuteness the construction and mishaps of this apparatus, because I think it may save others from wasting time, thought, and money upon the same subject. Conceive then, reader, if you please, a trench dug in the

earth, three feet deep, three feet broad, and about nine feet long, in which is built an arched furnace, with a fire-grate supported on cross bars, half-way between the crown of the arch and the ground. A door being adjusted at the one end, from the other is led off a horizontal flue, of a foot square and four feet long; where the furnace ends and the flue begins, a thin wall of perforated bricks is carried up between, so that no large cinders can pass from one into the other; eighteen inches beyond this first line of defence a perforated iron-plate is built into the flue, and beyond that again another plate, with still finer perforations; at the open end of the flue, thus triply guarded, a large brick box is now carried up, in which is supported and built-in an iron fan or winnower, in such a manner as that its axle, with driving pulley attached, comes through a hole in the brickwork. Hollow spaces having been left for ingress of the hot air from the flue into the open sides of the fan, when that axle was made to revolve rapidly, a strong draught was created through the furnace, and a vast volume of hot air was delivered up, skyward, from the wide mouth of the fan, which mouth was the only feature left visible and open. Upon the brick foundation, which thus encased the fan, was next erected a hollow wooden shaft or chimney, of about two feet square and twenty feet high. At four feet from the ground an opening was made into this chimney; then, by means of slots cut in the sides, we adjusted an iron axle, carrying a wooden drum or roller two feet long and nine inches diameter; a corresponding drum and axle were also adjusted nearly at the top of the chimney, and an endless band of the strongest sail cloth, also two feet broad, was stretched over both these rollers; a driving-wheel and handle being now keyed on to the lower axle, where it protruded through the sides, and movement being given to the lower drum thereby, the upper drum and canvas band revolved very smoothly and pleasantly. We next prepared a number of tines on bars, like the tines and bars of a hay tedder, and fastened them on to the endless band at intervals of about fifteen inches apart. All was thus ready for the preliminary trial, and when the outer wheel was turned, armfuls of hay and straw were carried slowly up by the ascending tines, and, upon passing over the upper drum, they fell gently down, being checked and shaken out in their fall by the descending tines.

Our next care was to provide for the movement of the fan at a sufficient velocity to drive up an ascending stream of hot air, to meet the falling grass, and so dry it. By borrowing the fly-wheel from the oat-bruiser, and some of the multiplying cog-wheels from the lawn-mower, we achieved a very respectable speed, considering that we had only hand-power to drive with; and when we lighted a good fire of malting coal in the furnace I obtained a strong stream of air at 280° by having the fan kept steadily going. But the first effect of this hot air was somewhat baffling, for it made the canvass band so slack that the rollers took no hold of it; we pulled it round by hand to its place of joining, and overlapped it till it was again taut, and then again set both machines to work; all went well for a time, and wet grass was fed freely in at the lower opening, and falling over as it reached the upper drum, meeting the current of hot air, had the water driven out of it in the shape of steam from the top of the chimney; but by-and-bye, as the band became wetted by the water in the grass, it contracted itself so forcibly that the axles of the drums groaned and squeaked in their sockets, the man at the wheel could no longer turn it, and finally the canvass burst from its last lacings. It was not easy to see how to overcome this awkwardness of alternate expansion and contraction, without adopting the expensive and heavy substitution of iron work for canvass. By means of a small model, which I could cut and hack about in various ways without compunction, I found at last that by cutting two grooves in the sides of the chimney, so as to allow the axles of the upper drum to work up and down, and then making those axles take their bearings on the short ends of two levers, the longer ends of those levers could be weighted to just such a balance as would keep the band always tight enough, without putting it to anything like a bursting strain. This got over the difficulty; the balance weights rose and fell with regular inflections as the canvass tightened with the introduction of fresh wet grass, and then gradually slackened again as the grass became hay; they might in practice have been used as indicators (by attaching a measured guage to them) to tell when the hay was dry enough. And here it may be well to explain how, when it *was* dry enough, we managed to get it out of the chimney. Simply thus:—By opening a trap-door at the top of the shaft, and putting a higher speed on the wheel that drove the band, the dry hay flung itself by centrifugal force off the band on to a hay platform, which was so arranged as to catch it as it fell, and from which of course it could be forked on to the stack; the trap-door was made to open and close by a cord and a rod worked from below. Had there been need, another endless band could have received it at the top, and carried it to any part of the rick-yard.

I was thus, at last, in possession of an apparatus which, although rough and primitive, was yet "workable," and which enabled me to obtain some positive data as to the average quantity of water which had to be expelled, and the cost of expelling it. Many experiments with this machine demonstrated that raw grass could be converted into fine green hay by the hot air and gases from a furnace, without detriment to its quality. But my object in attempting artificial means was not to *supersede*, but to *supplement*, nature; and I knew that in the worst seasons a very large proportion of the water that we have to evaporate from grass, in order to convert it into hay, can be got rid of in the fields by the usual methods. The mere withering out of the sap, which goes on in spite of frequent rains and absence of sun, will effect this. Hence the question to be answered was, how much coal will withered grass or wetted hay require to finish it and make it fit for stacking. To answer this, I carried out a large number of experiments, extending over two seasons, during which the first crops and aftermath were subjected to trial in many various degrees of greenness and wetness. The average proportions obtained in this way indicated that one ton of withered grasses, or imperfectly made and wetted hay, holds in combination quantities of water varying from 5 cwt. to 15 cwt., and that to free it from those quantities, and render it fit for stacking, required respectively (with this rough and imperfect apparatus) from 1 cwt. to 3 cwt. of coke. Now, taking coke to cost 1s. per cwt., these results showed that the mere cost of fuel would certainly not be a bar to its employment for this purpose, because every farmer knows how often a bad season discolours and depreciates the market value of his hay to the extent of 10s., 15s., or 20s. a load; and many are aware that alternate sun and rain destroy its fragrance, and wash out nearly all its soluble and nutritious principles, whilst the repeated "shaking out," which this frequent wetting and drying render necessary, knocks out a large quantity of the seed. The waste from these two causes alone often amounts in mere weight to a quarter of a load per acre, and "mere weight" by no means represents the whole of the loss. If any large proportion of the hay is retained by the farmer for feeding purposes, he will get less milk from his cows, less mutton from his sheep, and less work out of his horses; but leaving these last considerations out of the estimate, the two items of inferior quality and worse yield show an absolute money difference of from 30s. to 40s. between ill and well saved hay. Now, the 3s. worth of coke expended to save this loss will leave a large margin for such extra labour as the process might require. To ascertain the cost of labour with any degree of accuracy needed a much larger and more finished apparatus than my present one, so the next point to be

considered was, what sized machine would be required to cope practically with a wet harvest, and what cost of labour would be involved in working it? With regard to the last question, I had always had it in view to employ the portable steam-engines (now hired out for threshing), to give movement to the machinery, so as to utilize the waste heat from their furnaces to supply hot air to the fan, and the waste steam from the engine to heat metal plates or pipes in the shaft.

My working model was two feet square and 20 feet high, and as that was able to convert a charge of 40lbs. of wet into 30lbs. of dry hay, in fifteen minutes, giving an average of 120lbs. an hour, it would have been easy to calculate from these data how much larger the full-sized apparatus should be; but it was fairly to be expected that the adaptation of steam chambers or hot pipes in the shaft, would not only economise fuel but expedite the drying to such an extent as largely to modify the calculation for size. In order to test this, in my smaller model (of one inch to the foot) I introduced front and back plates, and heated them by steam. With this addition, hay that had taken fifteen minutes to dry *without* the plates, was dried in ten minutes *with* them—hence it followed that in the large model half as much again could have been dried by the aid of hot plates—that is 180lbs. per hour in place of 120lbs.; this would have been equal to nearly two tons in twenty-four hours; thence it followed that a machine five times the capacity of this present one would have been able to dry and deliver at the top of the stack nearly ten tons in the same time. I judged that the power of dealing with a less quantity than this would not suffice for real work, and yet a shaft of 24 feet high, 10 feet wide, and 2 feet broad, with its hot plates, endless band and tines, rollers, wheels, levers, and balance weights, all in proportion to this increased size, would have been both costly and unwieldy.

Machinery is very pretty, especially in a case like this, where it had done its work so well—carrying up its charge of wet hay and pressing it slightly against the hot plates of the ascending side, and then suffering it to fall slowly down over the reversed and descending tines, shaking itself gently open, so that the rising current of hot air could penetrate through every part of it, yet without any rough action to break the stalks or shake out the seed. It was also very satisfactory to see the hay fling itself out at the top, when dry enough, by the simple action of centrifugal force, and to find that, with one little contrivance after another, the whole thing was as nearly as possible automatic. I felt convinced also, by watching the action of it, that it could have been readily adapted for drying wheat and other grain crops in the straw, damp or sprouted corn in the seed, malt after steeping, and in fact anything requiring slow and regular movement, simultaneously with a perfect exposure to a powerful stream of hot air. All inventors, therefore, will sympathise with me in the mortification with which I consigned this promising apparatus to the limbo of oblivion, in order to make way for a simple, rough-and-ready process of effecting the same ends. I was, however, sufficiently acquainted with the urgent requirements of most farmers, and the prejudices of some, to know that unless a process was eminently simple, inexpensive, and not liable to derangement, it would take a long time before it would be generally adopted. With a view to meet these requirements, I sacrificed much that *was*, and *may even yet*, be found advantageous in the way of mechanical contrivance, and began the third course of experiments by directing streams of hot air from the fan's mouth upon masses of wet hay laid in an open wooden trough, causing such hay to be lifted and lightened up occasionally with forks, so as to bring each part of the mass, in turn, under the direct action of the air. The first result showed, several times over, that 25lbs. of half-made hay lost 10lbs. in fifteen minutes, the temperature of the ingoing air being 250° to 280°; the hay so finished was (as before) fragrant, of good colour, and readily eaten by stock of all kinds. I now took 21lbs. of this dried hay and drenched it with water, of which it retained 11½lbs. making its total weight, in the wet state, 32½lbs. It was then again subjected to the hot blast, and in eleven minutes was reduced to 16lbs., and had lost very much of its fragrance. I record, and would ask a close attention to this experiment—it being confirmatory of what I have before advanced as to the loss sustained by the action of alternate rain and sunshine, and as confirming also what observant practical farmers have frequently told me, viz.—that the loss of *weight alone* in a bad season is equal to nearly a quarter-load per acre—say 20 per cent. Whilst upon this subject I may mention that, on referring back to my own rough analysis of hay, I found that water had extracted from it 18 per cent., so that probably a large proportion of the 20 per cent. loss by wetting would consist of the soluble and more valuable portions.

To return, however, to the drying experiments. I next took some hay, almost, yet not quite, ready for stacking (a condition in which it is very constantly found towards evening in harvest time); it had been cut two days, and only once shaken out, and then winrowed up. I ventured to increase the temperature of the blast to 320°, and thus reduce 30lbs. of this hay to 22lbs. in four minutes, it being then perfectly fit for stacking. This was a very useful indication of the rapidity with which hay may be dealt with when it has arrived at that tantalising point where it only needs two or three hours more sunshine to finish it. And this is the point at which art may be most usefully called in to the assistance of nature. Let us ever continue to use all the aid that sun and wind, skilful implements, and well-applied labour place at our disposal; but when these fail, let us, if possible, have other means at hand to complete their work. It was, therefore, chiefly as a matter of curiosity that some experiments were now made upon raw wet grass, brought in from the fields within an hour after cutting; and I should hardly have given any record of these but from a recent suggestion that the new and striking successes lately obtained in the enormous growth of grass by means of sewage may probably render it needful to dry and store some portion of this growth at times of the year when sun and wind are not much to be depended on. I may therefore briefly mention that 45 lbs. of such grass, saturated with the heavy morning dew, was dried into 9 lbs. of bright green fragrant hay in fifteen minutes by maintaining a steady temperature of 320° for the ingoing air. This was my first experiment with steam power in lieu of hand labour, but I have since, with my smallest model, succeeded several times in drying grass in a similar condition into perfect hay in six minutes, using a temperature of 380° and a velocity of 1,650 revolutions per minute.*

(*To be continued.*)

SCIENTIFIC EDUCATION IN FRANCE.

The Minister of Public Instruction, in his report, already referred to in the *Journal*, speaks of the efforts which have been and are still being made in America, Germany, Russia, and England, for the establishment, at great cost, "of those arsenals of science called laboratories;

* Still more recently (viz., 22nd June, 1868) grass upon which a four hours' rain had fallen was cut and brought at once to the open shed of the wheat-dryer, the floor of which had been removed; and this grass being merely thrown on the ground before the mouth of the hot blast, and lifted and shaken out by two men with hay-forks, was converted into green hay in seven minutes; the temperature of the ingoing air being 300° to 320°, and the velocity of the fan about 600 revolutions per minute. The Duke of Sutherland, the Marquess of Kildare, Lord Blantyre, Sir T. F. Buxton, and several other gentlemen were present at this experiment. On the following day an average load of wetted hay was, by similar treatment, rendered fit for stacking in forty-nine minutes, and sent up by the atmospheric hoist to the top of the stack in twenty-five minutes.

schools, in fact, which are formed around professors of renown, and which assume the perpetuity of scientific progress, and are a serious menace against one of our most legitimate ambitions."

Referring to the inefficiency of existing establishments for the purposes in view, the minister says:—"It will not be necessary, in order to obtain what is wanting, to impose great sacrifices on the country, for if the Sorbonne, the Museum of Natural History, and the School of Medicine require enlargement, the cost of the necessary buildings may be divided over several years."

The minister points out that the lectures of many of the professors in Paris are delivered rather to chance listeners than to earnest pupils, and proposes that the character of the teaching shall be modified with especial view to the benefit of the latter class. "The moment," he says, "when our professors shall, as in the German universities, have veritable pupils, without neglecting the precious qualities of our national spirit, and without renouncing the art of good speaking, which is inseparable from that of good thought, they will give more time to the labour of literary or historical erudition, held in such high honour on the other side of the Rhine, and not sufficiently so at present amongst us." The government having obtained from the Corps Legislatif the means of increasing the stipends of teachers of the superior class, can ask them to give, in addition to the lessons delivered to numerous auditories, didactic instruction reserved for a limited number of persons. Some of the faculties have already taken steps in that direction, and the rest must follow. The secondary normal schools now being formed in connexion with the faculties in the provinces will doubtless yield the first supply of pupils for the new courses.

What is said above of letters applies equally to instruction in science. In the scientific courses, says the minister, our students must be more exercised in those operations peculiar to each kind of research, for every science, mathematical analysis excepted, has its necessary exercises.

All the establishments which lead direct to a profession, such as the faculties of medicine, and the superior schools of pharmacy, practical exercises, such as dissection, chemical analysis, &c., form a necessary portion of the normal course of scholastic studies, but it is not the same in the faculties of science, or in the great scientific establishments. Each chair of chemistry, of natural philosophy, and of natural history, has a laboratory attached to it, in which the experiments necessary for the professors' lessons are made, but they are at present closed against the students, to whom they should be opened, though not to mere casual listeners; and such laboratories of instruction would become schools, from which the directors of the proposed laboratories of research would select their assistants.

The laboratories of research, says the minister, would be equally useful to the masters and public, and would, therefore, ensure the future progress of science; the pupils, already well grounded in theoretical knowledge, and accustomed in the laboratories of instruction to the use of instruments and elementary manipulation, would, in the laboratories of research, be grouped in small numbers around an eminent teacher, would be stimulated by his example, and would practice, under his eyes, in the art of observation and the methods of experimentation. This has already been the case in the few laboratories of research existing in France; and it is through institutions of this kind that "Germany has arrived at that large development of the experimental sciences which we watch with uneasy sympathy."

In many cases the same building may serve for laboratories of both kinds, and the same professor may be at the head of both, with advantage to science and economy in working.

One innovation, very remarkable for France, is introduced with respect to the laboratories:—"The essential condition of these laboratories," says the report, "will be that the professors in charge of them shall have entire liberty to carry on their own labours as well as of the studies of their pupils, without reference to any official programme, in the manner they may believe most advantageous to science."

L'École Pratique des Hautes Études is the crowning of this new educational edifice. It has often been argued that the student of pure science is little assisted in his studies, or rather that such assistance sadly wants system and precision. The French school of chemistry has had the benefit of a regular school, and French chemistry has thereby greatly benefited. It is now proposed that all the sciences shall have the same advantages by means of the new school in question. "The words practical school," says the minister, "must not be taken in their ordinary sense, which would call up ideas of industrial utility, but in the most elevated sense, as expressing the fact that the work, both of the eyes and of the hands, is necessary to confirm and extend the highest and the most delicate conceptions of the scientific spirit. What is chemistry without manipulation, philosophy and physiology without experiment, or botany without herborization."

To give an example of the working of the system, the pupils of the mathematical section will be admitted to courses at the observatory, where they will be initiated into the theoretical knowledge that astronomical mathematics demand, as well as in the use of all the instruments employed in astronomical observation, thus forming a veritable school of astronomy.

In philology, the faculties of the University of Paris only teach the classical languages, and in history only the general history of antiquity, of the middle ages, and of modern times. The programme of the new school will include archæology, the science of language, paleography, comparative philology, general grammar, critical history, &c.

The Ecole Pratique will, of course, not be a special establishment; the pupils will be non-resident, and will attend the various courses as students in medicine attend the faculties, the hospitals, the museums, and the anatomical schools.

"There is no question," says the report, "that youths belonging to families in easy circumstances will be attracted to this school by its liberal character, without asking for public employment at the time of quitting it. The practical schools of the Museum of Natural History, by way of example, will assist in forming around that establishment a real faculty of agriculture for the study of the laws of animal and vegetable production, with which every proprietor of land or agriculturist ought to be acquainted."

The flexible organization thus given to the new practical school, renders it applicable to the faculties in the provinces as well as in the metropolis.

The report is followed by two imperial decrees. The first establishes the laboratories of instruction and research. By the first article, the laboratories attached to the various chairs are declared open as laboratories of instruction, for manipulation and practical experiments, to candidates for the licentiate, to pupils of the new Practical School, and also to candidates for admission to the school who have passed the preliminary examination. Should the accommodation be at present insufficient, the professor is to examine the candidates, and to admit them by order of merit.

The second article orders the establishment of laboratories of research, by the minister, on the advice of the Superior Council of the new Practical School, and the supply of the necessary funds from the special grant referred to above, both for the material of the laboratory and the payment of the director. The director is to recommend to the minister the appointment of the necessary assistants, and a list of the pupils he proposes to admit to the laboratory. The minister is also authorized to grant annual indemnities to professors who may establish laboratories of research, independent of public institu-

tions. (One, if not more, already exists in Paris.) The minister may, moreover, upon the advice of the superior council, accord indemnities to pupils admitted to these laboratories.

The first article of the decree for the establishment of the new school runs as follows:—"A practical school of superior studies as established in Paris, in connection with the scientific establishments under the Ministry of Public Instruction, the object of which is to join to theoretical education those experiments and exercises which may fortify and extend it." The School is divided into four sections:—1. Mathematics; 2. Natural philosophy and chemistry; 3. Natural history and physiology; 4. Historical history and philological science. The professors of the second and third sections will take the title of directors of laboratories, and those of the other two sections that of directors of studies.

No condition, with respect to age, grade, or nationality, is laid down with respect to pupils of this school, but all candidates must go through a probationary stage of three months or more, at the end of which time they are to be classified by the director, assisted by a permanent commission. Admission remains finally with the minister, and a pupil may belong to two or more sections. No pupil to remain more than three years in the school.

The pupils are expected to furnish written memoirs on given subjects, and analyses of books of science or erudition, foreign as well as French; to make researches in the libraries and museums on given subjects, and to report the results in writing. The pupils in the section of natural history and physiology will take part in scientific excursions directed by the professors; and those belonging to the sections of mathematics, natural philosophy, and chemistry will visit workshops famous for their machinery and tools, or for special methods of manufacture.

The minister may, with the advice of the superior council, grant annual allowances to pupils of the school; and pupils who exhibit great aptitude may, in like manner, be allowed to present themselves for the degree of doctor without passing through the licentiate.

Pupils who have passed through the superior normal school, and those who have taken the degree of *agrégé* of public instruction, may be named by the minister, for the period of two years, assistant-professors or "preparators" in one of the sections of the new practical schools, with an allowance, according to position, of 1,200 or 2,000 francs.

The assistants or pupils of the school will be employed by the minister in scientific foreign missions.

Each section of the school will be placed under the charge of a permanent commission of five members, named for three years, by the minister, from amongst the directors of the school; other directors to form part of the commission whenever any question relative to their own laboratory is to be discussed.

All the directors are expected to furnish annual reports of the working of the classes or laboratories.

The superior council of the school consists of the perpetual secretaries of the Academies of Sciences and Belles Lettres; the administrator of the College of France; the directors of the Museum, the Observatory, the Ecole Normale, the Imperial Archives, the Ecole des Chartes, the administrator of the Bibliothèque Impériale, the curators of the Museum of Antiquities, the deans of the Faculties of Sciences, Letters, and Medicine, with the members of the four permanent commissions above mentioned. This council, besides advising the minister on all important points relative to the school and laboratories, may recommend pupils quitting the school to appointments as teachers in secondary schools, as preparators, assistant naturalists or astronomers, librarians, &c.

The council to meet at least twice in the year, at the commencement and closing of the annual course.

Certificates of study, medals, honourable mentions, subventions, and special recompenses will be given to the pupils of the school at the end of each scholastic year.

It will be perceived that there is no mention throughout the report or the decrees of any fees to be paid by the pupils.

This is certainly one of the most important attempts ever made to bring the highest class of education within the reach of all who possess the necessary preliminary knowledge, together with sufficient capacity to offer fair promise of success. The scheme may seem complicated on paper, but when it is remembered that it consists entirely in the retension and popularising of existing means of instruction, the apparent complication disappears.

Fine Arts.

Works of Art ordered by the City of Paris during the Present Year.—According to a Paris journal, the artistic budget of the City of Paris for the present year amounts to the sum of £13,882, and the following is the list of commissions given to artists:—Two paintings for a chapel in the church of St. Bernard—artist, M. Porion. Decoration of the chapel of St. Vincent de Paul, and restoration of stained glass window in the church of St. Etienne du Mont—M. Felon. Church of St. Eustache: painting for the chapel of the Sacré Cœur, by M. Humbert; and window *en grisaille* for the chapel of St. Anne, by M. Lafaye. St. Germain des Prés: a crucifixion, by M. Montagny. St. Gervais: three figures in stone, by M. Marcellin. St. Jacques du Haut Pas: decoration of the chapel of the Virgin—M. Auguste Glaize. St. Jean Baptiste: fine painted windows—M. Steinheil. St. Joseph: the whole of the windows to be painted, by M. Oudinot. St. Laurent: decoration, enamelled on lava, for the portico, by M. Paul Balze. St. Médard: painting for the chapel of St. Catherine, by M. de Pommayrac. St. Nicholas des Champs: painting for the chapel of St. Bruno, by M. Kaplinski. St. Roch: two groups in stone for the façade, one by M. Victor Vilain, the other by M. Vital Dubray; statues, in stone, St. Clotilde, by M. Loison; and St. Geneviève, by M. Aizelin. St. Sulpice: two large paintings for the transepts, by M. Signol. The following are for the new monumental buildings:—Church of St. François Xavier: the mission of the apostles, by M. Cazes; the four evangelists, by M. Elie Delaunay; the decoration of the chapel of the Virgin, by M. Jules Lefebvre; a statue of the Virgin, by M. Bonnassieux; a bas-relief for the fronton, by M. Jules Thomas; two figures of angels, by M. Falquières: a statue of St. Peter, by M. Sanson, and of St. Paul, by M. Franceschi; a bas-relief of the Pascal lamb and two angels for the principal door, by Madame Bertaux; two painted glass windows and three roses, thirty-four windows *en grisaille*, and twenty-one other decorated windows, by M. Ottin, fils. St. Pierre de Montrouge: bas-relief, in stone, of the Last Supper, for the high altar, by M. Maniglier. Vaudeville theatre: ceiling, and four panels, representing Comedy, Fairy, Music, and the Drama, by M. Mazerolles. Ecole Turgot: bust of the founder, by M. Courtet; and bas-relief for the fronton, by M. Maillet. Fountain of the Chateau d'Eau: models of lions, by M. Alfred Jacquemart. In addition to the above, the City has ordered a commemorative medal of the new church of St. Augustine of M. Alphée Dubois; a similar medal of the church of La Trinité of M. Borel Valentin; an engraving of the Calvary, painted by the late M. Flandrin, in the church of St. Germain des Prés, of M. Poncet; and one of M. Hein's picture of the martyrdom of St. Cyr and St. Juliette, in the church of St. Gervais, to be executed by M. Achille Martinet. [*Mem.*—The former lists were not quite correctly dated; they ran from May to May, while this is for the current year, 1868. The present refers only to the Municipality of Paris.]

Congress for the Discussion of the Methods of Teaching Drawing, &c.—The meetings of this congress, already noticed in the *Journal*, are carried on with much animation. The first question in the second section was the following:—"Previous to the foundation of academies of the beaux arts, the graphic and plastic arts were only taught in the studios of artists. Public schools have now taken the place of the ancient mode of apprenticeship. What are the merits and the advantages of the two systems?" The discussion upon this question lasted three hours. M. Slingeneyer criticised the present organisation of academies, which he said arose in the decline of art, and had not produced the effect expected of them. The professor insisted on the necessity of teaching drawing from nature before that of copying from the antique; and recommended that while Government should appoint the director of an academy, the nomination of the professors should rest with the latter. M. Canneel, director of the Academy of Ghent, was of opinion that drawing after nature and from the antique should be taught simultaneously, and advocated the popularising and decentralization of academies. M. De Taeye sketched a plan combining the two methods of art education, namely, academic instruction, to develop the intelligence of the pupil and give him the necessary amount of science, and public ateliers where the pupils might receive instruction from distinguished artists. Many of the professors who spoke maintained the thesis that the business of academies was simply to teach the "grammar and orthography of art." A long and animated discussion took place on the methods of teaching elementary drawing, several of which were explained by their professors; "but," said one of the speakers, "whatever may be the method employed there is but one kind of drawing, and this rests on positive principles." He divided the teaching of drawing into four classes:—Linear and curvilinear drawing, relief and the effects of light and shade, and superior education, or art. "All the world learns to write, and all the world should learn to draw."

Manufactures.

Production of Silk in the Province of Cuneo.—The Chamber of Agriculture and Commerce of Turin have published the following official returns of the quantity of cocoons brought for sale at the various markets in the principal towns in the province of Cuneo during the present year (1868):—

Town		Quantity of Cocoons.
Alba	(Myriagrammes)	34,827
Bra	"	12,422
Ceva	"	8,118
Cuneo	"	57,468
Fossano	"	9,225
Mondovi	"	13,226
Racconigi	"	47,070
Saluzzo	"	21,444
Savigliano	"	11,864
Total		215,664

Commerce.

Printing of the Moniteur.—The minister, M. Rouher, having advertised for tenders for the printing and supply of the *Moniteur Universel* and *Le Petit Moniteur* for the French Government, the conditions of which had been previously published, made his adjudication a few days since. There were four tenders sent in, with caution money duly lodged. On opening the tenders it was found that all four offered to supply government with *Le Petit Moniteur* for each of the 40,000 communes of the empire for nothing. The minister then declared he would proceed to a new adjudication, which would be based on the furnishing the greatest number of *Le Petit Moniteur* to the government, independent of the numbers furnished gratuitously to the communes, in order that the most important of them might receive extra numbers. M. Wittersheim offered to give, in addition to the numbers to be furnished for each commune, 55,000; M. Pointel, 26,230; M. Charles Schiller, 25,005; M. Plon, 25,000. The adjudication was given in favour of M. Wittersheim, subject to the final approbation of the Minister of State. That the four competitors can offer such an enormous reduction, shows a considerable progress in the art of printing. The editor of *Les Mondes* considers this mystery is easily explained by the fact that M. Marinoni has invented a new press. In that rests the secret of this wonderful adjudication. M. Marinoni at first thought of offering to contract for the printing himself, so as to astonish the world by his low price; but on further consideration he determined not to incur so great a responsibility, not altogether suited to him, and he contented himself with negotiating with the four competitors for the adoption of his new press. It is he, therefore, who is in reality the printer of the *Moniteur Universel*.

Postal Statistics of Italy.—The following statistics of the receipts of the Post-office during the first half of the present year, as compared with that of 1867, is taken from the official returns just published by the General Director of the Italian Post-office:—

	1868.	1867.
Letters posted	41,056,737	40,746,626
Newspapers and periodicals	29,029,021	26,937,839
Other printed matter	4,913,210	4,480,442
Free correspondence, postal service, &c.	14,874,103	14,799,665
	Francs.	Francs.
Post-office orders issued	71,739,539	59,623,838
Total receipt of Post-office	7,734,666·78	7,430,286·45

Colonies.

Hong Kong.—The number of passengers visiting and leaving the city of Victoria is now estimated at 600,000 annually, the vast majority of whom are Chinese. The circumstances of this colony are entirely exceptional, inasmuch as Hong Kong, though an island, is separated in some places by scarcely a mile of water from the mainland, and is surrounded by the refuse of a large population specially addicted to piracy. During the past year the amount of gaol accommodation has been decreased; the quality of the labour exacted from prisoners has been made more rigorous, and the police have been entirely reorganised, resulting in a diminution of crime, as compared with previous years, of 30 per cent. Piracy has greatly diminished, a system having been recently adopted compelling all native vessels to take out licenses, by which means the name of every junk, with particulars of her armament, cargo, master, and destination, are obtained and recorded. The population of Hong Kong now numbers 115,000, of which 29,459 are females; these numbers being exclusive of the military and naval forces, and inclusive of 2,113 European and American civil residents. The imports for 1866 amounted to £54,613,008, and the exports to £32,592,295, exclusive of treasure, which amounted respectively to £12,771,967 and £13,862,955 sterling. The foreign trade with China in the same year amounted to more than ninety-four millions of pounds sterling; and of that trade the share of Great Britain amounted to seventy-one and a half millions, or nearly 63 per cent. of the whole.

Victorian Jams and Preserves.—The latest addition to the stock of new industries in this colony is a manufactory of jams and preserves, which form a considerable item in the consumption of the year. At one time the colony imported largely from home, latterly it has obtained its main supplies from Tasmania, but now the time has come when its fruit crops exceed the demand, and are being utilised in this way.

Railways in Victoria.—The returns of the Victorian railways continue to exhibit a marked improvement over those of last year. The aggregate receipts, from the beginning of the year to the 9th July, amounted to £286,937 14s., against £274,338 16s. 4d. taken during the same period of 1867, showing a balance in favour of 1868 of £12,598 17s. 8d. The weekly average this year has been £10,627 6s. 5d., against £10,160 13s. 11d. There are 254 miles now open. On the Melbourne and Hudson's Bay Railway a similar improvement is discernible. The aggregate returns for the past half-year amount to £67,309, against £64,814 in the corresponding period of last year. The weekly average has been £2,560, against £2,452 in 1867.

Industry in New South Wales.—The *Sydney Empire* says:—"The numbers directly employed in mining form a comparatively small proportion of the whole population, but they stimulate every other department of business, and add more largely to the wealth of the industrial and mercantile classes otherwise engaged than to the diggers themselves. Not only does gold mining give encouragement for the use of steam power, and for the more perfect instruments of industry, it disposes of numerous hands who would be of little use in any ordinary occupation, and who would make a living only where inferior forms of toil are well compensated and more in demand. No doubt there are the results of demoralisation to be taken into account, but when we look back upon the origin and progress of Australian colonisation, we shall see that fixed society has been greatly relieved by the existence of attractive occupations in districts remote from crowded cities. They, however, are not friends of the mining population who inspire them with unfounded expectations of great success, and discourage the slower process of gain which may result from more settled habits. There are no doubt gold fields that are grown into towns, and where there is a tendency in mining to become a permanent occupation, admitting of capital and division, in short reducing the system of getting gold to the common order and relations of a fixed industry. Whenever this takes place, there is a probability that the common employments will ultimately increase far above the enterprise which originally attracted the attention of the people, and that by the time mining is exhausted it may cease to be necessary. The occupation which first drew population to a particular centre will give place to still more profitable employments and pursuits."

Obituary.

Harry Chester, a Vice-President of the Society, died on the 5th inst., at his house in Rutland-gate, after a short illness, having only returned from Switzerland on the preceding Friday. He was the youngest son of the late Sir Robert Chester, of Bush Hall, Herts, Master of the Ceremonies under King George III., George IV., William IV., and Queen Victoria. He was born on the 1st October, 1806, and was educated at the Charterhouse and Westminster schools, from whence he proceeded to Trinity College, Cambridge, for a few terms, but quitted it in 1826 to accept a clerkship in the Privy Council Office, and was for a short time attached to the British Embassy at Lisbon. He was appointed assistant secretary to the Committee of Privy Council on Education in 1853, and held this office till 1858. He was a magistrate for Middlesex, and at his death was chairman of the Life Department of the Sun Insurance Company. Mr. Chester's connection with the Society of Arts arose in this wise:—In November, 1851, he addressed a long letter to the Council, proposing that an effort should be made by the Society "to develop existing, and to create new, institutions of the class commonly called Literary and Scientific Institutions, Mechanics' Institutes, &c., and to affiliate them to the Society of Arts." This letter having been considered by the Council, a committee was appointed to report on the proposal, and on the 18th May, 1852, a conference was held, at which the resolutions were passed which form the basis of the conditions on which the institutions then were, and are now, received into Union. This conference was presided over by the Marquis of Lansdowne; and among the supporters of the resolutions were Earl Granville, the Earl of Harrowby, the late Earl of Carlisle, the Bishop of Oxford, the late Dean of St. Paul's, Mr. Strutt, M.P. (now Lord Belper), Mr. Milner Gibson, M.P., and the late Mr. Joseph Hume, M.P. Out of this Union of Institutions grew the Society's system of examinations, the arrangements for which, as they are at present conducted, were due, in almost every detail, to Mr. Chester himself. The progress of this system of examination, from 52 candidates in 1856 to nearly two thousand in the present year; the special interest taken in them by the Prince Consort, who gave an annual prize of twenty-five guineas (still graciously continued by the Queen), are matters so well known to members of the Society, that it is unnecessary further to allude to them. At the opening of the session 1853-54, Mr. Chester was invited, at very short notice (owing to the resignation of Capt. Owen), to assume the chairmanship of the Council, and the address which he delivered on that occasion (the hundredth anniversary of the Society's foundation) will be in the recollection of many of the members. Mr. Chester, with a view to promoting a more extended knowledge of the educational appliances and systems in use both in this country and abroad, induced the Council to hold, in 1854, an exhibition of educational apparatus, which took place in St. Martin's Hall. It would be difficult to enumerate the many valuable suggestions made by Mr. Chester at the Council board, a large number of which resulted in useful and important action on the part of the Society; but it may be mentioned that in May, 1859, he proposed the appointment of the Committee on Musical Pitch, which resulted in the adoption, by a considerable number of our leading musicians, of the pitch then decided on. Among his more recent proposals may be mentioned the appointment of the Food Committee, in the formation and working of which he gave much valuable assistance. His constant attendance at the meetings of the Council and Committees, as well as at our evening meetings, and his numerous contributions to the *Journal*, show the unvarying interest that he took in all the operations of the Society; and it may be truly said that there was no face more familiar to the members than his, or one that will be more painfully missed at our various gatherings. He threw himself into all that he undertook, with an ardour which sometimes overtasked his physical powers; and an entire absence of all self-seeking was a remarkable feature in his character. His kind and genial disposition, and his singularly courteous manner, endeared him to all with whom he was brought into contact, and the Council, and especially the officers, with whom he was in almost daily communication, one and all, feel that his death has deprived them of a friend.

Notes.

The Mont Cenis Tunnel.—During the second fortnight of the past month (September) the progress made at the Mont Cenis tunnel was 54·45 metres; of which 25·10 metres were driven on the Italian side at Bardonnèche, and 29·35 metres on the French side at Modane. This

makes a total advancement of 106·85 metres during the month. The position of these works up to the 30th September was as follows:—

	Metres.
Length driven at Bardonnèche	5,211·10
Length driven at Modane	3,631·50
Total length of tunnel driven	8,842·60
Length remaining to be driven	3,377·40
Total length of tunnel	12,220·00

PRECAUTION AGAINST ACCIDENTS IN MINES.—A new method of destroying choke-damp by means of electricity has been submitted to the Paris Academy of Sciences by M. Delaurier, and referred to the mineralogical section of that body for examination. The inventor proposes to place copper conductors, of considerable thickness, in the galleries; these are to be broken at intervals, and joined by means of very thin gold wire, soldered to the copper, the gold wire to be surrounded by flowers of sulphur, which ignites readily. By passing a strong current of electricity through the conductors, the gold wire becomes red-hot, the sulphur is ignited, and burns the mixture of air and other gases which may be present. By this means, says the inventor, the circuit is never broken; and if an explosion of gases take place, it is shown by the fact of the sulphur being blown off. The electric current is to be made to pass through the apparatus every morning, before the descent of the miners, and by putting a few pinches of sulphur on the gold wire every evening, many lives might be spared. Several members of the Academy spoke approvingly of the proposed plan, but all coincided in the opinion that regular and powerful means of ventilation could in no case be dispensed with in mines where choke-damp existed, and, moreover, that the combustion of explosive gases, by the means proposed, would of itself render ventilation necessary, as it would produce carbonic acid and oxide of carbon, one suffocating and the other poisonous.

RECLAMATION OF WASTE LANDS.—A company commenced two years since the irrigation of a large tract of land, in what are called the Landes of the Pontlong, near Pau, in the Pyrénées, and a visit of the Emperor the other day has produced an account of the results obtained to the present time. Of the two thousand five hundred acres belonging to the company, one-half have this year produced fine crops of hay and grain, while the remainder are still covered with fern and reeds, intermixed with grass, which affords poor nourishment for cattle during only about two months in the year. It would be satisfactory to know at what expense and in what manner this important reclamation has been effected, for few countries are without waste land which requires some similar treatment.

PEAT LANDS AND FORESTS ON FIRE.—Extraordinary accounts are given of the fires which have occurred between the Russian frontier, to the north-east of Prussia, and St. Petersburg. The whole country was said to be in flames for a distance of four hundred miles or more. The soil, which consists principally of a bed of peat, from twenty to forty feet in thickness, from the long drought, and the excessive heat of the summer, took fire, as the reports say, at ten thousand different points; the fire, which commenced beneath, soon reached the surface, and communicated itself to the forests. The air was so laden with smoke that numbers of persons had fallen down suffocated. Later accounts state that the fire spread towards the south, where also the forests were in flames. In several of the northern districts, where the forests are immense and almost impenetrable, there were from twenty to thirty thousand of acres in a state of incandescence. The absence of dates, names, and other particulars detract from the credibility of these reports, but the disaster seems very serious.

Correspondence.

WAGES OF THE AGRICULTURAL LABOURER.—SIR, I see by the Society's *Journal* of last week that you want to know the wages of labourers in Somerset. I beg to enclose a list of the wages paid in Glastonbury and the surrounding villages; but whether this may be taken as a fair specimen of the wages for the whole of Somerset I cannot say. I have gathered the figures from my pupils, who are farmers' sons, from the places named, so that they may be depended on as far as they go. In the hope that you may find the enclosed useful, I am, &c., HENRY J. TAYLOR.

Glastonbury Collegiate School, Somerset, October 12, 1868.

Labourers.	Street.	Butleigh.	Walton.	West Pennard.	Glastonbury.	Meare.	Godney.	Somerton.	Charlton Mackerel.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Able-bodied ploughmen..	10 0	10 0	9 0	.. ..	10 0 to 12 0	9 0	10 0	10 0	10 0
Shepherds	9 0 and cottage	10 0	9 0	.. ..	.. ..	..	.. ..	10 0	10 0
Day labourers	8 0 and cottage	10 0	9 0	10 0	10 0	9 0	9 0	9 0	9 0
Women	6 0	4 6	4 6	5 0	.. ..	4 0	.. ..	5 0	—
Day labourers in harvest-time	12 0 food extra	11 0 food	10 0 food	.. ..	.. ..	food extra	.. ..	food extra	18 0 no food
Women in harvest time..	6 0	5 0	5 0	5 0	.. ..	food extra	.. ..	food extra	—
Ordinary prices of cutting and tying wheat per acre	7 6 to 10 0	.. ..	.. ..	.. ..	.. ..	8 0	.. ..	.. ..	7 0
Mowing clover per acre..	.. ..	.. ..	.. ..	.. ..	.. ..	3 0	—	—	—
Ordinary prices of mowing meadow grass per acre	3 0	3 6	3 6 to 4 0	3 0	3 6	3 0	mostly by machine	3 6	3 0

Rent of cottage, weekly or yearly:—Street, £4 to £6; Butleigh, £3 to £5; Meare, 1s. 6d. to 2s.; Somerton, 1s. to 2s.; Charlton Mackerel, £3 10s.

Perquisites:—Cider four pints per day; in harvest-time as much as the men want. Shepherds at Street have 6d. per lamb for all lambs reared more than number of ewes set.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Engineers, 7½. Discussion on paper "On the Screw Propeller." By Mr. Arthur Rigg, jun.

Patents.

From Commissioners of Patents' Journal, October 9.

Grants of Provisional Protection.

Advertising apparatus, for day or night, on land or afloat—2827—J. Hewes.
Anchors—2785—E. Padley.
Aniline black—2351—J. Higgin.
Axles, &c., metal for—2810—H. B. Woodcock.
Bale ties—2838—J. Edmondson.
Blinds for open vehicles—2771—S. Benjamin.
Boilers—2781—J. Shand.
Boilers, preventing accidents to—2915—W. Leatham.
Books, cutting the edges of—2847—J. Orrin and T. Geer.
Boots and shoes—2983—A. V. Newton.
Boots and shoes, scraping and cleaning—2840—R. Martin.
Boots and shoes, stretching and repairing—2887—J. Blakey.
Bottle stoppers, &c.—2763—A. R. Stocker and J. A. Edgley.
Bottles, capsuling—2857—W. Betts.
Bottling apparatus—2828—A. M. Clark.
Brushes, machinery for manufacturing—2815—W. R. Lake.
Buttons, apparatus for securing to articles of dress—2830—C. D. Abel.
Carding engines, condensers of—2730—C. Travis, J. Chadwick, and J. Law.
Casks, &c., self-acting tilts for—2801—I. Hudson.
Chandeliers, &c.—2987—E. Horton.
Coffee, &c., hulling and cleaning—2839—G. Davies.
Coffee-pots, &c.—2903—J. Lorkin.
Cooking stoves, gas—2834—C. de Bergue.
Crystals of soda, &c., utilising the alkaline salts, &c., contained in the weak alkali resulting from the manufacture of—2793—J. Oliver and C. O. McAllum.
Curtain rings—2841—A. Rooker.
Cylinders, &c., lubricating—2921—E. W. Halliday.
Discs having designs on their circumferences, moulds for casting—2985—L. Hannart and N. A. Aubertin, jun.
Dolls, &c., heads for—2859—W. R. Lake.
Electro-magnets—2854—A. M. Clark.
Electro-magnets—2951—E. Prévost.
Explosive compounds—2865—W. R. Lake.
Fire-arms, breech-loading—2744—T. Wilson.
Fire-grates—2855—G. B. Sharpe.
Float-valves of cisterns—2935—D. Cowan.
Fluids, machinery or apparatus for depurating—2881—W. Needham and J. Kite.
Fountains, ornamental—2901—N. Stevenson.
Furnaces—2811—C. Turner.
Fustians, &c., weaving and cutting—2975—J. Smith.
Gas—2585—J. Neumann.
Gas—2745—W. Tatlock and C. N. Abelseth.
Gas—2931—C. Hengst, H. Watson, J. B. Muschamp, and N. Wilson.
Gaseliers, gas pendents, brackets, and other gas fittings—2832—E. Sarjeant.
Gauze wire, annealing—2803—E. T. Hughes.
Girders, &c.—2797—O. C. Evans.
Grain, grinding—2823—J. D. Pinfold.
Grain, &c., treating—2711—H. Aitken.
Hats and caps—2829—E. Vickers.
Hats, &c.—2907—C. Vero.
Horses' shoes, &c.—2807—J. Roberts.
Hydraulic and other presses—2939—W. T. Watts and D. J. Fleetwood.
Iron and steel—2310—J. Bowron and G. Lunge.
Lathes, &c., gearing for—2957—J. Heap.
Liquid fuel, &c.—2869—J. H. Johnson.
Locomotive engines and carriages for railways—2909—F. W. Fox.
Looms—2848—J. Horrocks.
Looms—2937—C. Catlow.
Looms—2989—W. Gadd and J. Moore.
Meat, fowls, fish, eggs, &c., preserving—2846—C. Havard and M. X. Harmony.
Medicinal purposes, &c., purifying and supplying vapours for—2867—G. H. Barth.
Metallic plates or blocks—2819—C. E. Brooman.
Motive-power apparatus—2637—C. J. R. Jähns.
Musical instruments, wind—2943—J. L. R. Steckel.
Oakum, &c., apparatus for manufacturing—2895—N. Jarvie and W. Miller.
Omnibuses, &c., tell-tales for—2371—J. Onions.
Ovens, bakers'—2899—W. C. Woodcock.
Paste and card board—2961—J. Jones and G. E. Wilkinson.
Pianofortes—2850—G. R. Samson.
Ploughs—2860—T. Beards.
Ploughs—2861—J. Davey.
Ploughs—2973—J. Robinson.
Pneumatic apparatus—2929—A. M. Wier and M. A. Wier.
Potato-planting machines—2879—E. Templehoff.
Pumping apparatus—2933—E. Death and J. Ellwood.
Punching machines—2845—R. Hodson.
Railway tickets, cases for holding—2853—J. de Masy.
Railway trains, communication between passengers and guards, &c., in—2851—J. Walmsley.
Rock, &c., boring—2965—F. B. Dœring.
Safety-lamps—2891—L. Desens.
Safety-valves—2897—G. Sanders.
Screw propellers—2877—H. Vansittart.
Screwing bolts, &c., stocks and dies for—1739—W. Adkins.
Sewage, &c., treating—2883—W. H. Hughan.
Sewing machines—2925—A. Booth and J. Harrison.
Ships' bottoms, &c., preventing the fouling of—2871—R. Smith.
Ships, iron, preserving and keeping clean the bottoms of—2825—H. J. Turnbull.
Ships, propelling, &c.—2991—V. Juge.
Ships, &c., fixing armour-plates to—2905—J. Kirk and J. Batstone.
Ships, &c., registering the speed of—2913—C. E. Brooman.
Smoke, preventing, and regulating the supply of air to furnaces—2967—J. Shepherd.
Spoons, &c.—2783—T. Bennett.
Stamps, adhesive—2947—W. E. Newton.
Steam engines, condensing apparatus for—2795—W. R. Lake.
Steam pumping machinery—2831—M. Benson.
Steel, cast—2963—V. Gallet.
Sweeping machines, &c.—2835—F. Brady.
Swimming apparatus—2977—W. E. Gedge.
Tea, apparatus for sifting, cutting, and mixing—2799—W. Thompson.
Tea-plant, &c., treating the leaves of the—2893—B. Dickinson.
Timekeepers, mechanical, for recording the time when workmen come to or leave their employment—2949—W. J. Ledward.
Tools—2206—A. Munro and W. B. Adamson.
Toys representing game-cocks, &c., in the act of fighting—2833—H. Jewitt.
Travelling bags, writing cases, &c., fastenings and locks for—2843—E. Heusser.
Vessels, annealing raised hollow—2862—W. T. Watts.
Walls, &c., covering for—2842—W. R. Lake.
Warping mills and hecks—2955—J. Sutcliffe.
Water, raising—2993—J. Lambert.
Water, &c., raising—2863—W. E. Newton.
Weighing and lifting apparatus—2809—M. Henry.
Weighing machines—2852—H. Marrian.
Wells and pumps—2813—F. Warner.
Wire fences, constructing, and apparatus used therein—2873—J. Head.
Wire webs and strainer plates, preserving from corrosion—2844—W. Durham.
Wool, preparing for felting—2917—T. Lucas and W. Grimshaw.
Wringing machines—2875—T. E. Hughes.

Invention with Complete Specification Filed.

Fabrics, pile—3007—G. T. Bousfield.

Patents Sealed.

1205. C. Martin, W. Barrett, and T. H. Webb.
1210. G. Clark.
1213. A. Woodcock.
1218. B. J. B. Mills.
1219. J. Rothery.
1221. T. F. Shillington.
1227. T. Smith, T. Wood, and T. Don.
1233. M. P. W. Boulton.
1237. G. Glover.
1238. E. Page.
1240. R. Oxland.
1242. R. Boby.
1248. R. Weir and J. Gray.
1249. H. S. Evans.
1251. J. Robinson.
1254. G. D. Kittoe & P. Brotherhood.
1278. C. D. Abel.
1288. A. V. Newton.
1291. A. Cole and J. Carter.
1316. W. R. Lake.
1325. T. Hardcastle.
1346. D. C. Lowber.
1350. W. H. Ryland.
1373. D. Geraci.
1374. V. Delperdange.
1382. E. McDonnell.
1402. J. McKean & J. Stenhouse.
1403. H. Deacon.
1420. W. R. Lake.
1537. W. R. Lake.
1590. H. C. Crofts.
1637. D. A. Cooper.
1678. J. Starley.
1680. W. E. Newton.
1750. M. Gray.
1759. W. E. Newton.
1898. W. F. Proctor.
1900. C. R. E. Grubb.
1928. W. R. Lake.
2286. T. Kohn.
2319. J. Purdey.
2324. R. G. Hatfield.
2394. J. Rawsthorn.
2530. F. Barnett.
2534. I. M. Milbank.

From Commissioners of Patents' Journal, October 13.

Patents on which the Stamp Duty of £50 has been paid.

2593. J. Homan.
2594. J. Homan.
2615. J. J. Parkes.
2636. W. Mather.
2568. H. F. Smith.
2621. M. Henry.
2647. W. Robertson and J. G. Orchar.
2652. J. Tangye.
2693. J. Taylor, jun.
2787. J. and J. Hinks.
2626. J. Linton.
2628. J. H. Selwyn.
2627. V. A. and V. J. Messinger.
2630. A. A. Lerenard.
2669. H. Skinner.
2765. W. Smith.
2776. T. B. Jordon.

Patents on which the Stamp Duty of £100 has been Paid.

2499. A. Chaplin.
2535. J. Downs.
2568. J. Gilbert.

Journal of the Society of Arts.

FRIDAY, OCTOBER 23, 1868.

Announcements by the Council.

EXAMINATIONS, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

PRIZES.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

SUBSCRIPTIONS.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

SOUTHAMPTON HARTLEY INSTITUTION.—Dr. Bond, the principal of the Institution, a few days since, delivered the first lecture of a course on "Experimental Physics," adapted for young persons. The greater part of the audience on the occasion consisted of about 200 boys, who had been selected from the national and other similar schools in the neighbourhood, and who, with their teachers, will be admitted gratuitously to the course. The object which Dr. Bond has in view in making this experiment, which has grown out of a conference with the teachers held a short time ago in the Institution, is two-fold; firstly, to prepare a certain number of the boys for the examinations of the Department of Science and Art, and for competition for the Local Science Exhibition, which has lately been founded by the council of the Institution, in conjunction with the Committee of Council, for artisans in Southampton; and, secondly, to lay the foundation of a regular system of science teaching in the national schools of this neighbourhood. It is hoped that this will be effected by the opportunity which the masters will have of qualifying themselves, by attending the course, for obtaining the science certificates of the Department of Science and Art, and thus earning payment for themselves on results. In making the proposal to the teachers to establish this class, Dr. Bond offered to hand over to them all payments which might be made to him by the Department of Science and Art, on account of boys attending the class who might take certificates at the examinations of the department, on condition that the teachers would undertake to supplement the work of the lecturer, by preparing the boys in school for the examination, thus giving the teachers a direct personal interest in the work of the class.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*Shelley Mechanics' Institution.*—On Saturday, October 17th, the members and friends of this Institution met in the Assembly Rooms, to hear the opening address of the winter session, by Mr. Henry H. Sales, on the work of Mechanics' Institutes, with special reference to the examinations of the Society of Arts. The President occupied the chair, and at the close of the address presented the thanks of the meeting to Mr. Sales.

EXAMINATION PAPERS, 1868.

(*Continued from page 793.*)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

SPANISH.

THREE HOURS ALLOWED.

Candidates for the first-class are to translate an English passage into Spanish, to render in English several proverbs and idiomatic phrases, and to write in Spanish a short essay.

Translate into Spanish:—

Sancho came up to his master so faint and so dispirited, that he was not able to urge his ass forward. Don Quixote, perceiving him in that condition, said, "Honest Sancho, that castle or inn, I am convinced, is enchanted, for they who so cruelly sported with thee, what could they be but phantoms and inhabitants of another world? I am confirmed in that, for, having found that when I stood at the pales of the yard, beholding the acts of your sad tragedy, I could not possibly get over them, not even alight from Rocinante, so that they must certainly have held me enchanted, for I swear to you, by the faith of what I am, that, if I should have got over, or alighted, I would have avenged you in such a manner as would have made those poltroons and assassins remember the jest as long as they lived, even though I would have thereby transgressed the laws of chivalry, for, as I often have told you, they do not allow a knight to lay his hands on his sword against any one who is not so, unless it be in defence of his life and person, and in cases of extreme necessity." "And I, too," quoth Sancho, "would have revenged myself, if I had been able, knight or no knight, but I could not; though, in my opinion, they who diverted themselves with me, and at my expense, were not hobgoblins, but men of flesh and

bones as we are, and each of them, as I heard while they were tossing me, had his proper name. One was called Pedro Martinez, another Tenorio Fernandez, and the landlord's name is John Polomeque, the left-handed: so that, sir, as to your not having been able to leap over the pales, nor to alight from your horse, the fault lay not in the enchantment, but in something else. And what I gather clearly from all this is that these adventures we are in quest of will, in the long run, bring us into so many misadventures that we shall not know which is our right foot; so that, in my poor opinion, the better and surer way would be to return to our village, now it is reaping time, and look after our business, nor go rambling from Ceca to Meca, and out of the frying-pan into the fire."

Don Quixote, translated by Jarvis, cap. xviii.

Translate into English:—

Proverbs and Idiomatical Expressions.

1. Ahora que te veo, me alcuerdo.
2. No hay caballo, por bueno que sea, que no tropiece.
3. Perro ladrador no es mordedor.
4. No es razonable andar á caza de gangas.
5. Si quieres no errar, cosete la voca.
6. Su padre le calentó las orejas.
7. Mi amigo está en candelero.
8. No hay mas cera que la que arde.
9. Nos dió con las puertas en los ojos.

Write a short essay on any subject in Spanish.

Candidates for the second-class certificate will have to translate the half of the preceding extract, five of the idiomatical expressions, and the two next chistes.

Al ir un general á dar una batalla á los persas, le dijo un soldado medioso, mi general, es preciso ir con cautela con los persas, porque son tan numerosos sus ejereitos que con sus flechas cubren el sol. Tanto mejor replicó el general asi pelearémos á la sombra.

Preguntando uno á un viagero, ¿si sabia cual era la mejor cosa? respondió: la libertad. ¿I la mas gustosa? la ganancia. ¿I la mas conocida? la fortuna. ¿I la peor? la muerte. ¿I el mas dichoso del mundo? el hombre sabio, rico y con salud. ¿I el mas desgraciado? el anciano sin bienes. ¿I el mas importuno? el hablador. ¿I el mas peligroso? el medico ignorante. ¿I el mas digno de compasion? el mentiroso que no es creido, cuando dice verdad.

Candidates for the third-class certificate will have to translate into English the next extract from Gil Blas, and translate into Spanish some phrases for the elucidation of irregular verbs and other grammatical rules.

Translate into English:—

Sirviéronme un copioso plato de manos de carnero fritas y lo comi casi todo: bebí á proporcion, y despues fuime á la cama. Era esta muy buena, y esperaba que luego se apoderaria de mis sentidos un profundo sueño, pero engañéme, porque apenas pude cerrar los ojos, ocupada la imaginacion en que genero de vestido habia de escojer. ¿Que haré? me decia, ¿seguiré mi primer impulso de comprar unos habitos largos para ser domine en Salamea? Pero ¿á que fin vestirme de estudiante? ¿Tengo yo deseos de consagrarme al estado eclesiastico? ¿Acaso me inclina á ello me propension? Nada de eso: mis inclinaciones son muy contrarias á la santidad que piden: quiero ceñir espada, y ver de hacer fortuna en el mundo I á esto me decidí.

Resolví, pues, vestirme de caballero bien persuadido de que esto bastaria para alcanzar un empleo de importancia. Con tan lisonjeros proyectos estuve esperando el dia con grandisima paciencia, y apenas rayó en mis ojos la primera luz, cuando salté de la cama. Hice tanto ruido en el meson que despertáron todos. Llamé á los criados que estában todavia en la cama, y me respondiéron echandome mil moldiciones. Al fin se viéron obligados a le vantarse y les dí orden de que fuésen á buscar el prendero. No tardó mucho en llegar este con dos mozos cargados, cada uno con un envoltorio Saludome con grandes cumplidos y me díjo, Caballero, ha hecho bien y V ha tenido gran fortuna en dirigirse á mí mas bien que á otro; no quiero desacreditar mis compañeros; mas aqui para nosotros dos, ninguno de ellos sabe lo que es conciencia: todos mas duros que judios; yo soy el unico de mi oficio que la tiene; me limito á una ganancia justa y razonable, contentandome con un real por cada cuarto, equivoquéme quise decir con un cuarto por real. Despues de este preambulo, que yo creí al pie de la letra, mandó los mozos que desatasen los envoltorios.

Gil Blas, cap. xiv.

Translate into Spanish:—

1. They loved each other, and their fondness increased with time.
2. You must depart immediately; there is not a moment to lose.
3. She likes this bonnet, but does not like the other at all.
4. Forty-five houses in the village.
5. A city with two hundred and thirty-six thousand souls.
6. Eighty-four chapters in the first volume, and nearly a thousand pages.
7. A score of people in the theatre.

FREE-HAND DRAWING.

THREE HOURS ALLOWED.

Candidates are not required to attempt all the following subjects.

1. Make a drawing of the bird or birds, either in the cage or out of the cage.
2. Make an outline of the perambulator.
3. Draw from memory either a human head, or some foliage of a tree, or a tombstone.
4. State what you know of the proportions of the human figure. [Every candidate is expected to reply to this question; and if he does not know anything of the proportions of the figure he must say so.]

Directions for the Local Board.

Place a cage or coop, containing birds or fowls, before the candidates in free-hand drawing. The bottom of the cage or coop to be between three and four feet from the ground.

Put a perambulator or child's carriage on a table.

(*To be continued.*)

HARVESTING CORN IN WET WEATHER.

Prize Essay.

By W. A. Gibbs, Esq., of Gillwell-park, Essex.

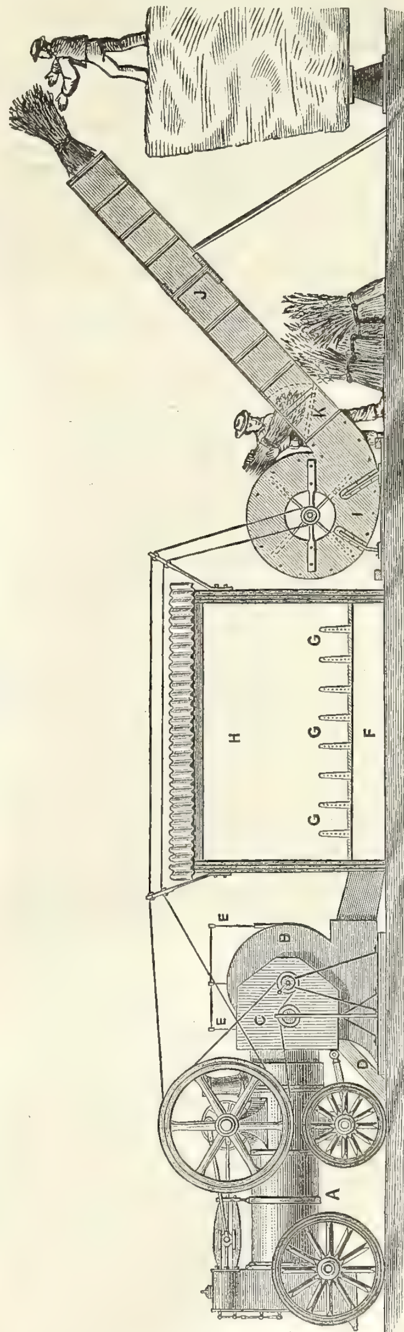
(*Concluded from page* 796.)

In the first arrangement of a model fan, so as to work it by a portable engine, I took some pains in calculating the respective apertures in the hollow shell or iron casing; "cone-ing" down from the opened back-plate of the engine with much nicety of adjustment, a funnel-shaped air channel to connect the smoke-box with the fan-case, and adapting the screen of malting wire at the larger end of this cone, so as not to check the draught by its intervening mesh-wires. Of course it was impossible to foresee what would be the first effects of this novel mode of dispensing with the steam blast and chimney stalk, or whether we should get steam enough, or more than we could manage. It was, therefore, a great relief to me to find that we had the most perfect and easy command of the draught of the furnace and the generation of steam. Turning the fanners by hand for a short time after lighting the fire, got "steam up" in half the time that it usually takes with the ordinary chimney draught, and then, when once up, by regulating the bulk of the fuel and the quantity of air admitted by the doors we could keep it quietly jogging on at 3 lbs. or 5 lbs. per

inch pressure, or run it up to 30 lbs. or 40 lbs. at need. In order to assure myself of the small power required to drive the fan, I preferred to work nearly the whole of the experiments using only 5 lbs. pressure; and this gave a fairly uniform temperature of 320° for the fan whilst the furnace door was closed, and 220° when opened. Here, therefore, was a fair ground for supposing that, by increasing the velocity and volume of such heated air, we should be enabled to deal with larger quantities of hay or wheat. Hence the next steps to take were the calculation for, and construction of, a fan of a size commensurate with the power of the engine and the bulk of the crop. In planning out the proportions for this, I desired to make it as large as possible, short of being utterly huge and unwieldy, because, by having ample *size*, the *volume* of air could be regulated by the velocity of revolution. This shape and proportion was, however, in a great measure to be determined by the breadth between the driving-wheels of the usual portable engine, and the height from the ground and circumference of the opening of its smoke-box; a minor and yet important consideration was how best to "work-in" in the construction the common and easily obtainable sizes of iron plates. These varied conditions were at last fulfilled by making the fan 6 feet high, 4 feet 6 in. diameter in the circular part, and 2 feet 6 in. wide, with side chambers and back casing duly proportioned to the mouth or outlet. Before definitely commencing to build up this monster fan I found it very useful to model all its different parts to scale, and I would strongly advise all amateur engineers to devote plenty of time and patience to this part of their devices. Whilst this was in course of construction we still carried out at intervals various tentative trials with the engine and small fan. In one of these experiments 28 lbs. of dried hay was slowly watered with the best imitation of heavy rain that we could improvise, 23 lbs. of water being thus administered to it, but when it was again weighed it had only increased to 42 lbs., having thus retained 14 lbs. out of the 23 lbs., *i.e.*, equal to one-third of the original weight of the hay; this wetted hay, being then subjected to the air blast at 320°, dried in nine minutes, weighing then only 21 lbs. This was the third or fourth proof of the loss sustained, when hay is rained upon and has to be again dried; and it also seemed to show that when the sap and natural moisture of the grass is once thoroughly out of it, it does not re-absorb, or even mechanically hold, any such large proportion of water as to render artificial drying or finishing a very formidable operation. The wheat at this time was not sufficiently ripe to try any experiments with it, but we took 36 lbs. of wheat straw—the dampest and mouldiest that we could get, and watered this plentifully, until it weighed 56 lbs., and then dried it in thirteen minutes, after which it weighed only 31 lbs. About half a pint of corn was shaken out of this truss of straw by the operation, although it had been threshed by one of the best machines in the country. This circumstance is worth notice, as showing that *thorough dryness* would increase the yield of corn from the straw. Half a pint more corn from each 36 lbs. of straw, small as it sounds, would mean an extra bushel per acre, which would help to pay for a good deal of extra coke. Touching the consumption of this last, we found that working the engine at from 5 lbs. to 10 lbs. pressure, 1 cwt. of coke gave both power and heat enough for carrying on the work during six hours.

The large fan being at length completed and fixed on to a rough frame-work of deal boards, we found that four men could lift it into, and out of, a farm-cart with very little trouble. We had formed the large central opening in the back casing, to stand exactly level with, and correspondent to, the opening of the smoke-box of the engine; it was, therefore, easily and quickly adjusted to this, without any nice fittings or intermediate chamber; a diaphragm of malting wire being fastened on to this opening, the fan was merely "butted up" to the end of

Fig. 8.



Wheat-Dryer constructed for the Duke of Sutherland.

A—Engine. B—Hot-blast fan. C—Casing of fan through which the heat from the engine is drawn. D—Air-duct from a sunk furnace (not shown). E E—Valve rods to regulate the supply of hot or cold air. F—Space between the ground and iron floor. G G G—Perforated conical tubes up which the hot air from F rises into the centres of the sheaves. H—Iron wheat house with its side walls and doors removed to show the tubes: this house is divided into two compartments by an iron partition down its centre, and the mouth of the hot-blast is provided with a valve by which the air can be directed into either compartment alternately. I—Cold-blast fan. J—Elevator. K—Valve for the introduction of corn sheaves or dried hay.

the engine, and steadied in its place by a few wooden stakes driven into the ground. A driving-band from the smaller wheel of the engine carried to the 7-inch pulley on the spindle of the fan gave us about 600 revolutions per minute, and produced, even at that slow speeed, a tolerably good imitation of a sirocco. In order to utilize the waste steam from the engine (now no longer needed as a promoter of combustion), I had had made a ⊂ shaped vessel, six feet long and four feet broad, with a steam-way between the double plates of which it was formed. This, when laid on the ground with its open end to the mouth of the blower, stood two feet high, and served as a convenient receptacle for the hay, presenting a large surface heated by steam, which communicated that heat to whatever was placed in contact with it, and thus aided the drying action of the blast. This hot chamber or receiver I intend to place upon a single pair of low wheels, and adjust shafts to it, as by these additions it will form a strong and convenient low cart on which the fan can be carried about from one place to another; an old shed anywhere in the fields or the steading will give shelter enough to carry on the process, or an additional rick cloth could be set up in the middle of the field, if thought desirable, and the hay brought from all points to this, as a centre, to be there dried, and carted home when thus finished. This arrangement might have some advantages when the rick-yard is a long distance from the field, but otherwise the plan I should prefer would be to make use of some building near enough to the stack to enable the men to fork the hay or wheat forward as it dried, into the "atmospheric hoist," and let it be blown up at once from the ground on to the top of the stack.

It was whilst waiting for rain to wet a quantity of hay so as to put the drying apparatus to the test on the large scale, that I found leisure to prove that the blast principle may be made to serve the purpose of a hay and straw elevator. The apparatus now in use for this special work is effective, but it is costly and somewhat cumbrous, and cannot, I believe, be worked at all during rain; so I brought the old fan into use again for a new purpose. We first adjusted it in such a position as that a strap from the larger wheel of the engine would run on the rigger of the spindle; and then wedged up the fan until the mouth stood at an angle of 45 degrees, pointing up to the top of the stack; as a continuation of that mouth, a box 20 feet long, 18 inches broad, and six inches deep, open at both ends, was constructed and lifted on to it, the upper end resting on a loading platform; a hinged valve being made at the lower end of this box, at a convenient height for feeding-in. The power of the blast drove up the hay and straw so well and quickly, that I felt justified in at once constructing a full-sized apparatus upon this principle. Before this was finished heavy rains came down upon a quantity of half-made hay, and gave me the requisite conditions for a definite experiment in drying, by which it was proved that a two-horse load of thoroughly wetted hay could be dried in one hour. By taking a rough average calculation of two such loads per acre, this indicates that in a working summer day of 12 or 14 hours, a farmer would be enabled to clear six or seven acres, or if he adopted the plan of dividing his men into two gangs during the wet weather, so as to carry on the work through the cool hours of a summer night, he might clear, dry, and stack the produce of 10 to 12 acres in the 24 hours. If practical men do not, upon consideration, feel content with such quantities, I have every reason to believe that I may safely promise them the power of dealing with twice or three times as much, by merely increasing the velocity from 600 to 1,200, or 1,800 revolutions per minute, because it will be readily granted that increased volume of hot dry air will give a proportionately increased evaporation. If the demand is still for more work, it can be answered by putting on more fans to the same engine. One 8-horse engine would drive four or five of these with ease, and more heat could be supplied, if needed, by connecting with the casings of the fans any simple form of portable stove. It would therefore appear that this method is practically unlimited in the extent to which it may be applied; and the advantage of this principle of extension will be felt to be more important when we come to deal with wheat, and the infinite variety of grain crops. To wheat, I now devoted my chief attention for the whole remaining part of this season. I had not much expectation that the same arrangement which had sufficed for hay drying, would serve also for the grain crops, but it was worth trying, so we opened some wet sheaves, and handling them as gently as possible, subjected them to the action of the hot blast in the steam receiver; but, as will be easily anticipated, even the most careful and gentle movement (so careful, indeed, as scarcely to fulfil the requisite conditions of exposing each part in turn to the action of the hot air), caused a notable quantity of the seed to fall out, and decidedly injured the straw. We next tried to dry the sheaves without unbinding, by placing them in every conceivable position, and endeavouring to direct the hot air through and amongst them; but this was a total failure—the exterior dried to brittleness, and the interior of each sheaf (especially under the band) remained as wet as ever. After reconsidering and rejecting many mechanical movements it seemed that the best and simplest thing to try next was a portable shed, in which the hot air could be retained long enough to diffuse itself through the sheaves. This, therefore, I planned and constructed with all speed, framing thin plates of iron on rough wooden battens, so as to form a number of panels, each panel being two feet broad by six feet high. A shed formed in this way is capable of indefinite increase either in length or breadth simply by bolting together a greater or less number of such panels, to form its sides and ends. The size fixed upon for this first trial was 12 feet square; and in order to form a foundation for the shed, four 12 feet planks were made into a square, shallow box, standing one foot deep upon the ground; a fifth plank, laid down the middle, divided this foundation into two compartments; at one end of this middle plank a valve was so arranged that the hot air, as it came in from the mouth of the fan, could be directed at pleasure to one or other of these compartments; the panels were then set up on the outer square of planks, and a corresponding division to the one below carried up to the roof of the shed, so as to divide it into two compartments of 6 feet by 12; two panels on each side of the shed were hinged, so as to give separate access to each compartment, and, finally, a false floor of wire-net was laid on the edges of the planks to sustain the wheat-sheaves at a height of twelve inches from the ground. The fan and engine being then adjusted to this shed, the air from the latter could be driven in under this false floor. Wet sheaves were now placed in one compartment, and the trial commenced. It was again an utter failure. The exterior of each sheaf was dried to brittleness long before the centres were anything like dry enough. We tried again, packing them as closely as possible in the shed, but with no better success, the close packing only heading-back the air, and retarding the process. So the wires were taken up and replaced by a plate-iron floor, into which a number of conical tubes had been riveted, in such a manner as to stand up about 18 inches from the level of the plates. These tubes served as air conduits, and, when sheaves of wheat were spiked upon them, guided the hot air into the very centre of each sheaf; small holes were made in the tubes to allow a proportion of the hot air to pass through the lower parts of the sheaves, and this had the desired effect of drying both corn and straw evenly and sufficiently. The first systematic experiment was upon a load of wheat, which the farmer from whom I procured it considered to require three days more drying before being fit to cart; it was decidedly moist to the touch, and there was some admixture of grass and green weed bound in with it. We took 32 of the sheaves, laid them

down singly on the ground, watered them with about 60 or 70 gallons of water, and then spiked them on to the tubes in one compartment of the shed; the fan being driven at about 500 revolutions per minute, sent in air which marked a temperature of 280° as it passed the mouth of the fan, but which came off from the spaces under the roof at 140°. In twenty minutes all these sheaves were examined, and pronounced, by the practical farmers who were present, to be dry enough for threshing out the corn, and for stacking the straw. Whilst these were drying, the second compartment was charged with another lot of 32 wetted sheaves, and by increasing the temperature of the ingoing air to 320°, and slightly accelerating the speed of the fan, these were equally well dried in fifteen minutes. The pressure on the safety-valve during this work did not exceed 10lbs. to the inch, and the bulk of fuel in the furnace was kept down to half its usual charge; the draught did not appear to be stronger than that usually produced by the blast-pipe.

About a week after these trials, the weather afforded an opportunity for a still more decisive experiment, and I was enabled to obtain a load of wheat, in the straw, which had been exposed first to eighteen hours of heavy, constant rain; had then had a day's standing in the field; then another six hours' rain and another day's standing, and was finally carted up to the drying shed during a perfect deluge of thunder-rain, which so completely drenched it, that the water ran from the sheaves as they lay in the cart; this was brought up in the morning about twelve o'clock, and left exposed to heavy showers till four o'clock in the afternoon, notwithstanding which, by using a temperature of 340°, and a velocity of about 700 revolutions per minute, several charges, of 32 sheaves each, were dried in fifteen minutes; the pressure was allowed to range up to 14lbs. to the inch, but the bulk of fuel in the furnace was not increased. It was objected that the quantity thus capable of being dealt with in a day would be too small; but it will be easy to see that the same fan, at double or treble the number of revolutions, would deal with twice or thrice the quantity, and the shed could be doubled or trebled in capacity without any difficulty. The bulk of incandescent fuel could also be doubled if it were found needful, and the waste steam from the engine utilised by means of pipes, or a hollow division between the two compartments. If, therefore, a shed of double the capacity of this present one is adopted, viz., 12ft. by 24ft., this would enable a farmer to dry sixty-four sheaves in fifteen minutes = 256 per hour. Now, by average obtained from three farms in this neighbourhood, 256 sheaves represent the produce of rather more than half an acre, hence half an acre per hour, or twelve acres in the twenty-four hours could be cleared by this means. If we take an average farm, say of 1,000 acres, worked upon the four-course system, there would be probably 250 acres in wheat, and upon the supposition of a season so unfavourable that the whole produce of those 250 acres had to be finished and harvested by artificial means, this could be practically accomplished in 21 days. On larger farms, or where a larger proportion of grain was cultivated, a larger drying shed would probably be advantageous.

I do not think any corn farmer need grudge the cost of fitting up a brick shed, or the erection of an iron one, with this false floor and tubes, because if attention be given for a few minutes to the peculiarity of this construction, it will be seen to be well adapted to the purpose of a storehouse for grain when its first office of a drying-room is accomplished. Being brick and iron, or all iron, it is impervious alike to damp or vermin; and having an air space between the false floor and the ground, and tubes which can be lengthened or capped, so as to diffuse air equably and freely into all parts of the mass of grain, it possesses many advantages over the ordinary form of granary; especially the facility of driving in, at any time of need, a current of warm air by means of the fan, which for this purpose might be driven by hand, and obtain its heat from a small portable stove adjusted to its casing. During the experiments it was questioned as to how far the high temperature used in the drying might affect the germination of the seed, but inasmuch as the moisture in the straw and grain instantly reduces the heat of the air which comes in contact with it, it was hardly maintained as a possible objection; however, to put the question beyond all doubt, I had five several plots sown with the wheat thus dried, and at this present time they are all up, and as well forward as any wheat in this neighbourhood.*

It was a matter of surprise to many who were present that the grain, when rubbed out, was wholly free from burnt taint or smell. This is explained by the fact that the gaseous products of combustion, being by nature volatile and evanescent, pass away in the steam which they generate; even were it not so, the husk envelops the grain so completely as to protect it from all direct action. An opinion was expressed that the dilute sulphurous acid gas given off by malting coal or coke would have the effect of checking or destroying any insect-life that might be latent or developed in the wheat, and thus secure it from after deterioration when stored; and that opinion seems largely confirmed by the well known value of sulphurous fumigation in hop-drying and vine culture.

I come now to the question of cost. This must, of course, be to some extent modified by the relative condition of wetness or dryness of the crops to be dealt with; but there are certain fixed data which may be ascertained with a fair amount of accuracy. First, as to the engine. If a farmer possesses one it will probably have cost him £200, and may be expected to last about twenty years, and then to be worth about £50; this £150 divided over twenty years makes a first charge of £7 10s. per annum for money sunk in the purchase; the interest on £200, at 5 per cent., shows £10, and the repairs will average another £5, making a total annual cost of £22 10s., *i.e.*, about 1s. 6d. per diem. The next item is the hot blast; if we take the first cost of this at £35, and estimate it to last 35 years (as with its short time of work and simplicity of construction it assuredly would), that gives £1 per annum for money sunk; 5 per cent. on £35 gives £1 15s. for interest, and 17s. per year would cover any repairs that might be needed; this forms a total of £3 12s. per annum. This hot blast, when once established on the farm, will, I think, be found available for a great many purposes, but for the present calculation we will put the whole charge upon the six weeks of harvest; this, therefore, will be another 2s. per diem. The new shed, or the tubular flooring fitted to an existing building, must not be estimated as machinery; neither must its whole cost be debited to the drying process, because it serves also the purpose of a storehouse or granary; therefore, if we take such a shed (say of 24 feet × 12), with its tube floor and divisions, to have cost, in one way or another, £80, a 7½ per cent., calculated on the six weeks during which it is devoted to this drying process, is all that is fairly chargeable to that account; this would show 15s., but we will call it 18s., so as to make an even sum of 6d. per diem. By bringing down these three calculations we arrive at a daily charge, for machinery and shed, of 1s. 6d. + 2s. + 6d. = 4s.

We have next to consider the labour cost.

One man is able, without hurrying himself, to fork on to the tubes 64 sheaves in 8 minutes, and to take them off in rather less time; hence he could empty or fill one compartment of the shed while the other half was drying. The carter who brings the wheat in from the field could of course keep pace with him by forking down the sheaves from the cart; thus we must estimate two men for day and two for night, equal to four labourers at 3s.

* June, 1868.

= 12s. The extra cartage, by reason of the additional weight of water in the wheat, depends upon the distance of the field from the rick-yard, and the proportion of water still remaining in the crop; but, except in cases of very long distances and excessive saturation, I am assured by practical farmers that the average extra cost of this item could not exceed 10s. per diem, say 10s. There would also be required two engine men, one for night and one for day, whose wages we may set at 5s. each = 10s.; giving a total of £1 12s. If now we add these labour items to the machinery cost, we obtain 32s. and 4s. as a fixed charge for the artificial drying of the average produce of twelve acres; the sum will therefore stand at 36s., divided by twelve acres, equal to 3s. per acre.

We may now pass to the calculation for fuel, and as this must be governed wholly by the quantity of water required to be expelled, we shall have to take a range of three or four different degrees of wetness, and estimate the quantities of fuel which would be respectively needed in each case. As a starting point for these calculations, I will premise that, having recently, with a very imperfect arrangement, evaporated 7 lbs. of water from the leaves and roots of mangold with 1 lb. of coke, I think we may fairly assume, that with a perfected apparatus, in regular work, we should be able to drive off 8 cwt. by 1 cwt., especially when it is noted that hay or straw does not hold water with so much tenacity as roots or leaves. The cost of coke this year at the gas-works was 9s. per chaldron of 14 cwt. (I have purchased it in former years at 6s.); add to that 9s., 5s. more for cartage to the farm, and that will give us 1s. per cwt. as the top cost of fuel on the spot. Therefore, if the produce of an acre of hay or corn (be it a large or small yield) contains 8 cwt. of water requiring to be expelled before that produce can be stacked, the fuel-cost of expelling it would be 1s. per acre; if it contains 16 cwt. the cost would be 2s. per acre; if 32 cwt. 4s.; or if, in some exceptionally wet seasons, there should be 2 tons of water obstinately clinging to every 2 or 3 tons of the crop, the fuel-cost would rise to 5s. per acre. Take this extreme case, and add to this 5s. the fixed charge of 3s. for machinery and extra labour, and we shall arrive at a final total of 8s. per acre, which, with a four-quarter yield would put 2s. per quarter on the wheat thus saved. For this extra expense, however, it should be fairly allowed that the straw as well as the wheat is secured in better condition, and the increasingly high value of that part of the crop makes this an important point in the calculation.

I would also point out that by the use of the "atmospheric hoist" for stacking the wheat as it is taken out of the shed, a large proportion of the extra manual labour incurred in the drying process would be recouped. This hoist, which I partially described in another part of the essay, and which is a very simple and inexpensive affair, proved itself able (when driven by the same engine that was working the hot blast) to send up sheaves of wheat to the top of a stack twenty-two feet high at the rate of 960 per hour. This, and most of the other experiments here described, were carried out last season in the presence of practical farmers, engineers, and men of high standing in the scientific world, and several reports, by eminent members of the press, appeared in the scientific and agricultural periodicals and other publications of the day.

After these statements of results, I have now only to submit for the consideration of practical men a few reasons in favour of this resource, and a few of the probable advantages that would follow from its wide adoption.

In the first place, it is not a mere theory, existing only on paper, or in the imagination of a sanguine inventor, but a palpable and very visible fact, that has been, and can be, put to the severest test of practical working.

2nd. It is a powerful yet inexpensive arrangement, with no complex nor delicate machinery which would render it liable to break down, clog, or otherwise get out of order.

3rd. It is portable and easily adjusted, and adapted to most varieties of engines without requiring any alterations in them.

4th. It leaves the hay and clover, whilst drying, constantly open to the examination of the men, so that the exact requisite point of dryness may be seen and seized upon; whilst with the cereals a definite time can be established by the first batch of sheaves, after which the same time may be depended upon for producing the same results without further watching.

5th. It does not pretend to supersede nature, to set aside experience, or to change old and approved modes of harvesting, but merely adds to them a large and easily-managed power of securing, with certainty and rapidity, each crop in succession.

6th. It does not involve any new system of things, but with an apparent natural sequence "follows the (steam) plough," and in the rotation of the seasons helps to harvest the increased growth which that plough has helped to produce.

7th. It fits in most conveniently and practically with the existing mode of hiring engines, offering a good means of paying employment to their owners just at the time when they have been hitherto idle, and yet not putting the farmer to one penny of cost, if the rare chance of a fine season for every one of his crops renders him happily independent of all need of help.

8th. It would be a boon to the harvestmen, providing them with work through wet and dry, saving them the loss of wage and temptation to drink that follows when they are turned off, to lounge about the village, waiting for a change of weather; and enabling them to get through with one job of harvest work in time enough to get another elsewhere.

These seem fair reasons for recommending it to the notice of agriculturists, especially when backed by the recollection that a well-saved harvest is not the affair of a class only, but of the community. It has been asserted that in Ireland alone the money-difference between fair and foul weather, during the in-gathering, is four millions sterling. Add to this the losses in Scotland, Wales, and the western counties of England, from a wet season, and it makes up a sum that must seriously affect the whole country.

Besides saving immediate loss, this means of harvesting the cereal crops, in spite of a rainy climate, would enable the wetter portions of the kingdom to retain, perhaps to resume, the cultivation of wheat with profit, and so (in Ireland especially) check the gradual depopulation and distress consequent upon the conversion of arable into pasture.

Nothing would be more likely to give a strong stimulus to the employment of steam machinery in Ireland, Scotland, and Wales, than the fact of its being available to counteract the disadvantages of climate; and it is precisely in those countries that our agricultural machinists would find the widest unsupplied market for their implements.

If, therefore, it be remembered that this new adjunct of the steam-engine begins its work with the first crop of hay, can next be applied to wheat, oats, barley, and the whole range of cereals, is then at hand to finish the second crop of hay, and enables us to dry the artificial grasses at any season of the year, it would seem as if it were destined, perhaps at no very distant period, to complete that perfect circle of systematic husbandry which now begins with the steam-plough and ends with the threshing-machine.

When continuous employment can once be found for the "iron horses," we may hope to see them on every considerable farm in the kingdom; first breaking up and cultivating the soil; next, mowing, reaping, and gathering the produce; and, finally, passing from field to field, and from farm to farm, saving, drying, and bearing home the harvest.

ON THE MANUFACTURE OF SUGAR BY THE PROCESS OF DRYING THE CANE.

By the Hon. Henry Stuart Mitchell, M.D., Ph.D.

The following paper was read before the Scientific Association of Trinidad:—

Although borrowed from even the earliest stage of the beetroot under the consulate, it was not till 1843 that the operation of slicing was applied to the sugar-cane. It was hoped that the cane, after having been sliced and dried and ground into powder, might be preserved long enough unchanged in this condition to allow of its being transported to Europe, where, not merely the whole sugar might be extracted at once in its present form, but the ligneous portion would furnish an inexhaustible supply of fibre for the paper market. The intercolonial tonnage also would thereby have been necessarily doubled. These hopes were, however, doomed to disappointment. The dried cane powder became altered on the voyage, and not only did great part of the sugar disappear, but the changes consequent on its decomposition discoloured the residuary fibre. But there was one result from this trial sufficiently noteworthy. It was clear that the cane could be sliced and dried in commercial quantities, and several of those concerned in the matter determined to extract the sugar on the spot; accordingly, more than one attempt was made to carry out the slicing, and every difficulty was, apparently, overcome when the building erected for the plant was, unfortunately, burned. One of the principal difficulties hitherto had been that of drying the sliced cane; to avoid this, in 1845, Messrs. Constable and Michel introduced their method on the estate of Ste. Marie, the property of Major Beauscarin, in Guadaloupe. It was as follows:—The canes, which were sliced at the rate of one ton in 20 minutes, fell into metallic baskets capable of holding each that amount. The baskets were moved by a central crane, and around the crane, at equal distances, were placed 6 copper vessels adjusted to receive the baskets when filled. These copper vessels were filled to such an extent with water that when the basket, full of sliced canes, was lowered into any one, the liquid rose to the surface. The basket No. 1, with its contents, having been thus dipped into vessel No. 1, was allowed to remain immersed till such time as the sliced canes had parted by displacement with a due proportion of their sugar to the water in vessel No. 1; basket No 1. was then hoisted out by the crane and consigned to vessel No. 2, where a second proportion of sugar was displaced, and so on throughout the series. In the meantime a fresh basket, full of sliced cane, was consigned to No. 1 vessel, the liquid in which abstracted a further proportion of sugar, and so on, till the contents of the first vessel were as fully saturated with sugar as the law of displacement allowed, and the slices of cane in the first basket were proportionately exhausted. This was virtually the old system of Dubunfaut with its defects, viz.: that the water was not easily kept at a suitable temperature; that the whole sugar was not extracted; and that, from the time which elapsed between slicing and exhaustion, considerable changes occurred in the saccharine fluid, which affected the quantity and quality of the result. These defects, in principle, did not, however, of themselves, contribute much to the failure of the plan; the system broke down in the subsequent evaporation, in which the heat employed was generated entirely from gas manufactured on the spot—an operation attended with such difficulties that the trials were given up after heavy outlay. This was much to be regretted, as the slicing process had shown that a much larger proportion of the sweets could be extracted from the cane than had been hitherto done in any other mode, for even the five-roller mills which had been started with sanguine hopes, during the preceding two years, had been successively abandoned. A system so simple and yet promising such complete results was not destined to disappear without traces. In September, 1847, Mr. Davier, apothecary in chief to the French service at Basseterre, resumed the experiments of slicing and drying the canes, at the point where they had been left off in 1845. He found that by driving off about 33 per cent. of moisture from sliced canes, they became so friable as to be reduced, without difficulty, to a coarse powder, in which the colouring matter and supposed albumenoid principles of the cane had become insoluble in water, while the saccharine elements were crystallised unchanged and ready for immediate solution and extraction by water, either hot or cold; the former would have been the more rapid, but he had met with an objection to its use, which, if not scientific, was at least practical. The vessels he employed were of copper, and transmitted the heat so rapidly, that the attendants were constantly burning their fingers; he did not consider it worth while to take any precautions to avoid this evil, as he found cold water sufficient for the purpose and more economical. The process he adopted was the following:—Six upright cylinders of copper, about four feet high and nine inches in diameter, were so arranged as to communicate with each other, and with a reservoir of water on a higher level; they were each furnished with guages and stop-cocks; five of these were filled with cane powder, and the last with animal charcoal—this last was merely precautionary, but not essential to the work. Water was admitted into No. 1, and retained there for 20 minutes after the guage showed that the vessel was full; it was then passed into No. 2, and so on. In practice it was found that on escaping from No. 4 the water had absorbed so much sugar as to mark 22·5 of Beaume, or about the density when syrup is usually consigned to the vacuum pan, and that the cane powder first in contact with the water, viz., that in No. 1, was completely exhausted, even to the tongue, that most convenient and reliable saccharometer, and represented what it was reduced to in reality—a mass of wet sawdust. At this stage of the process it was removed from No. 1 and replaced by a fresh portion of cane powder. As this part of the operation was performed without interrupting the duties of the other cylinders, it is clear that two of the greatest desiderata in the application of science to art had been attained, namely, the complete extraction of the sugar in a state of purity, and that by a continuous operation. The mechanism thus employed by Mr. Davier in September, 1847, appeared to leave little room for improvement. It was submitted to and approved of by the French Government, who commissioned the inventor to repair to Paris in the ensuing month of March to take the necessary steps for erecting a set of machinery on a larger scale on the French King's Estate of Tremouillant, in Martinique. Fortune seemed thus about to crown Davier's laborious and successful trials; but, like the course of true love, his expectations were doomed to disappointment. Before his appointed hour of embarkation arrived, cries of *Vive la République* were ringing throughout the French islands, and the new process with, no doubt, many a kindred scheme, was shelved for the time. Since that I have several times, in conjunction with Mr. H. Warner, repeated the process of slicing and drying the sugar-cane, with exactly similar results, namely: the extraction of all the contained sugar by displacement with cold water, in about one hour and twenty minutes, in the form of a pure syrup, marking between 22° and 23° Beaume. Within the last three years Mr. Warner directed his attention again to the slicing of the cane, to ascertain how far he could succeed in extracting the sugar without recourse to drying the slices. After repeated trials, conducted with every precaution, he succeeded in obtaining, by displacement, a liquor marking 9° of Beaume where the original juice of the cane marked 10° Beaume; this was a great success, but not equal in results to the other mode where the slices were dried, because there was not only an original loss in not obtaining the whole sugar, but the juice had an opportunity of becoming changed to an extent that greatly increased the quantity of glucose. This latter evil may now be obviated by the use of the

bisulphide of lime, with which the displacing water might be slightly dosed so as to allow the antiferment to preserve the juice unchanged throughout the process of manufacture.

In conclusion, I may mention that the only difficulty which has at any time stood in the way of manufacturing sugar by the process of slicing, drying, and displacement—apart from the mechanical one of slicing, was a rapid and economical mode of drying; this, I am happy to say, has been at length attained by the successful action of the megassiccator, which may be now constructed to dry economically and speedily any given weight of sliced cane. The above remarks have been principally directed towards obtaining from the cane a saccharine fluid as pure as possible. It is in this elementary step that the whole difficulty of manufacture lies; the mere evaporation and concentration may be effected in various ways; pure sugar and water is not easily destroyed even by the rudest manipulation; but common cane-juice, as it runs from the mill, will produce an inferior muscovado, except under the most careful and expensive treatment.

THE NEW HIGH SCHOOL AND LABORATORIES OF PARIS.

The provisions of the recent decrees, for the establishment of a practical high school and laboratories of study and research, already noticed in the *Journal*, are being carried into effect on a grand scale, and the demands for admission exceed all expectation. As regards the school, there are already more than one hundred and fifty applications, viz.:—Fifteen for the section of mathematics; fifty-one for that of physics and chemistry; forty-seven for natural history and physiology; and forty-four for the section of history and philology. Amongst the candidates inscribed are several young men who have taken the degree of *agrégé*, or doctor, and others who quit the career already entered upon for the new school; many of the applicants are foreigners. The studies will commence in all the four sections at the usual scholastic period, namely, the middle of November. Some of the laboratories will be opened about the same time. At the Sorbonne, the laboratories of physics, botany, physiology, and geology, to which MM. Desains, Duchartre, Claude Bernard, and Hebert have been appointed, will shortly be ready, and a large chemical laboratory, over which MM. Pasteur and Sainte Claire Deville will preside, is now being erected by the side of the physical laboratory built last year and directed by M. Jamin. At the College of France, and at the Ecole Normale the chemical laboratories of MM. Balard and Berthelot will be ready in good time; and those of M. Claude Bernard for physiology, and M. Pasteur for physiological chemistry, somewhat later. At the museum of the Jardin des Plantes, the laboratories of Milne Edwards, for zoology, and of M. Decaisne for vegetable culture and physiology, are ready. New and larger establishments are being arranged for botany, chemistry, and comparative physiology.

The provinces express the desire that their laboratories should be considered as annexes of the new school; several towns propose to develop their means of superior education; and the Conseil-Général of Calvados has taken the lead by voting a grant of money in aid of the study of agricultural chemistry in the laboratory of research, instituted at the Faculty of Sciences of Caen.

The council of the new high school is convened for the third of November, and the following are the names of the members appointed, in addition to those mentioned in a former notice, who have seats in the council on account of their official positions:—In the section of mathematics MM. Bertrand, Chasles, Delaunay, and Serret, members of the Institute of France; M. Puiseux, professor in the Faculty of Sciences of Paris. Section of physics and chemistry, MM. Balard, Frémy, and Wurtz, members of the Institute; MM. Desain and Jamin, professors in the Faculty of Sciences. Natural sciences: MM. Claude Bernard, Brongniart, Decaisne and Milne Edwards, members of the institute, M. Hébert, professor in the Faculty of Sciences. Historic and philological sciences: MM. Maury, L. Rénier, de Rougé, and Waddington, members of the Institute, M. Bréal, professor in the College of France.

The list of the laboratories given above shows the extent to which this new system of superior scientific education is to be carried, and the names of the professors and members of the governing council afford a guarantee of the quality of the instruction to be afforded. The scheme is certainly the most important and the most extensive of all those which have yet been put forward for the dissemination of high scientific knowledge.

HAVRE EXHIBITION.

The distribution of the awards made by the jury at this exhibition was announced to take place on the 25th of the present month of October, but the date has been altered to Monday the 26th, in deference to English views respecting Sunday. The ceremony will be presided over by M. Forcade de la Roquette, Minister of Agriculture, Commerce, and Public Works. The minister and M. Nicolle, the director of the exhibition, will deliver addresses. In the evening a grand banquet will be given in honour of the minister, in the Cercle International in the exhibition garden. This building was admirably adapted for the purpose for which it was erected, namely, a club-house, but it has never been used as such, and supplies fresh evidence, if that were needed, of the futility of such establishments in connection with industrial exhibitions. The principal use to which the cercle was put was for the exhibition of flowers, and more than one admirable collection was to be seen within its walls. A few conferences were also given there on various subjects. Concerts were attempted, but without success. Although club-houses are failures in such cases, it is highly convenient for exhibitors, members of the press, and others to have the means of writing letters, reading newspapers, making notes, &c., and the managers of the Havre exhibition provided this accommodation, to a certain extent, without charge. On an upper floor in the fine art gallery, in connection with a good exhibition of drawings and models, was a library, the main object of which was to exhibit books, memoirs, maps, and charts interesting to the commercial world, under the charge of a gentleman well-informed on such subjects, and this room was freely open to all who applied for admission. This is a precedent which may well be followed on future occasions.

Warnings are sometimes almost as valuable as examples, and this, like all other exhibitions, supplies both; a striking instance of the former is furnished in the arrangement of the fine art portion of the exhibition. The gallery set apart for the fine arts was found, long before the opening of the exhibition, to be much too small for the purpose; this was devoted to old pictures and objects of art, and a special gallery was erected for modern pictures in the rear of the chief building, but separated from it by a road, so that the collection is extensive and good, but the gallery has presented a deserted aspect throughout the whole time of the exhibition. It was proposed to separate the industrial and fine art exhibitions in Paris last year, but the proposal was fortunately overruled, and all the world knows what masses of visitors were constantly to be found in the picture galleries of the Champ de Mars, and how the connection of the two tended to diminish crowding in either the one or the other. Those who visited the Paris Exhibition of 1855, when the two portions were in separate buildings, will remember the overcrowded state of the industrial classes in the Palais de l'Industrie, and the generally-deserted condition of the fine collection of works of art across the road.

Fine Arts.

Congress for the Discussion of the Methods of Teaching Drawing, &c.—This congress has brought its labours to a close. One of the important questions discussed at the last meeting was the following:—"In the organization of fine art academies, that is to say, in special schools for complete instruction in the arts of design, is it proper to include, with a view to the wants of industry, a method of teaching applied art differing in any way from that which is requisite for art properly so called? What should be the programme for such instruction? And, if some portions of this double education are common to both methods, where should the separation commence?" The whole of the speakers pronounced in favour of the unity of art, all declaring that there was no real distinction between teaching applied art and artistic education properly so called. Amongst the most prominent speakers were M. Klein, of Copenhagen, M. Louvrier de Lajolais, of Paris, and M. Jean Rousseau, secretary of the Belgian commission of public monuments; the last-named gentleman claimed the assistance and influence of great artists in the interest of industrial art, to which he attached great importance, and expressed his opinion that its teaching should form a portion of superior artistic education. The almost unanimous feeling of the meeting on the above important question is the more striking from the fact that it is opposed to the methods which are adopted in industrial art education in France, England, and most other countries. Amongst the other subjects discussed was the importance of local museums and galleries of models; and the system of ambulatory collections adopted by the South Kensington Museum was specially referred to and highly eulogised. Another recommendation was unanimously adopted by the congress, namely, that of the establishment of general and local competitions amongst pupils. M. Joseph Gérard sketched the plan of such meetings, or rather of their principles, in the following terms—"Absolute liberty as to methods adopted. No intervention of the government as regards theory, but only with respect to recompenses proportioned to the results achieved."

Commerce.

Proposed Depôt for French Fabrics.—The *Daily Telegraph* says:—"M. Vidal, a French resident at Manchester, and a member of the Chamber of Commerce in that city, is, it appears, taking steps to establish an association there for the sale of French fabrics suitable for export. He has opened communications with the manufacturers of Alsace, Amiens, and other places; and he proposes to form in the cotton metropolis of England a depôt where the principal textures, cotton, woollen, and mixed, that are produced by our neighbours across the Channel, may be constantly on sale for the use of shippers, as well as buyers in our home market. The idea is novel and bold. We all know that French stuffs for dresses are not less regularly and freely bought by English people in English shops, than French gloves, jewelry, or bronzes. But the export trade, for which Manchester is the great mart, is a branch of commerce which we have managed to keep, on the whole, pretty much in our own hands. It has been profitable—of that there is no doubt; and M. Vidal, knowing what the taste and skill of his countrymen have accomplished elsewhere, fairly enough reasons that there need be no insuperable obstacle to their obtaining a share in the pleasant duty of supplying India and China with prints and shirtings. To do so, however, they must meet the demand where it arises—if the buyers don't go to France, France must go to the buyers. Hence the idea of a great central depôt at Manchester. Well, what have we to say against this? Are we jealous and uneasy? Not at all; and for several sufficient reasons. If our neighbours carry out their plan, the result will be that Manchester will become, not merely a producing centre, but an *entrepôt* in a wider sense than at present, attracting business in addition to that which it possesses now. Further, we have long outgrown all fears of danger to home interests from the greater cheapness of foreign productions; and Englishmen will certainly buy M. Vidal's goods, if they are cheaper and better than our own, in the full conviction that we shall thus act for our own advantage as consumers. We know also that, in such a case, our manufacturers, who are quite competent to take their own part, will be no losers in the long run, but will only be stimulated by the new competition into greater efforts to please all their customers, domestic and foreign. Finally, we welcome M. Vidal's effort, for the plain reason that, if successful, it will put a stop to all irrational clamour against the French Treaty of 1860. If French manufacturers can thus beard English industry on its own ground, what becomes of the complaint so freely uttered by M. Pouyer-Quertier and others a few months ago, that these very makers were threatened with ruin from inability to compete with the products of Lancashire?"

Beet-root Sugar.—The following are Herr Burger's estimates of the beet crops:—

	1868-9.	1867-8.	1866-7.	1865-6.
	Tons.	Tons.	Tons.	Tons.
France	200,000	224,767	216,855	274,014
North Germany	200,000	165,000	201,012	185,701
Russia	90,000	120,000	100,000	75,000
Austria	80,000	95,000	100,000	80,000
Belgium	35,000	31,093	39,133	41,552
Poland	17,500	15,000	19,000	17,500
Holland and Sweden	8,500	8,000	6,500	5,433
Total	631,000	658,860	682,500	679,200

We are aware (says the *Produce Markets Review*), that the estimate of 200,000 tons for France is the one accepted by the best authorities, but at the same time we are inclined to think that more weight should be attached to the undoubted increase in the area cultivated, and that the figure fixed upon gives the worst view of the case. Be this as it may, it is certain the estimated total for 1868-69 shows a wonderful increase on the crop of four years back. The yield for 1864-65 is given by Herr Burger as 552,000 tons; for 1863-64, 417,800; 1862-63, 474,150 tons; 1861-62, 426,700 tons; and 1860-61, 386,880 tons.

Colonies.

MINERAL STATISTICS OF VICTORIA.

The following is from the *Australian and New Zealand Gazette*, of September 19:—

The mineral statistics of the colony of Victoria, for the year 1867, which confer great credit on the Executive department, contain some very interesting information with respect to this important branch of colonial enterprize. It is premised that "whilst the old centres of population are still prosperous the miners continue to explore, with scarcely diminished energy, the more remote parts of the colony, many of which are now the scenes of active industry. The gold fields now extend westward from Stawell to the river Bendoc, on the eastern confines of the colony, a distance of 350 miles, and from north to south nearly 180 miles. It is not easy to collect accurate information respecting the proceedings of the miners over so large an area; and but for the zeal and activity of the several officers employed in the department, and the prompt, courteous replies

made to inquiries by mine-owners and others, these tables could not have been compiled."

The decrease in the number of miners employed which has been observed from year to year since 1859, though not so large this year as last, if we compare the mean numbers for the two years, is yet so great as to occasion surprise. The mean number of miners employed in 1866, was 73,577; and in 1867, it was 65,857; showing a decrease of 7,720. In none of the districts is there an increase in the number of alluvial miners; and in the mining districts of Maryborough and Castlemaine the decrease is very large. As regards Maryborough, this is mainly due to the fact that large numbers of the Chinese miners have left the central division and to a considerable reduction of the number of European miners in the Dunolly division. In the central division of the Castlemaine district there is a decrease of 620 in the number of Chinese alluvial miners; and in the other large divisions the decrease in the number of both Europeans and Chinese alluvial miners is considerable. The operations of the 42nd section of the Amending Land Act and the prosecution on an extensive scale of public works for the supply of water to Geelong and the gold fields have had the effect of withdrawing great numbers from mining pursuits. Those who have a desire to acquire landed property and those who can apply only unskilled labour in mining operations are glad to have an opportunity of leaving a somewhat uncertain but, in the main, profitable pursuit for employments better suited to their tastes and capacities.

In 1866 there was a decrease in the number of quartz miners, as compared with 1865, of 2,448, and it is a hopeful sign that this year it is so much smaller, and that in the two districts—Ballarat and Beechworth—where the decrease was so remarkable in 1866, there is this year in both a small increase. The following shows the total number of miners employed on the gold fields from 1859 to 1867 inclusive:—

1859 .. 125,764	1862 .. 93,379	1865 .. 79,457
1860 .. 108,562	1863 .. 92,994	1866 .. 70,794
1861 .. 100,463	1864 .. 84,986	1867 .. 63,053.

That the total number of miners in 1867 should be little more than half of the number for 1859, is, at the first view, somewhat perplexing and seemingly irreconcilable with that appearance of prosperity which is observable in nearly every part of the colony; yet, when taken in connection with other statistics—those relating to roads, public works, municipalities, agriculture, and stock—it is even more surprising that so much should have been done for the permanent improvement of the towns, in the construction of railways and roads, and in reclaiming waste lands, and that still more than 60,000 persons, among a population of 660,000, should continue to give all their labour to the work of searching for gold.

On the 31st December, 1867, there were 15,629 Chinese miners engaged in alluvial mining and 47 in quartz mining, making a total of 15,676. Having regard to the extent of the auriferous areas, they are not very unequally distributed throughout the mining districts, except as regards Gipps Land, where there are only 640 enumerated. It is probable, however, that in this district a good many not included in the registrars' returns are employed near the boundary line between Victoria and New South Wales. Last year the number was 20,134, showing a decrease of 4,458. Several causes have operated to reduce the number of those employed in mining. A great many have found employment in New Zealand, not a few have returned to China, and large numbers have found it profitable to devote their labours to gardening in places where there is a ready market for their produce. It is, perhaps, not more difficult now than formerly for them to get good profits by re-working abandoned auriferous ground; and enjoying in every respect the same privileges as Europeans, it is somewhat remarkable that the numbers continue to decrease.

The following is a statement of the average earnings per man per annum for the past eight years, without distinction of classes:—

1860 .... £79 9 3	1864 .... £74 1 9
1861 .... 74 15 11	1865 .... 74 4 2
1862 .... 67 17 10	1866 .... 80 8 3
1863 .... 70 9 2	1867 .... 87 1 7

The mean for the eight years is £76 1s. nearly. The average earnings per man of the alluvial miners and quartz miners severally, in 1867, was—alluvial miners, £67 10s. 7¼d.; quartz miners, £158 11s. 8¾d. These calculations must not be accepted as absolutely correct, though every endeavour has been made to get accurate data. With respect to the earnings of the quartz miners the difficulty is not so great, because there is some check on the estimated quantity of gold got in the quantities of gold actually obtained from certain parcels of quartz crushed. The average earnings of the quartz miner would amount to £141 1s. 9¼d. from the data so obtained, but it is well known that it is at present impossible to get returns from all the mills. It is satisfactory to note that in whatever way the matter is tested, this fact is indisputable—that both from the alluvial mines and the quartz veins the average returns per man per annum are higher this year than they have been at any time during the past eight years.

The number of engines employed remains nearly as it was last year (1866); but many small additions to apparatus, which it is not possible to comprise in a return, have been made in several of the larger establishments, and with good results.

The number of steam-engines employed and the stamp-heads for reducing vein-stuff, for the past four years, are as follows:—

Year.	Alluvial. No.	Quartz. No.	No. of stampheads.
1864	441	447	4,575
1865	473	491	5,119
1866	480	510	5,437
1867	470	532	5,529

There is a slight decrease in the power employed in alluvial mining, but in quartz mining the increase is marked and satisfactory. According to the returns made by the mining registrars and surveyors, there are 2,381 auriferous quartz reefs already opened, and 868¼ square miles of auriferous ground which have been worked, more or less.

The total area of land held as "claims" under the bye-laws of the Mining Boards was, on the 31st of Dcember, 1867, as follows:—

	Acres.
Ballarat	20,877
Beechworth	25,834
Sandhurst	4,129
Maryborough	4,672
Castlemaine	6,066
Ararat	7,038
Gipps' Land	7,060
Total	75,677

Excluding the land protected by certificates (which may or may not be worked hereafter), there were, therefore, only 73,918a. 1r. 35p. actually held *bonâ fide* for mining purposes on the 31st December by 63,053 miners, giving an average per man of 1a. 0r. 27p. The number of leases in force on the 31st December, 1867, was 1,047; area, 11,846 acres. The total amount of capital proposed to be employed in working these areas was £3,194,281. The revenue derived from the gold-fields from 1851 to 1867 inclusive is £5,179,445 0s. 9d. The revenue derived during 1867 from lands held by virtue of miners' rights, under the bye-laws of the mining boards, was £11,567 18s. 9d., and taking the mean total area so held for the

past year, the miners have paid at the rate of 3s. 0·47d. per acre; and, under the leasing system, the amount actually paid per acre is 15s. 4d. The estimated value of the "claims" in all the districts of the colony is £7,461,212. 948,850 12-20ths tons of quartz were crushed during the year 1867, which yielded 498,677 ozs. of gold, or an average of 10 dwts. 12·2 grs. per ton.

An interesting question, engaging a large share of public attention, is the extraction of gold from auriferous pyrites. In the Creswick division 165 tons of pyrites yielded 751 ozs. 8 dwts. of gold, or an average of 4 ozs. 11 dwts. 1·89 grs. per ton. In the Crooked River subdivision 2 tons gave 94 ozs. 14 dwts., or at the rate of 47 ozs. 7 dwts. per ton. From the Blackwood division a number of samples have been sent to Melbourne, and the yield is said to be from £17 to £32 per ton. The average return of gold is, therefore, about three ounces per ton, and the cost of extracting the gold £3 per ton, or £1 per ounce.

The length of water races is 2,300 miles 24 chains. These are used exclusively for mining purposes, and have cost, according to the information furnished by the registrars, £321,903, or at the rate of £139 18s. 8d. per mile. On the 31st December, 1867, there were 126 water-right licenses in force. The areas occupied amount in the aggregate to 1,194 a. 2 r. 23 p.; the total length of the races is 300 miles 13 52-100th chains, and the maximum quantity of water to be diverted per diem is 131,990,000 gallons. The aggregate area of the reservoirs under license is 303a. 2r. 17p., and the total capacity of the same 232,102,092 gallons. The capital invested, or proposed to be invested, in these works is £138,257, and the annual rent paid is £989 10s.

The mining companies registered in the several courts of mines during the past year amounted to 190, the number of shares, 491,804, and the nominal capital £1,234,096 10s. The number of companies wound up during the year was 12, the number of shares comprised in them was 16,680, and the nominal capital was £131,600.

The following is the account of the metals and minerals other than gold obtained during the year:—

Silver.—Only 178 tons of ores were raised at St. Arnaud, and but 78 ozs. 12 dwts. of silver smelted; but a large quantity of the gold got was mixed with silver, and it is not known how much was parted in Victoria. The customs returns show that 366 ozs. 2 dwts. of silver were exported.

Tin.—There were 177 tons 10 cwts. of black sand (mostly oxide of tin) and 4,256lbs. of tin exported during the year.

Copper.—About 230 tons of ores have been raised, and 3 cwts. of copper exported.

Antimony.—There were 272 tons of sulphide of antimony raised, and 508 tons 7 cwts. exported. This last includes ores which were raised but not sent forward for export during 1866.

Coal and lignites.—Only a few samples were raised.

Flags and Slates.—There were 1,560 square yards of hearth-stones; 2,000 square yards of coreing; 6,440 square yards of paving; and 431 tons $15\frac{1}{2}$ cwts. of flags raised during the year. The quarries containing roofing slates were not worked.

The following is an estimate of the value of the metals and minerals raised in the colony from the first discovery of the gold fields to the 31st December, 1867:—

Gold, $33,910,052\frac{3}{4}$ ozs.	£135,643,811
Silver, 12,591 ozs. 18 dwts. at 5s. 6d. per oz.	3,460
Tin	195,045
Copper	4,673
Antimony	30,426
Coal, 1,933 tons, at £1 10s. per ton	2,899
Lignite, 235 tons, at 17s. 6d. per ton	205
Kaolin, 1,757 tons, at £4 per ton	7,028
Flagging	18,663
Slates	508
Magnesite, $6\frac{1}{4}$ tons, at £2 per ton	12
Diamonds, about 80 carats, at an average of, say, £1 per carat	80
Sapphires, numbers cannot be estimated—say	150
Total	£145,006,692

The quantity of gold exported during 1867 was 1,433,687 ozs., of which 560,527 ozs. were obtained from quartz veins, and 873,160 ozs. from alluvial workings.

Notes.

REGULATIONS OF THE FRENCH TELEGRAPHIC SERVICE.—The annual examination of candidates for admission as supernumerary or probationary clerks in the telegraph service, is appointed to take place in the month of November, in the chief town of each department of the empire. Each candidate is required, in the first place, to deposit at the *mairie* certificates of birth, of having complied with the regulations of the conscription, of character, diploma of any college degree that he may have obtained, and to indicate the place in which he desires to be employed. The candidate must be not less than eighteen or more than twenty-eight years of age, except in the case of those who have passed seven full years in military service, or as teachers. The following are the heads of the programme of examination:—Writing, spelling, and French composition; the four rules of arithmetic, fractions, decimals, and the metrical system; natural philosophy and chemistry, the elements of electricity, and the action of batteries; geography. Very good writing and perfect orthography are absolutely insisted on; failing in these the candidates are immediately rejected. Those who desire it are also examined in one or more of the following languages:—German, English, Spanish, Italian, Dutch, Portuguese, and Arab. The candidates are also required to undergo examination by a medical man. At the expiration of the probationary stage, the duration of which is not stated, the supernumeraries are required to undergo another examination, when, if their theoretical and practical instruction are found to be satisfactory, they are placed permanently on the establishment.

POPULATION OF AUSTRIA.—A statistical work just published in Austria gives in the following proportions the nationality of the population of that empire:—8,782,000 German; 6,521,400 Cthecks, Moravians, and Slaves; 2,380,000 Poles; 2,985,000 Ruthenians; 1,203,600 Slovens; 5,400,800 Magyars; 2,916,000 Croatians or Servians; 2,884,000 Roumanians; 1,121,000 Jews; 589,100 Italians; 152,800 Zingari; 53,800 Bulgarians, Armenians, Greeks, &c. This country contains 26,600,000 Catholics, 3,100,000 Greeks, 2,400,000 Protestants, and about half a million of Jews; the remainder consists of Armenians, Unitarians, Mahometans, and members of various other creeds. The soil of Austria produces yearly, on an average, 518 millions of bushels of grain of all kinds, 203 millions of bushels of potatoes, two millions of tons of beetroot, and 240 millions of gallons of wine.

Correspondence.

FARM WAGES.—SIR,—With respect to this subject, the following account of yearly wages in the year 1732 appointed by the justices for the respective counties of Kent and Gloucester, may be interesting and useful for comparison. For Kent, wages were not to exceed the sums following:—

	£	s.	d.
Head ploughman, waggoner, or seedsman	8	0	0
His mate	4	0	0

	£	s.	d.
Best woman-servant	3	0	0
Second sort	2	0	0
Second ploughman	6	0	0
His mate	3	0	0
Labourers by day in summer	0	1	2
,, in winter	0	1	0

For Gloucestershire, wages were not to exceed the following sums:—

	£	s.	d.
Head-servant in husbandry	5	0	0
Second servant ,,	4	0	0
Driving-boy, under 14 years'	1	0	0
Head maid-servant in dairy and cook	2	10	0
Second maid-servant	2	0	0
Mower in harvest-time, without drink, per day	0	1	2
With drink	0	1	0
Mower and reaper in corn-harvest, with diet, per day	0	1	0
Other day labourer, from corn to hay-harvest, with drink only, per day	0	0	8
With diet, per day	0	0	4
Without diet or drink, per day	0	0	10
Carpenter, wheelwright, and mason, without drink, per day	0	1	2
With drink, per day	0	1	0

At that time (May) hay sold in London at £3 5s. per oad; coals, 22s. per chaldron to 25s.; wheat, 22s. to 26s. per quarter; oats, 10s. to 13s. 6d. per quarter; barley, 13s. to 17s. 6d. per quarter.—I am, &c., Chr. Cooke, Mem. Soc. Arts.

London, 15th October, 1868.

Patents.

From Commissioners of Patents' Journal, October 16.

Grants of Provisional Protection.

Axle boxes—2911—W. L. Wise.
Boats, paper—3083—G. Davies.
Boilers—2332—W. E. Gedge.
Boilers, &c., preventing the escape of heat from the surfaces of—3035—J. Howden.
Bone black, reviving—3031—J. Rogers.
Bricks, fire, and fire-resisting cement—3059—R. T. Monteith.
Buildings, &c., disinfecting—3067—W. Estor and C. T. Pearce.
Carding machines, &c., feeding wool, &c., to—2872—W. Clissold.
Cards, apparatus for shuffling and dealing—1896—H. A. Bonneville.
Carriage-door steps—2876—W. Cross.
Cartridges—2900—W. E. Wiley.
Cloth, felted—3073—J. Barcroft.
Copper, separating from its solutions—2805—G. Bischof, jun.
Dyeing apparatus—2945—P. Kean.
Fabrics, apparatus for producing adjustable pressure on rollers used in manufacturing—3057—W. Sievwright, jun., and G. Worrall.
Fibrous materials, extracting liquids from—2890—J. Brown.
Fibrous materials, preparing, &c.—2884—G. Bernhardt.
Fire-arms, repeating—3039—C. F. Galand and A. Sommerville.
Fire-escape, &c., apparatus to be used as a—2760—F. Andoe.
Furnaces—2868—T. and J. Jones, J. Brandwood, and J. Wren.
Furnaces—3017—W. R. Lake.
Games played with balls and cues—3075—E. J. Hughes.
Gas, lighting and regulating the flow of—2898—J. H. Johnson.
Hop poles, fixing and drawing—3085—R. Winder.
Horses' blinkers—2604—E. J. E. Niepce, jun.
Horses, &c., apparatus for clipping—2999—G. A. F. E. Dalrymple.
Infants, &c., supplying nourishment to—3021—E. O'Connell.
Knitting machinery—3063—W. E. Newton.
Lace—3025—S. Bates and W. Redgate.
Lamps and lanterns—2979—J. H. Irwin.
Leather-dressing machinery—2889—W. Haynes.
Leather, graining and bruising—2896—H. Foster.
Lighthouses, illuminating—3043—J. R. Wigham.
Looms—3003—B. W. Stevens.
Looms—3011—D. Crichton, W. Donbavand, and D. Crighton.
Malt, roasted, obtaining extracts from—3081—J. Steel.
Manure, making and preserving—3087—J. Dewar.
Manure, manufacture of—3033—B. E. R. Newlands.
Measures for measuring liquids—2914—B. C. Scott.
Meat-mincing machines—2817—J. Coppard.
Mowing and reaping machines—3023—N. Henwood.
Needles, packing up—3029—Z. Shrimpton.
Oil-cake, envelopes used in making—3053—C. Eskrett.
Paper, sizing—2821—C. E. Pommier.
Paper, &c., applying adhesive agents to—3071—G. Speight.
Pianofortes, &c.—2836—J. H. Schucht.
Pistons, &c., packing for—2814—E. Turner.
Plants, &c., withering the leaves and flowers of—2894—B. Dickinson.
Potatoes, preserving, &c.—2941—J. Torbitt.
Printing presses, &c., blankets for—3055—J. H. Johnson.
Railway breaks, &c.—3041—E. Simons.
Railway fastenings—2789—A. B. Ibbotson.
Railway tickets, &c., perforating—2741—J. Sloper.
Rifled barrels—2912—W. J. Murphy and J. B. O'Hea.
Rifling machines—2892—G. Innes.
Saw handles—3079—J. H. Johnson.
Sawing machines—3049—H. Steffanson.
Scissors sharpener—2997—W. E. Newton.
Sewage, &c., treating—2919—E. H. Prentice.
Sewing machines—2922—H. Lomax.
Ships, &c., propelling—3001—J. Woollatt and W. B. Dodds.
Sieves—3065—J. Dupree.
Skates—3027—T. C. Parson, jun.
Steam engines—3019—G. Holcroft and W. N. Dack.
Steam engines, &c.—2787—W. McNaught.
Steam engines, &c.—2866—H. Wilson.
Steam engines, &c., governors for—2615—W. J. & C. A. Kesselmeyer.
Steam engines, &c., valves of—3037—J. B. Joyce.
Street-lamp reflectors—2886—M. Macdermott.
Taps—2902—C. Wheeler.
Telegraph posts, metallic—2735—S. Sharrock.
Telegraphic instruments—2916—R. Harling.
Tobacco, twisted—3013—R. Legg.
Umbrellas, &c.—2908—S. Fox.
Vehicles, &c., registering distance traversed by—2606—P. N. Hasluck.
Warping machines—3061—W. Rossetter.
Washing or bleaching apparatus—2837—W. Campion and G. Hall.
Watch-case spring—2981—A. H. Brandon.
Wool, &c., preparing—2995—W. Richardson.
Yarns, &c., dyeing and printing—2918—F. C. Calvert.

Invention with Complete Specification Filed.

Electro-plating with nickel—3117—W. R. Lake.

From Commissioners of Patents' Journal, October 20.

Patents Sealed.

1252. H. G. Fairburn.
1253. C. W. Siemens.
1255. H. O. Robinson.
1256. W. Gorman.
1259. W. E. Gedge.
1260. F. Bacon.
1264. T. Bradford.
1265. G. Lister.
1266. E. T. Hughes.
1271. N. Ager.
1272. H. W. Widmark.
1274. R. Hill and J. F. D'Oyly.
1275. A. B. Childs.
1279. J. Cooke.
1281. J. and J. A. Fawcett.
1284. J. McGhie.
1285. S. W. Worssam, jun.
1286. W. W. Symington.
1287. J. J. R. Humes and J. G. Sullivan.
1290. J. Woolfield.
1294. E. Kemp and H. Gourlay.
1295. A. Paget.
1297. L. Bing.
1298. S. Dreyfous.
1302. M. S. Maynard & R. Grime.
1306. J. H. Bolton.
1308. T. Whittaker.
1310. R. Side.
1312. T. L. Scowen.
1313. T. L. Scowen.
1317. H. Hill.
1320. H. H. Murdoch.
1321. R. F. Fairlie.
1323. E. Samson.
1326. E. Rostron and W. W. Whittaker.
1330. G. F. and J. Stidolph and T. Simpson.
1332. J. Armstrong.
1333. W. R. Lake.
1335. J. Reid.
1342. T. T. Macneill.
1344. J. R. Johnson.
1345. R. and T. Nuttall and B. Barber.
1347. C. W. Harrison.
1348. J. Liddard and G. Buxton.
1353. W. Bartram.
1354. G. A. Welch.
1361. P. Spence.
1362. A. W. Pocock.
1370. E. P. H. Vaughan.
1371. J. Hepworth and G. W. Bayldon.
1375. P. Nisser.
1376. K. V. Barnekov.
1377. H. Chaytor.
1378. R. Holt, R. Burlison, and H. Sampson.
1379. L. Perkins.
1380. J. Scoffern.
1381. L. Perkins.
1393. G. B. Babacci.
1407. A. Homfray.
1424. C. D. Abel.
1430. P. Marlin and A. Tack.
1454. T. and G. A. Pemberton.
1481. J. Young.
1513. C. E. Brooman.
1515. W. Seck.
1538. J. B. Kingham.
1539. A. Holbrook, jun.
1557. S. B. Allen.
1568. W. E. Newton.
1658. A. V. Newton.
1778. P. Buchan.
1984. A. Mackie.
2448. A. V. Newton.
2478. W. E. Newton.
2488. H. Dubs.
2545. J. B. Thompson.
2612. J. Tall.

Patents on which the Stamp Duty of £50 has been Paid.

2653. W. J. C. MacMillan, J. Mason, and J. V. Scarborough.
2678. G. Davies.
2752. W. M. Scott.
2656. J. L. Hancock.
2660. A. J. Mott.
2661. F. Wise, E. Field, and E. H. Aydon.
2665. J., S. A., G. E., and F. F. Reading.
2674. C. G. Lenk.
2709. J. and G. H. Needham.

Patents on which the Stamp Duty of £100 has been Paid.

2766. J. Archer.
2616. C. De Bergue.

Journal of the Society of Arts.

FRIDAY, OCTOBER 30, 1868.

Announcements by the Council.

Examinations, 1869.

The Programme of Examinations for 1869 is now published, and may be had *gratis* on application to the Secretary of the Society of Arts.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Proceedings of Institutions.

Marlborough Reading and Mutual Improvement Society.—In the twenty-fourth annual report of the society, to Michaelmas, 1868, the committee refer with pleasure to the fact that the funds of the society have enabled them, during the past year, to make the considerable addition of eighty volumes to the library, at a cost of £18 18s. With respect to the concert and lecture engagements of the past year, the committee would particularlarly refer to the concert by professional artistes, which Mr. Bambridge (the organist of Marlborough College) kindly conducted, on behalf of the society, in the large room in the town-hall, in November last, and which was attended by 500 persons. To this concert the members of the society were admitted at half-price, and a considerable number were present. The committee have already made some musical and other arrangements for the approaching season. The balance-sheet shows that the expenditure has amounted to £168 16s., and that there is a balance in hand of £20 6s. 5d.

EXAMINATION PAPERS, 1868.

(*Concluded from page* 804.)

The following are the Examination Papers set in the various subjects at the Final Examination held in April last:—

GEOMETRICAL DRAWING.

THREE HOURS ALLOWED.

The constructions must be accurate, and show clearly, by plain and dotted lines, with appropriate letters of reference, the principles on which they are based. No construction by trial nor calculation will be admitted. They may be put in ink or left in pencil, at the discretion of the candidate, provided they are distinct.

No deviation from the conditions of the questions can be admitted; and since no candidate must answer more than two questions from any one section, he is advised not to attempt more than the time will admit of his completing, since little or no credit will be given for incomplete or inaccurate constructions.

Observation.—Whatever the number of questions the candidate constructs, one-half must be from the Solid Geometry.

I.

Construct a six-sided polygon A B C....F from the following conditions :—

Sides.	Angles.
A B = 1·5 inches	A B C = 100°
B C = 2 ,,	B C D = 110°
C D = 2·25 ,,	C D E = 120°
D E = 2·5 ,,	D E F = 130°
E F = 3 ,,	

Write down the length of the side F A, and the angles E F A, F A B.

II.

A line, A B, 3·5 inches long, is to be divided in the points C D, according to the following conditions :—

1. A C : C D : D B :: 1·75 : 2·25 : 3.
2. A C : C B :: A B : B D (The point D will be in A B produced).
3. A C · B D = A D · B C (A C to be 1·25 inches and D in A B produced).

III.

Construct a triangle from one of the following conditions :—

1. Its area 6 square inches; its sides as 2 : 2·5 : 3.
2. Its area 6 square inches; its sides equal.
3. Isosceles, its base 2 inches, and the angles at the base double of that at the vertex.

IV.

Draw a triangle, its sides being 2·5; 3; 3·25 inches.

1. Construct an equilateral triangle equal to it in area.
2. Construct a square of twice its area.
3. Construct a triangle *similar* to it of twice its area.

V.

1. A point P is 2 inches from the centre of a circle of 1·25 inches radius; draw a line through P, cutting the circumference C D, so that P C · P D = C D²

2. Draw two other circles to touch the first and also each other, so that the *areas* of the three may be as 1 : 2 : 3.

3. Circumscribe the first circle by a triangle, having its sides as 2 : 2·5 : 3, and having one of its angles at P.

Solid Geometry.

(These constructions to be made explicit by a consistent notation, and by *indices* where required.)

VI.

1. Represent, by means of any two lines lying in it, a *plane* inclined to the paper at 50°.

2. Represent a plane inclined at 50° to the paper, and another perpendicular to the first but inclined at 70°.

3. Represent three planes, each perpendicular to the other two, the intersection of two of them being inclined at 30°.

VII.

A triangular pyramid has its edges 2″·25; 2″·5; 3″; 3″·25; 3″·5; 3″·75;

1. Draw its *plan* and *elevation* when it is standing on any of its four faces on the paper.

2. Draw its plan and elevation when its longest edge is vertical.

3. Determine the form of the section of this solid made by a plane bisecting any two of its edges, and passing through its centre of gravity.

VIII.

An octagon of 1 inch side is the base of an *oblique* prism, the edges of which being inclined at 70° to that base, are 4 inches long, and parallel to a vertical plane passing through a diameter of the base.

1. Show the plan of this solid when standing on its base and an elevation on a plane not parallel to the edges.

2. This prism is bisected by a plane perpendicular to the edges; draw the real form of the section.

3. Draw the plan of one of the frusta when standing on the plane of the section.

IX.

An *oblique* pyramid has an octagon of 1 inch side for its base; its axis, which is 4 inches long and inclined to the base at 70°, lies in a vertical plane, passing through a diameter of the base.

1. Show the plan of this solid when standing on its base, and an elevation on a plane *not* parallel to the axis.

2. Draw the plan and an elevation when the shortest edge is either vertical or horizontal.

3. Determine the plan of the frustum cut off by a plane perpendicular to the axis, and passing through the centre of gravity of the solid when that frustum stands in the plane of the section.

X.

A right cone and a cylinder, each 4 inches high, and their bases 3 inches in diameter, and a sphere 3 inches in diameter; to be represented by plan and elevation.

1. When the cone lying on its side on the paper, the sphere also lying on the paper, touches the cone in a point at $\frac{1}{3}$ of the distance from the vertex to the circumference of the base.

2. When the cylinder standing on its base touches the cone in a point with the same condition.

3. When the cylinder lying on its side, the cone standing on its base touches the cylinder, and the sphere touches both.

XI.

Determine the shadow of one of the above solids, as cast by a luminous point 6 inches above the paper, when

1. Perpendicularly over the vertex of the cone, when lying on its side on the paper.

2. When 4 inches from the surface of the sphere, lying on the paper.

3. When in a vertical plane touching the side of the cylinder, lying on its side on the paper.

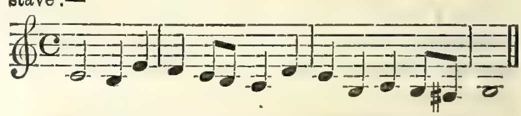
(In each case the line or lines on the curved surfaces, which separates the part in light from the part in shadow, to be shown).

THEORY OF MUSIC.

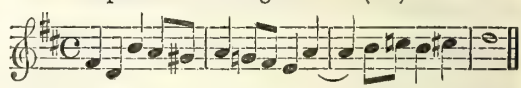
THREE HOURS ALLOWED.

Rudiments of Musical Grammar.

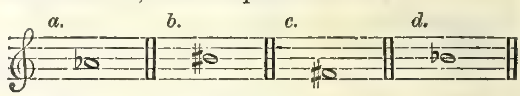
1. Write the following, *at the same pitch*, on the bass stave:—



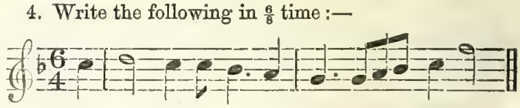
2. Transpose the following into *Si b* (B *b*):—



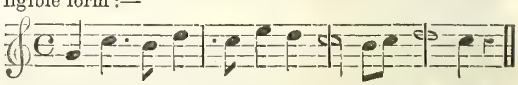
3. Add a minor second to *a*, a major third to *b*, a perfect fourth to *c*, and an imperfect fifth to *d*.



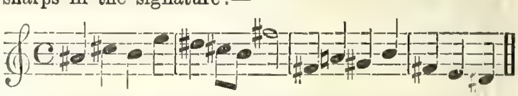
4. Write the following in $\frac{6}{8}$ time:—



5. Write the following in a more modern and intelligible form:—



6. Simplify the following, by placing the *essentia* sharps in the signature:—

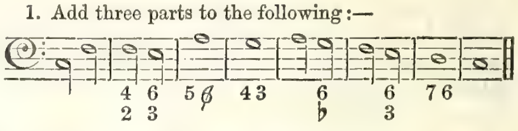


7. Write the signatures of *Mi b* (E *b*), *Fa* (F), *Sol* (G), and *La b* (A *b*), major; and of *Si* (B), *Do* (C), *Re* (D), and *Mi* (E), minor.

8. Write from memory the psalm-tune (melody only) *Bedford*, or *London New*, or any other.

Harmony.

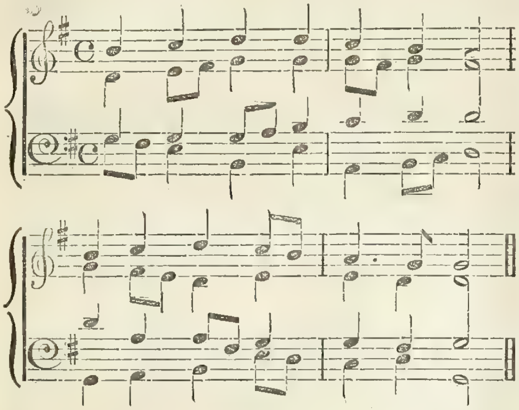
1. Add three parts to the following:—



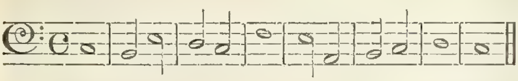
2. Write discords of the dominant seventh, and their resolutions in the keys of *Do* (C), *Re* (D), *Mi b* (E *b*), and *Fa* (F).

3. Harmonize the following:—

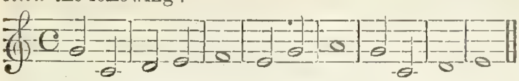
4. Put the following into score for soprano, alto, tenor and bass:—



5. Add a part or parts, in any kind of counterpoint, *above* the following:—



6. Add a part or parts, in any kind of counterpoint, *below* the following:—



7. Correct the errors in the following without altering the extreme parts—treble and bass:—

8. Place the following names of composers in chronological order, under the following headings—the names of the countries of one or other of which they are natives—*Italy*, *Germany*, *England*, *France*:— Purcell, Mozart, Weber, Tallis, Rameau, Callcott, Mendelssohn, Rossini, J. Sebastian Bach, Auber, Blow, Palestrina, Morley, Bishop, Marenzio, Haydn, Webbe, Handel, Lully, Arne, Spohr, Carissimi, Orlando Gibbons, and Beethoven.

ON THE EDUCATION OF THE MERCHANT.*

By Professor Leone Levi, F.S.A., F.S.S., Doctor of Economic Science, &c.

Ever since its foundation, forty years ago, it has been the aim of this college to supply, to the utmost of its power, the best practical education, to cope with the advance of science, and to adapt itself to the varying requirements of the times. Depending, as it does, altogether on voluntary support, and having no trust to fulfil, and no will of long departed founder to obey, the one object which the institution, as a whole, and each professor and lecturer individually, have at heart, is to extend their usefulness, and to render the college, really and practically, worthy of the place which it occupies in the centre of this great metropolis of commerce. We feel that we must not stand still whilst all around is moving, and we are ready and prepared to admit of any improvement which the wisdom of the country may suggest, or any change which altered circumstances may dictate, be it in the subject matter of education, or in the manner of teaching, so that by any means we may advance, and not be found wanting.

The effort now made to promote what is termed technical education is not new to this college. One of its principal functions has been to diffuse the knowledge of those sciences which are intimately associated with the industrial progress of the country. We have a whole department for the Applied Sciences. Engineering and Architecture form the subjects of special studies. The Theological and Medical departments are essentially technical institutes, and pre-eminently so is the Evening Class department. It would be difficult and otherwise inconvenient to establish distinct professional colleges for the different occupations of life, since the elementary branches of education are wanted in common for all occupations and professions, and certain branches which are of absolute necessity to some, are often learnt with a view to ornament and pleasure by others. Nor is it well to accustom our youth to class distinctions, however unavoidable in after-life. Sufficient if every one anxious to enter any occupation or profession has within his reach the means of acquiring the knowledge of the sciences necessary for the same.

Assuming, for instance, that the largest number of those who enter these evening classes have already made up their minds as to the avocation they intend to follow, it is comparatively easy for them to select such classes as are likely to prove the most useful, and in this manner each may derive from them the benefit of a technical institute. A first condition for a successful technical education for any profession, is, doubtless, a mind already prepared by a sound general education. It must be remembered that technical education begins where a good elementary, and sometimes even a secondary, education ends. The general education which a youth obtains at school fits the mind for the higher and more appropriate studies, just as the breaking of the fallow ground, the tilling and ploughing, prepare the land for any seed which the husbandman may intend to sow. And what is this general education which the student for the mercantile profession should absolutely possess? First and foremost is a sound knowledge of English, the mother-tongue. In the foreign schools the national language always stands first, and nothing can be more important than the ability to speak and write in a clear and precise manner, and in a style at once correct and elegant. A prolix and fanciful phraseology ill accords with the pressing demands of commerce on the time and energies of the merchant. Together with the knowledge of the native language, that of one or more foreign languages is of the greatest utility. There are but few offices of merchants or brokers in the city of London, or in any other mart of merchandise, where such knowledge does not come into actual practice, whether in the correspondence or in personal intercourse with natives of other countries. The French language has become indispensable by the immense extension of our trade with France, and the increasing intercourse we have with her people. German is the tongue of the great corn-growing countries in the north of Europe. The Italian language is of use not only for Italy, but for Greece and the Levant

* Introductory lecture delivered at King's College, London, on the 15th October, 1868.

The study of foreign languages is of much practical value, more especially as an intellectual exercise, and as the means for unlocking the gate to a large field of knowledge. As for the classics, the study of Latin, at least, is recommended, not only on account of the beauty of the language, but because it has entered so largely into the English that the meaning of a considerable proportion of our words is first discovered to us on learning Latin. Beyond this, arithmetic is of paramount necessity, and mathematics is needed to give completeness to the knowledge of arithmetic. These, and other branches of elementary education, the students of these evening classes are supposed to possess, nor is it needful to inculcate the advantage of acquiring them in as perfect a manner as possible to such a class as I have the honour to address.

We must, however, pass to the higher studies required for the mercantile profession; and, to determine these, let us for a moment glance at some of the operations of trade. In their simplest form, as they are carried on by the retail dealers in shops and warehouses, they appear comparatively simple, and little more than a practical application of the principle of buying in the cheapest market and selling in the dearest, but as you rise from the retail to the wholesale, from the home to the foreign merchant, how vast and complicated become his operations, how extensive the correspondence, how manifold the duties, how arduous and responsible the management. The merchant needs to be acquainted with the productions of different countries, and with the economics of such productions. He should have regard to the political vicissitudes of states, and balance the probabilities of war and peace, of quietness or revolution. The stability of finances, and the state of public credit, have a direct influence upon his trading, and to them he must give his attention. The law of supply and demand, and its effects at any given time on prices and values; the various, and often perplexing, phenomena exhibited by the operations of monetary laws; the state of the foreign exchanges, and the manifold contingencies connected with the transport of merchandise, how do they task the mind, and call forth the greatest energies! And when we come to the practical work of a merchant's office, see how well-defined are the duties of each officer, and how systematic is the work of every one of them from the highest to the lowest. Can we fail to perceive that much knowledge is required for the satisfactory management of such operations, and that many sciences should be studied ere we can reason safely on the working of so many influences, and unravel and master the difficulties and intricacies of mercantile enterprise?

I am not prepared to say that the study of science is the sole condition to mercantile success. Full well do I know how much a natural shrewdness and sagacity, a careful and steady application, and other moral, rather than intellectual, qualities benefit a trader; and do we not daily see men of no education amassing princely fortunes? Yet of this we may be certain, that the whole doctrine of commerce is based upon inductive reasoning. In most cases, it is not theory or imagination. Facts and figures are there — he who draws the most correct inferences reaps the largest profit. A great revolution has been effected in late years in the method and basis of mercantile transactions. When all information was monopolised by a few, when all notions of quantities were extravagantly distant from truth, and when events even the most patent could be concealed with perfect impunity, mercantile adventures were founded on chance, and secresy formed the chief stock of merchandise. Now, however, both commerce and banking are approaching towards the perfection of fixed sciences, and as such they must be studied. Like every other science, commercial and monetary sciences have ideas and principles peculiar to themselves. Let us investigate them as carefully and thoroughly as we do other sciences, and we shall soon be able to see light amidst all the ambiguity, difference of opinion, and contradictory views often enunciated on the different subjects connected with commerce and banking.

Having already dwelt on the importance of the study of languages and mathematics, studies which must be followed up with still greater care and completeness in connection with technical instruction, let me call your attention to the study of statistics as a science of primary importance in every branch of commerce. Statistics, as is well-known, are the science of procuring, arranging, and publishing facts calculated to illustrate the condition and prospects of society. In relation to trade, they supply facts connected with the quantities, existing or available, of different articles of produce or manufactures the prices which rule or have ruled in different countries, the operations of banking and monetary institutions, the rates of freight, and a vast variety of miscellaneous information. Mechanically, the merchant and banker are constantly manufacturing statistics. Let it be remembered, however, that whilst nothing seems easier than forming huge columns of numbers, nothing is more difficult than an exact classification of facts. Statistics always labour under the imputation from public men of being very unsafe and deceptive. The best means of avoiding this charge, and of relieving the science from this source of failure, is to bestow the greatest care upon each fact collected in its individuality of source and bearing. The first duty of the statist is to guard against all conjectures in the methodical classification of facts, to be sincere, impartial, and scrupulous in arranging them, and to be careful in laying down only what he knows. In connection with algebra and mathematics, statistics are the groundwork of the whole business of life, fire, and marine insurance. The great extension of life insurance, especially, has introduced the new profession of the actuary, and in his hands, the tables of mortality have acquired a novel and highly practical value.

Naturally connected with arithmetic is book-keeping, or accountancy, and we have here a class in the evening, where the student is taught to journalize, post, and balance accounts, to make trial balances, and to close a set of books. And for this purpose the supposed transactions of a mercantile house, extending over a period of three months, are given him to copy, and make the necessary calculations preparatory to the entry of them in a proper manner in the different books. Doubts have been raised as to the expediency of teaching book-keeping, since different systems are used in trade, and what is learnt may afterwards prove useless, but we cannot doubt the necessity of extending the knowledge of commercial accountancy. Is it not the fact that a multitude of bankruptcies are occasioned by the defective state in which the accounts are kept? In Edinburgh there has been for a long time instituted a Society of Accountants, the members of which are required to know the more advanced rules of arithmetic, algebra, the principles upon which annuity and life assurance transactions proceed, how logarithmic tables are framed and used, book-keeping of every description, the method of compiling and framing statements in investigation, the bankruptcy law, and the law of partnership. Let it be the aim of every merchant to possess the requirements of professional accountants, and the interests of trade and morals will gain enormously.

Foremost, however, amongst the technical studies of the merchant is a knowledge of commerce itself, including the principles which govern international trade, money, prices, wages, profits, the foreign exchanges, banking and commercial crises. How perplexed we often are at the phenomena presented by the sudden influx or efflux of capital, at the extreme height and the degraded value of money. How many problems have been suggested in connection with the changes in the foreign exchanges, and how strange does the attitude of the Bank of England often appear, especially in relation to that much vilified piece of legislation, the Bank

Charter Act of 1844. The only way to obtain proper light on such subjects is to study the principles of commercial science. And such principles may be studied with great interest in the history of our commercial and banking policy. Many a lesson may be drawn from the working of acts and measures which, having been sought after with eager expectation, left afterwards nought but bitter disappointment. Nor is it less important to learn the details relating to the organization of the principal industries, and the facts and information respecting the different articles of trade, such as prices and quantities, processes of manufacture, sources of the raw materials, and more especially the economics of labour now so much affected by trade unions. Take tea and sugar among the articles of import, and cotton and silk among our manufactures. How valuable to know the countries whence they are received and whither they are sent, the bearing of legislation on consumption, and other particulars peculiar to each industry. How useful also would it be to familiarize the student with the appearance of such articles by means of a well-assorted museum of samples, which might be easily founded in this college.

On the subject of commerce there are many works which may be studied with advantage. McCulloch has written largely upon it; his dictionary is a mine of commercial information, and his essays on the subject are very full and reliable. Mr. Laing's work on the "Theory of Business" is terse, correct in the main, and well conceived. It is an able effort to reduce into scientific order the daily practice of business, and to trace relation and connection between facts and circumstances apparently isolated and disconnected. Upon the origin and history of commerce Anderson's "History" and Macpherson's "Annals" are standard works, though now very old as to date. But to see the character and extent of the commerce of this and other countries now, you must study our official publications, such as the Annual Statement of Trade and Navigation of the United Kingdom, published by the Board of Trade; the annual reports of Her Majesty's Board of Customs and Commissioners of Inland Revenue; the statistical tables relating to foreign countries; the reports of Her Majesty's secretaries of embassy and legation on the manufacture and commerce of the countries in which they reside; the commercial reports of Her Majesty's consuls; and more especially the Statistical Abstracts of the United Kingdom, of India and the British colonies, which contain the cream of the information given in hundreds of volumes. To say nothing of smaller works on the commerce of special countries, and on certain articles of trade.

Political economy, which investigates the nature of wealth, and the laws of its production and distribution, is pre-eminently useful for commerce, especially in so far as it discovers the economical laws which govern production and international trade. The School Inquiry Commission strongly recommended such study, on the ground that it bears directly on the conduct of life, and may be made exceedingly interesting; that it supplies excellent examples of reasoning; and that in the hands of a skilful teacher it can be brought completely within the comprehension of all. Doubtless, if we take John Stuart Mill's, or any other treatise on political economy, we shall find many chapters which have only a distant relation to commerce. But few can rise from the study of Adam Smith's "Wealth of Nations," and the other works which have emanated from Mill, Senior, Say, Chevalier, and other economists, without being pervaded by a strong desire to know more of a science which, better than many others, reveals the vast resources of nature, and the secret of her working.

Physical geography is another branch of knowledge of practical value to the merchant. To know the chief characteristics, and the different productions of the soil of each country, is of the utmost importance for purposes of commerce. New scenes are constantly opened to mercantile adventures. Countries, once closed to European contact, gradually enter into the bonds of civilized states. China and Japan, the oldest countries on earth, except, perhaps, Egypt, are now open to British trade. And how little we know as yet of their boundless capacities. It has been well observed, the bounties of nature are inexhaustible. Nature has yet many wonders in her storehouses awaiting the discoveries of man, and fitted for the rapid advancement of civilization, and for the diffusion of numerous comforts. Other sciences become necessary to merchants and manufacturers in special localities. Geology is of primary necessity to all connected with mining enterprise, at home and abroad. Millions are often wasted through ignorance, from trying to get metals from barren rocks, or from not seeking them where they may best be found. And chemistry is of considerable use in manufacture.

But of still greater utility to merchants and manufacturers of all classes, is a knowledge of the laws which regulate the different relations of trade, and the various instruments of commerce. Some acquaintance with commercial law, and especially with the law of contracts, partnerships, agency, bills of exchange, shipping, and insurance, is indeed indispensable to a trader. Surely it must be useful to learn how to apply the scientific principles of law to such transactions as the purchase and sale of goods, the drawing, accepting, or endorsing of a bill of exchange, or the preparation of a bill of lading or charter-party. We must remember also that, commerce being essentially international, the laws of foreign countries on these subjects are equally important as our own. Therefore a knowledge of the code of commerce of the country with which you are trading is of the utmost value, and may save you many a blunder, and protect you against many a loss. And so it is with international law, which has reference to the rights of neutrals, the rights of belligerents, and the rights and duties of consuls and ambassadors. Let a war suddenly break out in any part of the globe, and British property and British subjects are certain to be more or less affected. What could be more important for a merchant than to know how he should protect himself in such emergencies, and what are the requirements of that law of nations which acts so imperiously even in the farthest quarters of the globe. Works on commercial and international law are very numerous. Besides my own "Manual of Mercantile Law" and my larger work entitled "International Commercial Law," you will find Smith's "Mercantile Law" a standard work on the mercantile laws of England, and many treatises on special branches of law, such as Chitty's compendious books on contracts, bills of exchange, &c., Lindley on partnerships, Byles on bills, &c. On international law, Vattel, Wheaton and Phillimore are the most authoritative writers, and their works may be read with considerable interest.

Many other branches of knowledge are of great advantage, if not an absolute necessity, to the merchant. The customs laws of other countries materially affect our foreign trade. How can we calculate the cost of merchandise at this or that other port, and the value of the sale-price of any article, unless we know the tariffs of other countries? As yet the weights, measures, and coins of different states are widely different from our own and from one another. A knowledge of these, and more especially of the metric system, which is being introduced in all countries, and will probably ere long be made compulsory in this country, is also important. Very frequently do we find our minds seriously tasked when we have to calculate the cost-price of wheat and other articles at quotations so strange, both as respect quantities and currencies, to say nothing of the difficulties introduced by the relation of gold to paper-currency in such countries as the United States and Italy.

I have far from exhausted the catalogue of the branches of knowledge necessary for the safe manage-

ment of trade, but I trust it may suffice as a guide to such as wish to assume a position of influence in the difficult career of commerce, and to such especially as disdain wandering about on a pathless ocean, without a compass, depending on the winds and tides to carry them into port. It is said that a youth, placed early in a mercantile office, will learn all that is required without much study. We may fancy the mechanic, artisan, and manufacturer to be insensibly disciplined to perform works by the hands with wonderful dexterity; but I doubt whether the clear head, the variety of accomplishments, and the real judgment, which are necessary for a merchant, can be acquired by merely inspecting what others are doing. Let the transactions of a counting-house be ever so important and diversified; let them be judiciously conducted, and methodically adjusted, according to the nicest art of mercantile skill—yet, if a youth is not furnished with the requisite knowledge to enable him to obtain the best advantage from what he sees transacted, he will not be much the wiser for it. All that is transacted will seem to him confused and perplexing, and he may remain utterly unprepared to take a wide and firm grasp of all the various operations which are necessary in the prosecution of business. A combination of study and practice is the best preparation for the mercantile career; and this is now within your reach by the institution of these evening classes, where you can get in the evening a philosophical explanation of your work in the day.

As a first condition of success, let me entreat you not to form too low an idea of the accomplishments necessary for the mercantile profession. It is not well to imagine that you may fill your place and carry out your work without any great effort of mind and intelligence. Let it rather be your ambition to enter into your profession well harnessed for your duties, and determined to master all the details, and to learn in all cases the reason of the thing. And do not think ill of commerce. Form no low conception of that calling. Time was when commerce was deemed a craft, the child of chance, or the fruit of sordid cupidity. And there may have been some, like the Romans of old, who have esteemed its functions degrading to the mind, and calculated to stifle every noble emotion. Dismiss any such idea. Think how much does the world owe to commerce. How it has softened the character of society. How far and wide it has introduced civilisation. How much the state of warfare, in which society was constantly thrown, has been altered through its peaceful influence. What riches it has amassed! How much human comforts have been thereby increased; and, withal, what an amount of happiness it has procured. Truly, commerce has its trophies nobler far than military prowess. And is commerce the pursuit of only the unlettered and ignoble? No. Where prejudice and pride once disdained its touch and alliance, now the coronet encircles the head of the successful merchant and banker. Their voice is heard in the councils of the Sovereign, and the wants of commerce are carefully weighed in the balance of public good.

Those who have examined the question of technical education in all its bearings, have come to the conclusion that the defects by which this country suffers, in the great competition with foreign countries, are far more due to the ignorance of those who direct the works than to the imperfect technical education, want of skill, or incapacity in those who execute them. May it not be the same as regards merchants and clerks? Is there not reason to fear that in the eagerness for wealth many suddenly start as merchants who are altogether strangers to that calling, and many who have had no previous training to prepare them for its duties? Let us remember that in this, as in all other respects, education is power; that skill and inventiveness add immensely to the resources of the merchant, and that the economy of time and of agents obtained through increased efficiency, act as so much addition to the mercantile capital. It is the same in commerce as in manufacture. Mr. Chance, the eminent glass manufacturer in Birmingham, in his evidence before the Committee of the House of Commons on scientific instruction, said that the head of a great manufacturing establishment cannot be too highly educated. He thought it a mistake to look on his pursuit otherwise than having a high professional character; that it is a greater error to suppose that the conduct of large works does not require a variety of the qualities of mind which are wanted for certain professional pursuits. And he advocated that every one who is to be at the head of a large manufacturing establishment should have a university education.

The Committee on Technical Education, appointed by the Society of Arts, Manufactures, and Commerce, have recently put forth a scheme for the education of the merchant, suggesting that courses of lectures on the subjects already indicated be provided, and that yearly examinations be held, presided over, if not conducted by, merchants of the first-class, in the same manner as the leading solicitors and the members of the medical profession now conduct the examinations of the medical and law institutions. We offer here, at King's Collegee, precisely the same scheme. We give the required instruction. We hold yearly examinations, and have no objection to the presence of the best and most influential of our London merchants. Let a student enrol himself in the classes which are necessary for trade as indicated in the syllabus, and if he succeeds in obtaining upwards of 300 marks at his examination, we shall grant him a diploma of fitness for the mercantile profession. What we require is a proper encouragement for the students to pursue such studies. The Committee of the Society of Arts, of which I was a member, stated in their report that it is incumbent on all those who really believe in scientific teaching to prove their faith by giving a practical value to the certificates obtained by students. The best mode of inducing the rising students to follow this methodical training, is doubtless by showing them that the few who take that course do find employment more readily than those who do not. And the employers of scientific labour can give an enormous impulse to scientific training by showing a real preference for young men who have passed through the courses of study recommended. With this I entirely agree, and I do trust that those who are in the habit of taking pupils, apprentices and clerks, will consider it for their own benefit to give the preference, as far as possible, to those adducing evidence of the possession of adequate instruction in the sciences applicable respectively to their professions or occupations. But would it be asking too much that studentships or scholarships be founded in connexion with commercial studies as a small reward to those who, being employed all the day in arduous work, devote their leisure time, morning and evening, to the cultivation of what, in the end, will prove as advantageous to the community at large as to themselves. Would it be too much to expect that some of our merchant princes and wealthy City companies should do for commerce what Mr. Whitworth and Sir David Baxter have so nobly done for mechanics and industry?

The necessity of extending commercial education is felt in other countries as well as in this. The Paris Chamber of Commerce recently founded a School of Commerce, for imparting the special knowledge necessary for the heads of trading firms, and the French Commission on Technical Instruction recommended that the secondary special instruction should comprise both an elementary and a superior instruction in commercial science. In Germany the practical schools impart such instruction, and the Academy of Commerce at Vienna, the School of Commerce at Munich, and the commercial divisions of the Polytechnic Institutes of Munich, Stuttgart, and Baden, teach all the requirements of commerce. Italy has her commercial institutes. In Belgium the Superior Institute of Commerce, at Antwerp, is a complete commercial college; and in America there is an international chain of com-

mercial colleges in upwards of thirty of the leading commercial cities of the United States and Canada, where the attempt is made to teach both the principles and practice of commerce. We learn that in these colleges everything is done on the premises. The young aspiring merchant has his correspondents in other colleges of the chain, with whom he carries on the mimicry of real trade; he has but to step from one end of the apartment to the other to transact imaginary business with his banker. The whole mystery of letters of credit and bills of exchange is revealed to him. Stock is regularly taken; affairs are wound up in bankruptcy; commercial law is expounded; book-keeping in every form of entry is practised; and no single transaction of commerce is unrepresented, so far at least as its forms are concerned. For my part, I do not think it expedient to spend the valuable time of college-work in anything beyond the instruction in the sciences required for commerce. The practice of commerce will always be learned better in a merchant's office than in the college classes. But it is important to realise that other countries are alive to the necessity of elevating the character of the merchant, and of diffusing among both merchants and clerks those principles of science which are necessary for the efficient discharge of duties of great importance to the well-being of the country. Hitherto the British merchant has enjoyed a world-wide reputation for perspicacity, boldness, and enterprise. Well known for his wealth, he has been equally esteemed for integrity of principle and high tone of morals. Let us hope that though other nations follow him in close competition in the pursuits of trade and merchandise, he may still stand foremost in intelligence and virtue.

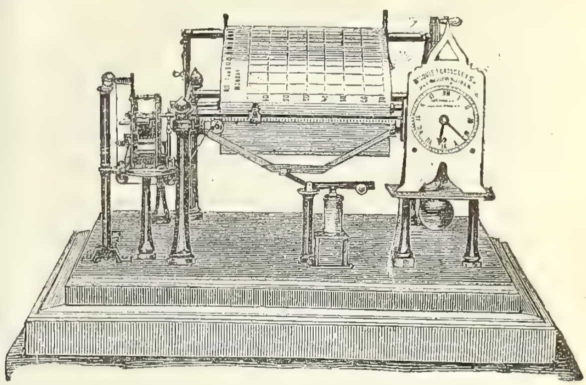
SELF-REGISTERING ELECTRICAL ANEMOMETER.

This instrument was invented by Mr. Louis J. Crossley, and is manufactured by Mr. Sax, of Bloomsbury. In the year 1865, while the inventor was studying the relative velocity of the winds on lofty hills near Halifax, the great convenience that would result from the use of electricity became very apparent. The loftiest of these hills is more than 1,000 feet above the sea, and nearly 800 feet above the valley in which the Calder runs. The other points—High-road, Wellmoor, King's-cross, and the Museum, are, respectively, 830, 660, and 511 feet above the sea. All these lie in a line, running from W. to E. A little to the S. of this line is Willow-hall, the residence of Mr. Crossley, which is about two miles away from the most distant hill. It was proposed to connect these stations by telegraph wires, all terminating at Willow-hall; to put together a simple inexpensive instrument for recording the velocity of the wind as given by sets of Robinson's cups; and then to study the effect of elevation and position upon the great westerly gales of autumn and winter. The wires were laid to the loftiest points, and an instrument devised for sending the currents to the recording apparatus. It consists of a set of Robinson's cups attached to a tube, within which is a long spindle. At the bottom of the tube, and fixed to it, is a cog-wheel working a larger one. Upon the latter is soldered a broad inclined plane of platinum. Above these wheels is a brass bridge; to this is soldered a strip of elastic steel, having its free end armed with a broad platinum surface, so that, after a certain number of revolutions of the cups the lower plane glides under the upper, and makes contact. This arrangement has been found to answer extremely well. Another form is one in which platinum pegs, fixed to the wheel, and a lever armed with platinum, are made to send the currents. This worked for several years, but not very satisfactorily. Excellence of workmanship and strength of make would, however, remedy its defects. Certainty of contact, perfection, and considerable duration of contact, as well as great steadiness of mechanism, are the points to be attained in this part of the apparatus.

The recording instrument consists of an electro-magnet, and armature, a train of wheels, and a set of four dials. The principle is identical with that of Breguet's A B C telegraph, with the exception that the spring is dispensed with. Four of these instruments were made and placed at the four stations above-named, and found to work well. The recording apparatus cost from £4 to £5; the cup apparatus about £4; the battery of twelve Daniell's cells, about £1 10s.—so that, for £10, the instrument could be obtained complete. The battery only needs the supply of a little sulphate of copper once in two or three months. The cup apparatus, if well made, would last many years. Cups of various sizes have been tried; some were three, some were six, and some were ten inches in diameter. Those now in use are nine inches, and the length of the arms, measuring from the centres of the cups, is forty-seven inches.

Of course this instrument must be read at some fixed hour daily. The readings being in currents, can be readily reduced to miles of wind by a simple division, or by reference to a table drawn up for each instrument. The recording instrument is contained in a mahogany box, 6in. long, 6in. high, and 4in. broad, having a glass face.

Fig. 1.



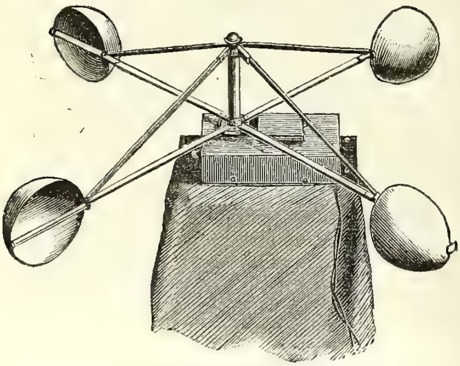
In Fig. 1 is shown the self-recording anemometer. On the left is seen clockwork, with an electro-magnet under it; the armature of this magnet is carried up to the teeth of the escape wheel, and allows only one cog to escape at a time; the axis of this wheel is prolonged in the form of a screw, 18 inches in length, so that as the cogs escape the screw revolves. Upon the screw is placed a carriage with a pencil, so arranged that the lower part of the carriage slides along a brass railway, to which it is loosely attached. In front of the long screw is a paper drum, which is driven by the clock on the right. Behind the drum are two brass rollers or bobbins; from the lower one the paper is drawn by the revolving drum at the rate of one inch per hour; and after passing over the drum, and receiving the wind curve from the pencil, it is drawn round the upper bobbin, by means of a weight. The paper is ruled for miles of wind, and also for the hours of the day, and along the zero line, on the left, are printed in large type the hours and days. A sheet may thus be put on every morning (which is in every respect the best plan), or a month's paper may be rolled upon the lower bobbin at once.

The pencil can be made to return to the zero line, either every hour, or when it has crossed the paper. This is done by means of the driving clock, and an electro-magnet under the railway. The armature of this magnet is attached to a lever, the long arm coming in contact with the magnet, and the short arm raising the railway and the carriage. Contact is made in the driving-clock every hour, and a current thus sent into the magnet; the lever is drawn down, the carriage lifted

from the screw, and pulled back along the rails by a cord and weight. The weight passes down a brass tube, and when it reaches the bottom it strikes down a spring; the current is thus thrown out of the electro-magnet, and the carriage falls upon the screw and begins its work again. All this is done in less than one second of time.

Fig. 2 shows the arrangement of the cups.

Fig. 2.



The advantages claimed for this instrument, when reduced in size (and this is now being done), are:—1. Its cost will be small. 2. It is easily fixed, and easily removed. 3. The cups may be fixed at any distance from the recording instrument. 4. The cups may be fixed upon any chimney of an ordinary house, without having to drill holes in the roof for the passage of rods, chains, &c. 5. The recording instrument, when reduced in size, will stand in a glass case 1ft. square.

As regards trouble in attending to the machine, the driving-clock needs winding up weekly, the escapement clock every two days; the weight, every day or week, according to the depth of the fall; the battery must be looked at, and a little sulphate added, every two or three months.

Fine Arts.

Government Patronage of Art.—The *Daily Telegraph* says:—"Sir James Thornhill, we are told, contracted to paint the interior of the cupola of St. Paul's Cathedral at the rate of forty shillings the Flemish ell. But there are a great many yards in the area of the dome of St. Paul's; and Sir James, it is said, did not make a very bad bargain. Somewhat better terms were offered him for decorating the Hall at Greenwich Hospital; but, in the execution of both works, there were many 'bits of fat,' as actors say. Plenty of clouds, plenty of sky, plenty of voluminous draperies, flying, like the winds in Sternhold and Hopkins, 'all abroad'—these enabled the painter of allegories to get over a large space of canvas in a comparatively short time. Our Paris correspondent told us yesterday of an able French painter, M. Bénédict Masson, who does not appear to have been so fortunate as Sir James Thornhill. He contracted to paint, with episodes from French military history, the Cour d'Honneur at the Hôtel des Invalides. The task was gigantic; for each side of the court measures about a hundred and fifty feet. The Emperor came to see the work while it was in progress, and asked how much the Ministry of Fine Arts paid for each of these colossal paintings. M. Masson replied that he was only to receive twelve thousand francs—four hundred and eighty pounds. His Majesty was shocked, and promised to have the affair inquired into; but the Fine Arts Minister has not fulfilled the Imperial promise. The poor artist declares that he is two thousand pounds out of pocket, and is on the verge of ruin. Now, an English painter of M. Masson's standing would, for a single fresco or other painting, of very moderate dimensions, on the walls of the new Palace at Westminster, receive, certainly a thousand, perhaps two thousand pounds sterling; and yet English artists sometimes complain that they lose money by undertaking Government work. M. Bénédict Masson's case seems to be hard; but—and there is a very important 'but' in the matter—it must be remembered that, in France, Governmental commissions to painters, although with no splendid remuneration, are continuous and continual. The Ministry of Fine Arts is an inexhaustible milch cow to artists even of average ability. In England it is only the princes of the profession whom her Majesty's Commission deigns to honour, and sometimes to squabble with; and Government patronage altogether is as rare as a blue diamond."

M. Taine on Landscape Painters.—M. Taine, in one of his recent lectures at the Ecole des Beaux Arts, Paris, made the following remarks on landscape painters:—"It may be remarked that the artists of the Latin race always paint classical landscapes, and show little taste for wild natural scenery. They have only the tastes of society. A glance at our ancestors the Gauls will show the difference between them and the Dutch; the former lived in villages placed near each other, loved companionship, and sought the pleasures of society and conversation. The Germans did not congregate together; each placed himself near a stream of water, and lived in isolation, except as regarded the affairs of the tribe. It is still the same in England, where everyone desires to have a house to himself, in a little enclosure, which shuts it out from its neighbours, instead of taking up his quarters in a large house, as with us. We like the civilized landscape, the landscape of Italian villas, or the gardens of Louis XIV., where the Grand Seigneur lives surrounded by poets, painters, architects, beautiful women, given up to the pleasures of intellect and taste. The Germanic races exhibit a contrary character. They are the men who still go to America, isolate themselves, cultivate virgin lands in far-off countries, who can do without conversation, and enjoy full liberty in the midst of nature. From these very distinctive characteristics of the two nations, as regards their manner of looking at nature and at landscape, it has resulted that Caracci, Albani, the greatest Italians, as well as Poussin and Claude Lorrain, only seek beautiful decoration, and arrange nature so as to make it look like a creation of man; the Dutch painters, on the contrary, follow real nature; they love her for herself, such as she is, and not accommodated to our convenience and to our taste. The landscape painters of this school are very numerous; after the precursors—Esaïas Van de Velde, the uncle of the celebrated Guillaume Van de Velde, Van Goyen, Pierre Molyn—there were Jean Wynants, Albert Cuyp, Van der Meer, Hobbema, the two Van de Velde, Ruysdael, Paul Potter, and how many more. All these painters, born at the epoch when Holland, after a struggle of thirty-seven years' duration, had conquered its independence, each of them had his own originality, his characteristic trait, and in the infinite diversity of the sky, earth, and water, of night and of day, found a distinct field for his talent."

Ghent Triennial Exhibition of Works of Art.—The exhibition organised by the Royal Society for the Encouragement of the Fine Arts takes place in this town once in three years only, but it is an international exhibition, and of considerable importance; it contains this year considerably more than a thousand works of art, German, Dutch, French, and Belgian, and the catalogue contains a large number of well-known names. The Belgian exhibitions are so arranged that those of the principal towns interchange with each other, and thus they obtain an importance which they could not well otherwise have.

Bordeaux Exhibition of Fine Art.—The Société des Amis des Arts, of Bordeaux, has just published the annual account of its exhibition and its results, by which it appears that while the works purchased by

private persons only amounted last year to £1,293, a sum equal to the average of former purchases, they have this year reached more than double that amount, or £2,673, a remarkable increase. The number of members of the society is increasing, and at present exceeds one thousand; but circumstances have increased the expenses in a still greater ratio, and brought them up to £459, so that the society itself was unable to make any important purchases. The authorities of the town of Bordeaux purchased for their public gallery a picture of "The Trial of Joan of Arc," by Antony Serres, a native of Bordeaux; "Sinbad the Sailor," an important work by M. Adrien Dauzats; and three water-colour drawings by M. Bernède. The general result is the sale of 187 works of art, making an amount equal to £3,573. This is a fair contribution from a provincial town towards art, and Bordeaux does not stand in the first rank in this respect. The society has held seventeen annual exhibitions, and the total sales to the present time amount to £32,876, or nearly two thousand per annum on the average. It must be noted that this result is the work of a private society, with some assistance from the local authorities, the patronage of the Emperor, and of the Minister of the Beaux Arts.

French Drawing Schools.—M. Baltard, the Director of the Architectural Works of the City of Paris, in addressing a meeting for the distribution of prizes to the pupils of the municipal drawing schools, gave the following statistical information concerning these schools:—They are open gratis to all. The number of pupils now in the schools, including those who are merely learning the elements of design, as well as those who are preparing for a professional career, is 10,800—in 1862, they numbered 1,300. The amount included in the city budget this year for drawing is equal to £12,800—in 1862, it was only £2,720. The number of schools in which drawing is taught is now 223, while in 1862 there were but 133 in existence. Moreover, the solicitude of the authorities and the progress made are elsewhere apparent, the primary schools for girls and boys, together with the adult classes, have been increased during the past six years from 303 to 418. It is not only in Paris, added M. Baltard, that institutions for professional education and its principal element, artistic and geometric drawing, have been founded and developed—there are already industrial schools at Châlons, Aix, and Angers. The school at Cluny, so recently created by the Minister of Public Instruction, already takes its place amongst the most important establishments for special instruction in existence, one of the most useful auxiliaries in the development of youthful intelligence and ability.

Manufactures.

Tooth's System of Boiling Sugar.—The *Produce Markets Review* says:—"In an ordinary vacuum pan, the top of the liquid alone forms the evaporating surface, and evaporation would, of course, be more rapid were a greater portion of the liquid exposed. The most notable feature of Mr. Tooth's invention consists in pumping the juice down from the top of the vacuum pan, at the moment of granulation, through a rose. The juice is thus distributed in small streams through the air contained in the evaporating vacuum chamber, and the surface exposed, as compared with the old system, is said to be as 1,000 to 50. The evaporating chamber differs from the old vacuum pans in shape, being, to speak roughly, a long cylinder, with the ordinary round pan at the top and bottom. The juice, before reaching the evaporating chamber, is pumped up through a number of pipes surrounded by steam in a cylinder. The following advantages are stated by the inventor to be secured by this process:—1. The juice is protected from excessive and long-continued heat. 2. Long exposure to the injurious influence of the atmosphere is avoided. 3. Great rapidity in carrying on the evaporation is secured. 4. The juice is transferred to the vacuum pan (or evaporating chamber) immediately after defecation and filtration, avoiding the necessity of open pans. 5. Any extent of heating and evaporating surface is easily obtained. 6. The cost of fuel is greatly lessened. 7. Vacuum pans now in use may be made available for the improved system at a comparatively small cost. 8. The finest sugar is produced without the expense of animal charcoal, and the crystallisation being perfect there is no loss by drainage. 9. There is no formation of molasses beyond that naturally existing in the juice, as the temperature never need exceed 140° to 160° Fahrenheit. 10. The system is also useful in beetroot sugar manufactories. There is an arrangement by which the clogging of the rose, through which the partly granulated sugar passes, is remedied. The idea of exposing a greater surface to evaporation seems to us excellent in theory, but it belongs, of course, to practical men to say if it will work. Mr. Tooth has another patent to compete with Mr. Fryer's concretor, for rapid and cheap evaporation. This consists in passing the partially granulated juice through a rose, and letting it drop down through a long cylinder or tower filled with heated air. The patentee states that the juice reaches the bottom in the shape of sugar."

Commerce.

The Vintage in France.—The produce of the whole of the vineyards of France this year is estimated at between 50 and 60 millions of hectolitres, that is to say, from 1,100 to 1,320 millions of English gallons. The official returns give the production of preceding years as follows:—

1865	68,393,000 hectolitres.
1866	63,838,000 ,,
1867	55,000,000 ,,

The amount of land planted with vines is 6,750,000 acres, or 24,000 square kilometres, the whole superficial area of France, or of the cultivated lands, being 543,051 square kilometres, so that the vine, important as it is in French agriculture, does not occupy one-twenty-second part of the land. Of the fifty-five millions of hectolitres of wine produced in 1867, rather more than half was consumed in the country in the natural form; seven millions of hectolitres were converted into spirits, and 335,306 hectolitres into vinegar. The quantity consumed by the growers themselves is given as averaging only four millions of hectolitres during the past five years, but it is said to have reached an average of twelve millions during the period of five years ending with 1862. This extraordinary difference must be attributed, not to a diminution in the wine drunk at home in the wine districts, but to a falling off in the production of spirits from wine, which is greater every year. Dividing the 28½ millions of hectolitres consumed in France last year by the number of the whole population, we obtain an average result per head of about sixteen gallons per annum; and to this must be added a large quantity of spirits and beer; but it must be remembered that by far the greatest part of this wine is taken with meals, and in moderate quantities at a time.

Russian Commerce.—The official returns for the first six months of the present year show a serious diminution in the receipts of the Russian custom-house, the deficit approaching two millions of roubles, as compared with the amount received during the same period last year, namely 24½ millions. The largest falling-off in the import list is in raw sugar, the quantity imported this year being under 50,000 pouds, against more than 300,000 pouds last year; refined sugar and coffee also show each a small diminution; salt, a very

considerable one, amounting to more than 20 per cent.; textile materials and fabrics mostly show a large falling-off; raw cotton to the extent of 10 per cent.; cotton yarns about 12 per cent.; silk, nearly 40 per cent.; cottons, about 25 per cent.; linens, 20 per cent.; and silks and woollens a slight diminution; raw wool, on the contrary, shows an increase of more than 10 per cent. The articles which exhibit an increase, as compared with last year, are, tea, about 8 per cent.; wine, a large per centage; tobacco and cigars, dyewoods and lead, to the extent of nearly 50 per cent. The exports exhibit a diminution in cereals to the extent of nearly one-seventh; tallow, one-fourth; raw hemp, a tenth; and yarns of hemp and flax, a small falling-off. On the other hand there has been an increase in linseed and hempseed to the extent of nearly one-half; in flax, of rather more; tow, more than double; skins nearly the same; leather, an increase of more than three hundred per cent.; bones about a third; wool, still larger; bristles and potash nearly double; iron, 50 per cent; cables and cordage, a small increase; sailcloth, duck, and brabante, nearly double; other coarse linen cloths, a still larger augmentation; timber a considerable increase; and furs nearly three times the amount of last year. The returns for the various countries are not given. The imports of the precious metals stand at nineteen millions of roubles against a little more than two millions during the same period last year, while the exports, on the contrary, have been less than three millions against nearly ten millions.

The Silk Trade at Marseilles.—The following statistics relating to imports of silk cocoons and grains (eggs) at Marseilles during 1867 have recently been published in the annual returns of the Chamber of Commerce of that city. The imports of silk during the last six years were:—

	No. of bales.
1862	19,693
1863	24,502
1864	23,888
1865	39,542
1866	29,491
1867	32,000

This decrease in the imports of bales of silk since 1865 may, in some measure, be attributed to the falling off in the supplies from the Levant, Persia, and the Caucasus, in which countries the silkworm disease has been prevalent. The imports from these places, which in 1864 were 12,990 bales, fell 8,867 in 1865; 6,663 in 1866; and in 1867 to only 4,663. Only 1,900 bales were obtained from Persia and the Caucasus last year against 4,500 in 1866. The imports from China and Japan, on the other hand, have greatly increased, and during the last five years those from the former country have been nearly doubled, whilst those from the latter have been increased threefold. The following are the imports from China and Japan during the last five years:—

	China.	Japan.	Total.
	Bales.	Bales.	Bales.
1863	11,051	2,871	13,922
1864	6,894	2,917	9,811
1865	19,031	8,103	27,134
1866	11,501	5,222	16,722
1867	20,540	8,290	28,830

The imports of cocoons were as follows:—

	Kilogrammes.
1862	728,900
1863	743,400
1864	542,000
1865	664,000
1866	745,000
1867	579,000

This decrease in the importation of cocoons may be attributed also to the falling off in the supply from the Caucasus, which in 1866 was 300,000 kils., and in 1867 did not exceed 8,000 kils. The supply of grains, which, in 1863, amounted to from 38,000 to 40,000 kils., was formerly obtained almost exclusively from Nouka, the Caucasus, and Georgia, has, since 1865, been obtained principally from Japan. The number of cards of grain (each card contains, on the average, 25 grammes of grain) imported from Yokohama and Nagasaki, in 1865, amounted to 2,000,000, or about 50,000 kils., from which must be deducted from 10 to 12 per cent. for damaged grain. In consequence of the great quantity which were brought into the market in 1865, the prices fell from 18frs. per card to from 2frs. to 3frs., and even as low as 1fr. 50c.; and upwards of 300,000 cards remain unsold. In 1866 and 1867 the number of cards imported into Europe was only 800,000, of which two-thirds were sent to Italy, and one-third remained in France.

Consumption of Wine.—The following table (quoted from the *Produce Markets Review*) shows the average consumption in this country in 1856-59 (previously to the reduced duty), together with those of 1867 and the present year, which last is calculated on the basis of the first seven months, showing the relative positions of French and Spanish wines in our consumption:—

Wines.	Average of Years.	Gallons consumed.	Per-centage of Total.	Total Gallons.
Spanish	1856 to 1859	2,785,831	39·58	7,092,046
Do.	1867	5,862,630	42·62	13,754,343
Estimate from the first seven months	1868	6,167,067	40·59	15,192,375
Portuguese ..	1856 to 1859	2,201,305	30·99	7,092,046
Do.	1867	2,857,399	20·77	13,754,343
Estimate from the first seven months	1868	2,721,577	17·91	15,192,375
French	1856 to 1859	600,932	8·85	7,092,046
Do.	1867	3,595,177	26·13	13,754,043
Estimate from the first seven months	1868	4,666,202	30·72	15,192,375

Colonies.

Cotton at the Cape of Good Hope.—A sample of wild cotton from the district of Oudtshoorn has been on view at Cape Town. It is the produce of only two pods, is of fine quality, and pure colour, and literally as "fine as silk." This wild cotton grows in abundance, not only in Oudtshoorn, but in many other divisions of the colony—in Albany and Queen's Town, for instance; there is, therefore, every reason to suppose the cotton plant might be most successfully cultivated in South Africa.

Resources of New South Wales.—The *Sydney Morning Herald* says:—"This colony never held out greater attractions than it does now. In three different directions the railways have tapped large areas of good agricultural land, where farmers will always be within easy reach of a market. The agriculturist can please himself as to the choice of climate and crop. No other colony probably offers such variety. From the English climate

on the highest lands, down to the semi-tropical climate on the northern rivers, there are all intermediate grades. The coast lands have been proved to be well fitted for the production of sugar. The preliminary difficulties have been overcome; and, though on a small scale as yet, local-grown sugar has come into the market. So encouraging are the prospects of this new industry, that speculative capitalists are beginning to take it up, and it promises in a very few years to be the most attractive of our agricultural industries. But besides sugar, cotton will grow excellently, if the requisite pains are taken with it, and one or two enterprising innovators have shown that nothing but the right effort is wanted to to make this a great silk-producing country."

Corn and Wine in Victoria.—The average yield of wheat in South Australia was only about five bushels to the acre, while in this colony (Victoria) the yield was fifteen bushels against twenty-two bushels per acre the year before. The actual decrease in the total yield of wheat was 1,151,312 bushels. The total area under wheat was 220,734 acres, producing 3,489,893 bushels. The area under oats was 124,558 acres, producing 2,350,110 bushels. The vineyards extended to 4,176 acres, containing 8,341,497 vines, which yielded the vintage before this 27,641 cwt. of grapes not made into wine, and 101,327 so disposed of; the quantity of wine being 361,790 gallons. Altogether there were in cultivation last year 634,270 acres, which is nearly an acre per head on the population.

The Census of New Zealand for 1867 states the number of houses or dwellings in New Zealand at 54,009 against 37,996 in 1864. Of these, 38,840 were wooden, 1,182 brick and stone, 13,119 other materials, and 868 raupo. Besides these there were 6,559 buildings uninhabited, or used only as stores or offices. The number of houses building when the census was made was 697 in the several provinces—Auckland, 112; Wellington, 86; Canterbury, 216; Otago, 111; Nelson, 66; Taranaki, 31; Hawkes Bay, 30; Marlborough, 19; Southland, 25. The total population in December, 1867, was 218,637.

Manufactures of New South Wales.—The total number of manufacturers' works, &c., in this colony is 2,389, 159 of which are mills for grinding and dressing grain. There are 5 manufactories for the manufacture of woollens, producing 172,720 yards cloth; 26 soap manufactories, producing 68,456 cwts.; 37 of tobacco, producing 7,755 cwts.; 2 of refined sugar, producing 110,509 cwts.; and 45 boiling down establishments, producing 19,416 cwts. tallow, and 6,284 lbs. of lard.

Glass Manufactory in Melbourne.—A glass manufactory is shortly to be started in Melbourne. The colonial manufacture of glass has hitherto been very small. Many years ago there was a manufactory in Sydney, but it was abandoned. Lately it has been re-established, and although unable to compete in the ordinary forms of glassware with the home manufactories, it was found that there were many articles, such as glass fish globes, confectioners' glasses, carboys, soda-water bottles, &c., the importation of which is attended with the colonies. The resources at the command of the so much expense, which could be profitably made in manufacturer at the commencement of operations will enable him to melt and convert into glass 350 lbs. of "metal," as it is technically termed, twice a week, but if the enterprise meet with support this quantity can be doubled.

Notes.

Supply of Iced Water to Paris.—Every one who has visited the cafés of Paris, must have observed the *carafes frappées*, that is to say, water bottles with a great block of ice, often very curiously crystallised inside. The production of these frozen decanters has become a very important operation, which is carried on at ice houses situated in the Boulevard Lannes, on the Passy side of the Bois de Boulogne. The establishment consists of ten great underground ice vaults, protected from the action of the sun by buildings raised over them, and covered with straw. Each of the ice vaults is nearly five hundred feet long, and about thirty-six feet high, and the ten are capable of holding ten thousand tons of ice. The department in which the water bottles are frozen is a curiosity. These decanters are two-thirds filled with filtered water in the receptacles of the freezing machine, and the freezing is produced by means of salt water and vaporised ether. A steam engine of sixteen horse-power is employed to work two air-pumps, which produce the vacuum in the copper reservoirs placed in the salt-water basins. After a short time, the water within the decanters is reduced below freezing point, and yet it is not frozen. Each bottle is then taken in hand by a workman and its contents rapidly stirred with a stick, and the freezing takes place as if by magic. More than six thousand of these frozen carafes are sent out daily in hot weather at a very trifling charge, and each being filled up with fresh water as often as required, will serve during a long summer day and cool ten gallons of water, so that the Parisians are supplied by this establishment with about sixty thousand gallons of iced water per day. The economy of this system, as compared with the use of pure broken ice, half of which is wasted, is very evident; and, besides, the ice in the frozen carafes is produced from pure filtered water. Why should not London and other large towns have their frozen water bottles as well as Paris?

Decimal Coinage in Italy.—The value of the money coined in Italy from September, 1862, to 30th June, 1868, was as follows:—

	frs.	cents.
Gold coin	200,132,000	0
Silver do	165,062,825	0
Bronze	65,573,980	14
Total frs.	430,768,805	14

The following is the value of the old coinage of the various Italian States withdrawn from circulation during the same period:—

	frs.	cents.
Piedmont and Sardinia	27,607,014	84
Lombardy	4,722,227	95
Parma	1,247,234	48
Modena	524,762	66
Rome and Bologna	54,842,071	79
Tuscany	84,123,802	37
Naples and Sicily	155,653,253	98
Venice	4,514,029	50
Foreign coin	16,124,436	55
Total	349,358,834	12

Railway Orchards.—A proposition is now before the French railway companies to plant the slopes of the railways with fruit trees. The plan suggested is to support the trees, pear, gooseberry, &c., according to soil and position, on light iron espaliers. The cost of cultivation is estimated at less than sixpence a yard. The idea is not quite new, for in certain parts of Germany and in the Grand Duchy of Luxembourg the lines are bordered with fruit trees. Nothing is to be said against such an economical arrangement, but many travellers on the French lines will regret the lilacs, syringas, and other shrubs and flowers which now flourish there in many places.

French Revenue Accounts.—The Minister of Finance has published the accounts of income for the first nine months of the present year, as compared with 1866 and 1867. The revenue from indirect taxation has amounted this year to the sum of £37,195,200; in 1866 it amounted to £36,485,200, leaving a balance in favour of 1868 of £710,000, but certain diminutions which have taken place in the extra tax on registration, import duties, &c., bring up the real augmentation to £1,100,000. Compared with last year, the increase is equal to £439,360, but 1868 being leap-year, this sum is actually reduced

to £317,160. The items in which the great differences appear, are:—In augmentation, registration, mortgage, and other fees, import duties, taxes on potable liquors, and on the home-made sugar, and postage, and in diminution duties on French colonial sugar, on foreign sugar and salt, and on the sale of tobacco, snuff, &c. The whole of the improvements, however, belong to the first and second quarters of the year, for the third quarter of 1868 shows a deficit amounting to £183,800, as compared with the same quarter of last year.

The Electric Light.—The *Athenæum* says, "M. Haussmann's irrepressible energy, directed to the reconstruction of Paris, has recently assumed a new phase. Daylight being insufficient to enable certain works to be completed in the desired time, the aid of M. Serrin's beautiful and ingenious apparatus for the automatic regulation of the carbon electrodes of electric lamps has been called into requisition. The intense nature of this light is such that it has been used with great success in obtaining photographs of the catacombs under Paris, and also of the sewers, and it is now employed to enable masons and other workmen to labour through the night hours."

Patents.

From Commissioners of Patents' Journal, October 23.

Grants of Provisional Protection.

Acid liquors, utilising waste—3119—N. Smith.
Animal skins, tanning—3141—L. Clozel.
Bale ties—2974—T. Briggs.
Barometers, &c.—2924—A. Barclay.
Bath-rooms, &c., supplying with hot water—2888—F. Dyer.
Boots, &c., application of elastic fillets, &c., to—2920—J. Macintosh and W. Boggett.
Boots, &c., button-holes for—2926—J. H. Glew.
Buckles, &c.—2849—F. F. Greenwood.
Bulldog, &c., machinery for reducing—3107—B. Walker and J. F. A. Pflaum.
Candlesticks—2992—J. Mabson.
Carriages, &c., wheels for—2936—J. Fry.
Cartridges—3068—W. Richards.
Casks, filling—3008—J. D. Scally.
Chandeliers, extension—3038—W. R. Lake.
Charcoal, animal, preparing and cooling—2970—J. Gregory.
Chimneys, smoky, preventing and curing—3097—T. W. Dyer.
Coal, &c., getting—3145—J. G. Jones.
Compass deviations, correcting and preventing—2986—H. J. and J. W. Girdlestone.
Cooking apparatus, &c.—3054—F. P. Warren.
Cotton, &c., flyers used in spinning—3058—J. H. Johnson.
Door knobs—3089—T. Heacock.
Door plates, &c.—3099—L. Hannart, N. A. Aubertin, jun., and W. J. Cunningham.
Earth closets and commodes—2972—R. Duncan.
Electricity, generating by heat—3060—E. T. Hughes.
Electro-telegraphic conductors, &c.—3129—W. A. Lyttle.
Enamel applicable to wood, &c.—3042—E. Tchepelevsky.
Explosive compounds, apparatus for firing—3115—F. A. Abel and E. O. Brown.
Fatty matters, hardening—3026—C. E. Brooman.
Fire-arms, breech-loading—3002—G. Unwin.
Fire-places, top bar for—3139—R. Rowbotham and C. Ezard.
Fuel, artificial—2962—G. F. Morant.
Fuel, &c., economising—2976—J. Wadsworth.
Furnaces, &c., used in metallic operations—3137—W. Yates.
Gas burners—2944—J. Wright and W. H. Williams.
Gas burners—2980—E. T. Hughes.
Gas regulators—3109—D. and G. Hallas and S. J. Woodhouse.
Gas regulators, &c.—3133—W. T. Sugg.
Gates and turnstiles on railway level crossings—2988—G. Daws.
Gauges for indicating the pressure of steam, &c.—2994—A. Lafargue.
Grain, decorticating—3016—W. E. Newton.
Hoisting gear, prevention of accidents from the breaking of chains or ropes of—2952—P. J. E. Caron.
Hydraulic presses—3040—E. T. Bellhouse and W. J. Dorning.
Hydraulic rams—3048—T. Garnett.
Hydrocarbon liquids, generating and burning the vapour of—3151—W. R. Lake.
Iron and steel—3034—E. A. Cowper.
Iron and steel—3050—J. G. Willans.
Iron, converting cast into wrought—2968—C. D. Abel.
Kilns for burning clay, &c.—3022—A. Monsnergue.
Leather, &c., cutting—2934—E. Death and J. Ellwood.
Locomotive engines—3012—C. B. Chardon.
Metals, purifying—2996—W. E. Newton.
Oakum, &c., picking—2971—G. A. C. Bremme.
Omnibus traffic, apparatus for facilitating—2969—W. McAdam.
Planing machinery, &c.—2946—C. Scriven and W. Holdsworth.
Railway trains, communication between passengers, &c., in—2956—J. Ramsbottom.
Railways, apparatus for the increase of safety on inclines of—2958—C. F. Whitworth, G. Pearson, and W. Smith.
Railways, permanent way of—2954—J. H. Johnson.
Ratchet and crank braces—3024—R. F. Drury and J. E. and W. G. Walker.
Rivets, &c., metallic, manufacturing—2146—E. H. Waldenstrom.
Rouge and polishing powders—3004—A. T. Becks and G. Johnson.
Sample bags or envelopes—3046—A. G. Straker.
Saws, circular—2928—W. Thomas.
Sewing machines, &c.—3000—O. W. Powers.
Sewing machines—3103—W. J. Curtis.
Ships' binnacles—3091—W. E. Newton.
Ships' bottoms, composition for protecting—2923—H. J. B. Kendall.
Ships' bottoms, removing animal and vegetable adhesions from—3030—J. Baker.
Show boards, &c.—3125—A. Field and A. W. Tuer.
Shuttles—3062—J. Wood and J. Arundale.
Smoke, consuming—3010—J. Murray and O. Harling.
Spanners—3045—F. S. Gilbert and W. G. White.
Steam pumps, &c.—3044—G. Graveley.
Stone, &c., artificial—3006—H. Highton.
Surface condensers, &c., packing for the tubes of—3056—D. Marshall.
Telegraphic cables, &c.—3051—J. Aspinall.
Tents—2904—P. E. L. W. Stockmann.
Tents, &c.—2948—G. Ritchie.
Tin-plates, converting tin-plate shearings into—2984—W. Hallam and H. J. Madge.
Tobacco jars—3135—R. Spice.
Tobacco, manufacturing—2964—H. Gibson.
Wall papers, &c.—3064—J. Watson.
Wall papers, &c.—3066—J. Watson.
Washing apparatus—2874—C. H. Hudson.
Watches, clocks, &c.—3070—H. Josephi.
Water, heating by means of steam—2930—H. Woods.
Weights, &c., raising and lowering—2978—A. M. Clark.
Wheat, &c., separating and cleaning groats of—3113—R. Tod.
White-lead—2940—I. Baggs.
White-lead—2998—J. H. Johnson.
Wool, &c., washing—2960—J. Petrie, jun.

Inventions with Complete Specifications Filed.

Elastic moulds—3155—H. A. Bonneville.
Fire-arms, breech-loading—3165—W. R. Lake.
Carriages for ordnance, &c.—3196—W. Fitch.
Safety lamps—3198—H. A. Bonneville.

From Commissioners of Patents' Journal, October 27.

Patents on which the Stamp Duty of £50 has been paid.

2698. T. Routledge, D. Bentley, and J. B. Jackson.
2717. R. Biessy.
2756. T. R. Crampton.
2786. H. Larkin.
2835. H. Bessemer.
2838. J. B. Elkington.
2885. C. Cochrane.
3009. T. Redwood.
2726. J. Wright.
2759. E. Hunt.
2766. L. Bennett.
2813. A. Boisonneau.
2860. R. C. Mansell.
2738. A. Chaplin.
2762. H. Wilde.
2771. T. Greenwood.
2784. W. and E. Westmoreland.
2902. C. W. Jones.
2987. W. Clark.
2751. G. L. Scott.
2767. G. W. Bacon.

Patents on which the Stamp Duty of £100 has been Paid.

2583. W. T. Weston.
2632. J. H. Johnson.
2646. C. Brison and A. Chavanne.
2669. E. Chambers.
2656. I. L. Pulvermacher.
2668. W. Wharton.
2834. W. J. Hay.
2583. W. T. Weston.

Registered Designs.

4965—Aug. 28—Apparatus for fixing the height of window and other blinds, maps, and other similar articles—J. Collings, Birmingham.
4966—Sept. 12—The universal sovereign protector—George Edward Allshorn, Clifton-house, Dalston.
4967—Sept. 18—Ale and porter tap—John Cloves, Birmingham.
4968—Sept. 18—Breeches stretcher (The Genuflexure)—John Evans, 18, Old Compton-street, Soho.
4969—Sept. 23—A card case—G. H. and J. James, 11, Newgate-street, E.C.
4970—Sept. 28—Improved folding meat safe or lantern—Geo. Burt, Birmingham.
4971—Oct. 10—Ear-ring—Edward Umfreville, 42, Frederick-street, Birmingham.
4972—Oct. 13—Salt cellar—Elkington and Co., Birmingham.
4973—Oct. 15—Expanding fish-hook—Joseph Hemming and Joseph Welch, Redditch.
4974—Oct. 27—Photo-camera lucida—W. Whiting, 29, Park-street, Camden-town; and John Checketts, 14, Elm-grove, Hammersmith.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 6, 1868.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Fifteenth Session of the Society will commence on MONDAY,* the 23rd NOVEMBER inst., when the Opening Address will be delivered by Lord Henry G. Lennox, M.P., Chairman of the Council.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock :—

1868. November	—	—	23*	25	
„ December	2	9	16	23	—
1869. January	—	—	20	27	
„ February	3	10	17	24	
„ March	3	10	17	—	31
„ April	7	14	21	28	
„ May	5	12	19	26	
„ June	—	—	—	—	30†

For the Meetings previous to Christmas, the following arrangements have been made :—

NOVEMBER 23.—Monday.—Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.

November 25.—"A Glance at the Past and Present of the Society of Arts, with some Suggestions as to the Future." By S. T. Davenport, Esq., Financial Officer of the Society.

December 2.—"Further Notes on the Productive Industries of Natal." By Dr. Mann, Superintendent of Education and Special Commissioner for the Colony.

December 9.—"On the Theory of Boiling, in connection with some Processes in the Useful Arts." By Chas. Tomlinson, Esq., F.R.S., F.C.S.

December 16.—"On Artificial Freezing." By Dr. B. H. Paul.

December 23.—"Description of the Electric Organ." By Henry Bryceson, Esq.

A book of blank Tickets of Admission to the Meetings is now being sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

The first Course of Cantor Lectures for the ensuing Session will be "On the Aniline or Coal Tar Colours," by W. H. Perkin, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 7th, 14th, and 21st December, at Eight o'clock. Other courses are being arranged, particulars of which will appear in the *Journal.* These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

* As the Elections render it impossible for the Chairman of the Council to attend on the 16th inst., the Opening Meeting is unavoidably postponed to Monday, the 23rd of November.

† The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

Institutions.

The following Institutions have been received into Union since the last announcement :—

London, South London Working Men's College, Collingwood-street, S.E.
Newcastle-upon-Tyne, Mechanics' Institution.
Riddings (near Alfreton), Mutual Improvement Association.
St. Martin's (Stamford), Evening School of Art.

Prizes for Art-Workmen.*

The Council of the Society of Arts hereby offer Prizes for Art-Workmanship, according to the following conditions :—

I. The works to be executed will be the property of the producers, but will be retained for exhibition, in London and elsewhere, for such length of time as the Council may think desirable.

II. The exhibitors are required to state in each case the price at which their works may be sold, or, if sold previously to exhibition, at what price they would be willing to produce a copy.

III. The awards in each class will be made, and the sums specified in each class will be paid, provided the works be considered of sufficient merit to deserve the payment; and, further, in cases of extraordinary merit, additional awards will be given, accompanied with the medal of the Society.

IV. Before the award of prizes is confirmed the candidates must be prepared, if called upon, to execute some piece of work sufficient to satisfy the Council of their competency.

V. *Bonâ-fide* Art-workmen only can receive prizes; and medals may be substituted for money prizes of equivalent value at the option of any successful competitor.

VI. Although great care will be taken of articles sent for exhibition, the Council will not be responsible for any accident or damage of any kind occurring at any time.

VII. Prices may be attached to articles exhibited and sales made, and no charge will be made in respect of any such sales.

VIII. All the prizes are open to male and female competitors on equal terms; and, in addition, *special* prizes, on the same scale as to amounts, will be awarded, at the discretion of the judges, among female competitors; although the specimens exhibited by females may not be as good as those exhibited by males, not deemed worthy of reward.

IX. Any producer will be at liberty to exhibit, either in his own name or through his workmen, any work or works as specimens of good workmanship, in the various classes, provided that the work or works be accom-

* The Worshipful Company of Salters contribute ten guineas annually to this prize fund. The North London Exhibition prize consists of the interest of £167 7s. 3d., invested in the name of the Society of Arts, to be awarded by the Council "for the best specimens of skilled workmanship" at the Society's Exhibition of the works sent in for the prizes named above.

panied with a statement of the name or names of the artisans who executed their respective portions; and if the work or works be sufficiently meritorious, extra prizes will be given to the artisans who have executed them.

X. Artisans may, if they think fit, exhibit works executed by them of a similar character to the prescribed subjects, although not exactly correspondent therewith. If the works be sufficiently meritorious extra prizes will be awarded.

XI. All articles for competition must be sent in to the Society's house on or before Saturday, the 19th of December, 1868, and must be delivered free of all charges. Each work sent in competition for a prize must be marked with the Art-workman's name, or, if preferred, with a cypher, accompanied by a sealed envelope giving the name and address of the Art-workman. With the articles a description for insertion in the catalogue should be sent. The works will be exhibited at the Society's House, and afterwards at the South Kensington Museum.

XII. Two or more Art-workmen may concur in the production of any article sent in for competition; but in that case the names of, and respective parts taken by, each must be specified when the article is sent in, together with a statement of the proportions in which they may have agreed, if successful, to divide any prize which may be awarded.

*** The Council are happy to announce that many of the works which received first prizes in the competitions of 1863, 1864, 1865, 1866, 1867, and 1868 have been purchased by the Department of Science and Art, to be exhibited in the South Kensington Museum and the Art Schools in the United Kingdom.

The Council of the Society of Arts, in framing the above conditions and preparing the subjoined detailed list of subjects for competition, have had under consideration the recommendations of the Society's judges, as set forth in their last report, together with the opinion expressed by the Art-workmen assembled on the occasion of the announcement of awards made in connection with the last competition.

The principles upon which their programmes for the last six years have been based, namely, using the competition as a means of testing the power of the Art-workman of the present day to re-produce choice models of ancient art-industries, are believed to have worked most successfully; and the Council are of opinion that, however fitting it may be at the present time to remodel their programme, it will be well to return, from year to year, or from time to time, to the programme which has proved so useful in the past. Instead of making partial changes in that programme, they have deemed it best to offer one of entire novelty, having for its special objects—Firstly, To encourage the revival of the practice of dormant or rarely used processes of handicraft, by which the field of Art-industry may be extended, and Art-workmen thereby be, in course of time, more adequately remunerated as a class; and, secondly, to exercise the artisan in the practical application, in accordance with recognised principles of good taste, of the art-processes so to be revived, to objects of ordinary use, hitherto for the most part undecorated.

In considering the apportionment of the money prizes to the respective subjects, attention has been paid to the probable expense to which any Art-workman must be put in each case who may enter upon the competition.

It will be observed that in the First Division, "Specimens of Art-workmanship in prescribed processes," the money prizes are in all cases of smaller amount than in the Second Division, "Specimens of the application to ordinary industry of prescribed Art-processes."

The reason for this difference consists in the fact that the Council look for minor specimens in the one case, involving the workman in little expense beyond the risk of the loss of his own time; against which he should set the value of the improvement he may derive from making the effort under any circumstances; while in the other they expect to see a finished article of a more elaborate nature fit for immediate use by any purchaser.

Art-workmen are earnestly recommended to pay due regard to simplicity and harmony, as well as richness and elaboration, in all their productions, since the judges will estimate no less highly purity of line and good balance of colour or of plain and enriched surfaces, than they will any merits of mechanical execution.

The taste exercised in the selection of objects for ornamentation will be considered in the adjudication of the prizes.

First Division.—Specimens of Art-workmanship in Prescribed Processes.

For the best specimen of:—

A.— Enamelling on sheet metal, in various colours, combined with gilding fluxed over.—One prize, £7 10s., for the best, and one of £5 for the second best.

B.—Enamelling on metal, the enamel filling incised lines and surfaces; both opaque and translucent enamels to be introduced on the same plaque.—One prize, £7 10s., for the best, and one of £5 for the second best.

C.—Enamelling on a metal base, the compartments for the enamels being formed by filigree, after the manner of Chinese, Japanese, or Byzantine enamel work. —One prize, £7 10s., for the best, and one of £5 for the second best.

D.—Painting with enamel colours and fired on earthenware slabs.—One prize, £7 10s., for the best, and one of £5 for the second best.

E.—Ditto, on curved or moulded surfaces of earthenware.—One prize, £10, for the best, and one of £5 for the second best.

F.—Ditto in transparent and opaque colours, combined with gilding, fluxed on clear glass.—One prize, £7 10s., for the best, and one of £5 for the second best.

G.—The execution of "filigrani" in glass, after the Venetian fashion.—One prize, £7 10s., for the best, and one of £5 for the second best.

H.—Painting and lacquering on wood or papier maché, after Persian and Indian methods.—One prize, £7 10s., for the best, and one of £5 for the second best.

I.—Damascening in gold, silver, and copper, on steel or iron.—One prize, £7 10s., for the best, and one of £5 for the second best.

J.—Ditto on silver in combination with niello. (The study of Japanese specimens is recommended.)—One prize, £10, for the best, and one of £5 for the second best.

K.—Ditto on brass or white metal.—One prize, £10, for the best, and one of £5 for the second best.

L.—Combination of marquetrie with carving in low relief. (The study of M. Fourdinois' cabinet at South Kensington is recommended.)—One prize, £10, for the best, and one of £5 for the second best.

M.—The combination of gilding or gilt-metal work, with incised ivory or hard wood.—One prize, £7 10s., for the best, and one of £5 for the second best.

N.—Inlay of hard woods, ivory or tortoiseshell, in softer woods or other substances in the solid.—One prize, £7 10s., for the best, and one of £5 for the second best.

O.—Combination of mosaic with carved marble.—One prize, £10, for the best, and one of £5 for the second best.

P.—Ditto and inlay with carved stone.—One prize, £7 10s., for the best, and one of £5 for the second best.

Q.—Carving, involving the combination of not less than three different woods.—One prize, £7 10s., for the best, and one of £5 for the second best.

Second Division. — Specimens of the Application to Ordinary Industry of Prescribed Art Processes.

For the best specimens of :—

A.—The most beautiful dial-face for a clock, not less

than nine inches in diameter, in any metal or metals, the principal decoration being by painted enamel on the surface.—One prize of £15 for the best, and one of £10 for the second best.

B.—The most beautiful frame for a miniature; not less than five inches by three inches, in any metal or metals, the principal decorations being produced by enamelling on incised lines and surfaces (as per Process B., First Division).—One prize of £10 for the best, and one of £5 for the second best.

C.—The most beautiful small metal ring-tray for a lady's dressing-table, decorated with filigree enamel (Process C., First Division).—One prize of £10 for the best, and one of £5 for the second best.

D.—The most beautiful earthenware slab, not less than one foot by six inches, painted in enamel colours and fired, for insertion in the frieze of a stone or marble chimney-piece.—One prize of £15 for the best, and one of £10 for the second best.

E.—The most beautiful tablet in moulded or modelled earthenware, painted with enamel colours and fired, for monumental or commemorative purposes, or (say) for bearing the name of a street, or indicating sections of a museum.—One prize of £15 for the best, and one of £7 10s. for the second best.

F.—The most beautiful drinking-vessel of clear glass, decorated in colour, &c. (as per process F., First Division).—One prize of £7 10s. for the best, and one of £5 for the second best.

G.—A champagne glass, with filigrani in the cup, and stem, and foot.—One prize of £7 10s., for the best, and one of £5 for the second best. N.B.—Filigrani may be white or any colour.

H.—A pair of boards for book-covers, suitable for an octavo volume. Decorated within and without according to Process H., First Division.—One prize of £10 for the best, and one of £7 10s. for the second best.

I.—A set of fire-irons, enriched with damascening (as per Process I., First Division.)—One prize of £15 for the best, and one of £7 10s. for the second best.

J.—A silver drinking-cup, to hold not less than half a pint, decorated with damascening and niello (as per Process J., First Division.)—One prize of £15 for the best, and one of £7 10s. for the second best.

K.—A musical instrument, say trumpet, cornet, or saxe-horn, decorated with damascening (as per Process K., First Division.)—One prize of £15 for the best, and one of £10 for the second best. N.B.—It is indispensable that no process shall be used which shall diminish the tone or sonority of the instrument.

L.—An envelope-case, enriched with carving in low relief and marquetrie.—One prize of £15, and one of £7 10s. for the second best.

M.—The most beautiful flute, decorated with gilding, carving, gilt metal work, or incised ornament.—One prize of £15, for the best, and one of £7 10s. for the second best.

N.—A small musical instrument (as a violin or guitar), or any conspicuous or principal part of a large instrument (as a set of pianoforte or organ keys), decorated with inlay of hard woods, ivory, or tortoise-shell, in softer woods, or otherwise combined in the solid.—One prize of £20 for the best, and one of £10 for the second best. N.B.—It is indispensable that no process shall be used which shall diminish the tone or sonority of the instrument.

O.—A pedestal for a bust (less than life-size), forming a clock-case, with an aperture for the dial not less than six inches diameter, consisting of carved marble combined with mosaic.—One prize of £20 for the best, and one of £15 for the second best.

P.—A chimney-piece, suitable for a lady's boudoir; opening, three feet wide by three feet three inches high, in carved stone, enriched with mosaic and inlay.—One prize of £15 for the best, and one of £10 for the second best.

Q.—An occasional table, with a round top, say two feet six inches diameter, decorated with carving, involving the combination of not less than three different woods.—One prize of £15 for the best, and one of £10 for the second best.

R.—Ornamental ironwork for the balcony of a window, 3 feet 6 inches wide, height of balcony 1 foot, the work to be wrought; the specimen may be oiled but not painted.—One prize of £10 for the best, and one of £5 for the second best. N.B.—Extreme elegance is desired in this specimen rather than over-much work.

Proceedings of Institutions.

UNION OF LANCASHIRE AND CHESHIRE INSTITUTES.

The annual meeting of subscribers and delegates of this Union was held on Wednesday, the 28th ult., at the Manchester Mechanics' Institute, Mr. Alderman RUMNEY in the chair. There was a large attendance of delegates.

The HON. SECRETARY (Dr. Pankhurst) read the annual report of the council, of which the following is an abstract:—

The number of Institutes now in union is 126, of which ten have been admitted during the past year. The following is a summary of returns from 99 Institutes:—Number of members (99 Institutes), 24,159; number of female members (56 Institutes), 2,512; number of members attending elementary evening classes last winter (98 Institutes), 10,145; number attending government science classes in Lancashire and Cheshire, 2,829; number of volumes in library, 157,550; income (89 institutes), £25,680. The value and necessity of statistical information, with regard to the condition of education in the Institutes have been frequently insisted upon by the council. The organization of the Union has been energetically worked in all its departments. The visiting agent (Mr. Lawton), to whose zeal, energy, and devotion the Union owes so much, has never ceased to make the supervision and examination of the class work of the Institutes a leading part of his occupation. He has, in addition to the other departments of his labours, been remarkably successful in strengthening old classes and forming many new ones. The principles which the council have pursued in forming a graduated scheme of examinations have in former reports been fully explained. The result has been that the field of competition has been extended, and the stimulus of honour and reward applied just at those points and in those subjects where experience has proved that it is most needed. The council have never allowed themselves to lose sight of the real relation between thorough elementary instruction and systematic technical education. After giving a classified statement of the result of the examinations, the report proceeded to state that the object of the council in establishing the special prize scheme has been achieved in an eminent degree. It has stimulated those who have disciplined their faculties by regular training to engage in competitive contests where success tended to the acquisition of sound and comprehensive views of the scientific principles of the arts of production and design. Other subjects in the scheme relate to the laws of economic science. The plan of granting rewards upon the results of competition, of which the tests should be attainment of "the highest aggregate number of marks" in the subjects of several examinations, has proved both sound and successful. The foundation of the "Rumney Science and Art Exhibition" was a subject of congratulation on the occasion of the last annual meeting. Happily, the excellent influence of this provision for successful merit has been doubled, by the establishment of a second "exhibition," by means of the association of the grant of the Government with the funds so kindly furnished by Mr. Rumney. This "exhibition" will, without doubt, provoke imitation on the

part of others who value the cause of popular education. The great success of the Union in the diffusion of science teaching, so manifest on the occasion of the last report, has been more than maintained during the year just closed. In the organisation of science classes in connection with the Department, and in the economical distribution of teaching power, the original policy of the Council has been steadily prosecuted. Upon the number of science classes in connection with the Union, and the area over which they extend, the official inspectors of the Government report in terms of the highest commendation. An analysis of the results of the Government science classes shows that in Lancashire and Cheshire 2,829 students were, during the past year, receiving instruction. Of this number 180 attended science classes in connection with day schools, while 435 attended classes not connected with the Union. There was, therefore, the considerable number of 2,214 members attending evening science classes in the Lancashire and Cheshire Institutes of the Union. At the May examination 1,499 "results" were obtained by Lancashire and Cheshire candidates, of which number 929 were artisans, excluding schoolmasters, clerks, and bookkeepers. Hence it appears that the present provision for science teaching has placed many of the artisan class under instruction in science, whilst the subjects principally taught show that the information communicated relates very intimately to the principles and methods of the industries and arts, in the practice of which they are engaged from day to day. The Council are deeply sensible of the defective character of the existing provision for technical education, but they use every exertion in their power to apply to the fullest extent the means within their reach, while they endeavour, as far as in them lies, to prepare the way for a more comprehensive scheme. It is demanded by the necessities of the time that an efficient system, on the one hand of elementary instruction, and on the other of systematic science teaching, should be placed in a state of mutual inter-dependence, so that the course of mental discipline on the part of the student may be constant and continuous. The principles upon which the Council originally framed their procedure with regard to female instruction they still acknowledge and follow. That particular excellencies and attainments must be subsequent to and based upon adequate general culture is a proposition of universal value and application in all true education. The prize scheme in this department deserves special attention. The Council of the Society of Arts have offered a special prize of £10 10s. No extensive action will take place in female education until there is a cordial recognition of the principle that a noble life in woman depends as essentially upon true mental culture as it does in man.

The statement of the financial position of the Union appended to the report showed that the receipts for the year ending August 31 amounted to £405 0s. 6d., whilst the sum expended was £416 1s. 11d. There was a balance of £11 1s. 7d. against the Union.

The following is an extract from the report of the visiting agent (Mr. Thomas Lawton):—"During the past year I have inspected the elementary evening classes of 58 Institutes, and delivered 50 public addresses. Arrangements have been made for the opening of new classes at the following Institutes:—Accrington, Altrincham, Chapel-Town, Church, Farnworth, Freetown, Glossop (this class will include members from six Institutes in the Glossop district), Haslingden, Hurst, Pendleton Club (two Institutes), Southport, Staleybridge (three Institutes), Sunnyside, near Bolton; Upper Mill (two Institutes), Whitworth, St. George's Schools, Oldham-road, Manchester; Openshaw, Colne, Blackley, and St. Helens. With three exceptions the new classes are for geometrical and mechanical drawing and building construction. Last winter I examined 3,217 pupils in dictation and arithmetic. There was a decided improvement in the organisation of the elementary classes. The teaching power was much better, the black board was more frequently used, dictation was more generally practised, and in many cases the course of study was specially arranged to prepare the pupils for the elementary examinations. The results of my inspection vary considerably. In some districts the papers were very creditable, while in others both the dictation and the arithmetic were very poor. In some Institutes the per-centage of errors in spelling was much greater than last year. This may be accounted for on the ground that the material was much worse in 1867 than in 1866. There was a large influx of new members, and many of these were almost unable to read or write. But while on the other hand it may and does for the present bring down the status of an Institute in the inspection, yet the entrance of a large number of ignorant youths upon regular class instruction amply compensates for the loss of three or four per cent. of examination results. Out of 3,217 examined, 595 were absolutely unable to write down a simple sentence, 711 made three mistakes and upwards in spelling. 1,300 were able to put down from dictation and work correctly a simple sum in addition. I would strongly recommend committees to see that the pupils are at certain times, say once a month, put through a written examination. With very few exceptions, the arrangements for female education do not rise above reading, writing, dictation, arithmetic, and sewing. It is very desirable that classes for special instruction in domestic economy and physiology, relating to the laws of health, should be organised. The small number of candidates at our examinations in these subjects is attributable mainly to the fact that there is scarcely a class in existence. A class, numbering about fifteen pupils, has just been established at Church-Kirk, near Accrington. At the government science examinations, held in May last, not a single certificate was awarded to female candidates, simply, as I believe, because no one was examined. At the Society of Arts examination the following results were obtained:—Bacup, one 3rd class, domestic economy; Bury, one 3rd class, free-hand drawing; Droylsden, one 3rd class, domestic economy; Macclesfield, one 2nd class, domestic economy; Preston, one 3rd class, domestic economy; Salford W.M.C., four 3rd class, free-hand drawing: two 2nd, and one 3rd class, French; one 3rd class, German.

The Chairman moved the adoption of the report, which was seconded by Mr. T. Bazley, M.P.

The report having been adopted, a vote of thanks was passed to the council and the officers for their past services.

Dr. Pankhurst acknowledged the vote.

Mr. Traice moved the following resolution:—"That, in the opinion of this meeting, it is highly desirable that every Institution in Union should have well appointed classes for primary instruction, and science classes for geometrical drawing, mechanical and machine drawing, building construction, chemistry, animal physiology, and theoretical and applied mechanics, in addition to any class which may be appointed of special importance to particular districts."

Dr. Watts, in seconding the resolution, referred to the progress which had been made since the establishment of the union. In 1864, the number of certificates granted was 72, and in the present year 586. In the Society of Arts examinations, 247 certificates were earned in 1864, and this year the number was 422. In the Government Science Classes he found that in 1864 518 certificates were earned, and that number had increased this year to 1,499, 929 of which were taken by artizans. He found that in this last year the number of science class pupils was 600, and the total number of certificates earned throughout the country for the year was 8,654. Of that number the Institutions in the Lancashire and Cheshire Union had taken 1,499, or very nearly one-fourth. But they must be more active in the work even than they had been in the present year. There was plenty of room for it, because he found

that, according to the return of last winter, 59 of the Institutions of the union had science classes, and 63 had not. Some of them, possibly, had not even an elementary class. Looking to the state of instruction throughout the country, it seemed to him most reprehensible that an Institution should exist, calling itself a literary Institute, having no means of bringing up the youths who had been neglected in the primary schools, so as, at any rate, to enable them to read, write, and work out arithmetic. In some cases he was sorry to see that science classes had been attempted to be worked where elementary instruction had been very deficient, and consequently the work had been ineffective, as far as results went. The grand defect was, no doubt, a want of the elementary system. In Germany, for many years, the youth could get free instruction. In France a series of decrees had lately been issued, arising out of a commission which had been examining the state of instruction in Germany, and which sought to utilise all the French institutions in the same manner, and make it possible for every deserving youth to secure a free instruction. Wherever a grammar school existed in this country, public opinion should be taken, and either an improved teaching should be adopted, or the public, through the trustees—and if they refused, through the Charity Commissioners—should seek to have scientific teaching introduced. The Manchester Grammar School, after three years' fighting in Chancery, had got the liberty of admitting paying pupils, and now they had an additional income of £1,200 a year, and he hoped to live to see the time when it should be educating 1,000 scholars, forming a main feeder to a university, of which Owens College should be the centre.

The resolution was supported by Mr. Alderman WILKINSON (Burnley), Mr. DAVID MORRIS, Rev. Mr. STORREY, Mr. PLANT, and Dr. PANKHURST, and unanimously adopted.

The proceedings terminated with a vote of thanks to the Chairman.

In the evening the Marquis of Salisbury distributed the prizes in connection with the Union in the Free-trade Hall. The chair was occupied by Mr. Thomas Bazley, M.P., and amongst those present were Mr. Jacob Bright, M.P., Sir Edward Watkin, M.P., Mr. Wright Turner, Principal Greenwood (Owens College), Mr. Ernest Jones, &c.

Before the presentation of the prizes the Marquis of SALISBURY delivered an address on education. He deprecated the collection of funds for educational purposes by local rating, which had its advantages when economy was an object; but in the present case, when they were desiring rather to stimulate an expenditure in a matter whose importance is not sufficiently appreciated, he deprecated the application of a machinery which has excessive economy for its chief object. That was the reason why he, when it came to a question—as he hoped it would soon come—as to a larger expenditure of the public money for the cause of education, would recommend grants from the Imperial exchequer in preference to the adoption of local rates. The great difficulty, however, to be overcome was the indifference of the people on the subject of education, and to remedy this they had heard proposals, which sounded strange to English ears, of compulsory laws for forcing parents to send their children to school, whether they liked it or not. It was true that such laws existed in several other countries, but he thought them utterly unsuitable to England. For his own part he viewed with apprehension these recommendations for compulsory legislation. His fear was that, if they did not make a great success, they would make a tremendous failure; if they did not succeed in driving children into schools, they would drive the parents into opposition to all schools; they would implant in their minds a hatred of education, as of something directly imposed upon them, which would do more to hinder their efforts in the future than any slackness or tardiness of which they had to complain now. He believed that in the spirit which animated these confederated Institutes a more excellent way would be found.

After enlarging upon the subject at considerable length, the noble Marquis distributed the prizes to the successful candidates, and accompanied the gift of each prize with a few appropriate words of encouragement.

Mr. JACOB BRIGHT, M.P., moved a vote of thanks to the Marquis of Salisbury.

Sir E. WATKIN, M.P., Principal GREENWOOD, of Owens College, and Mr. ERNEST JONES supported the resolution, the latter gentleman dwelling at some length upon his conviction that there was a thirst for education among the working classes, and a desire for the enactment of compulsory education.

The Marquis of SALISBURY acknowledged the compliment, and moved a vote of thanks to the chairman.

Mr. BREMNER having briefly seconded the resolution, which was carried amid general applause, the Chairman responded, and the meeting separated.

YORKSHIRE UNION OF MECHANICS' INSTITUTES.—*Todmorden Mechanics' Institute.*—The annual *soirée* of this Institution took place at the Oddfellows' Hall, which was crowded to excess, on October 21. In the absence of Mr. J. Fielden, the president, who is contesting the Riding, the chair was taken by Mr. Eastwood, one of the vice-presidents. Addresses were given by Mr. Henry H. Sales, on "The Work of Mechanics' Institutes in connection with Technical Education;" by the Rev. A. Molesworth, vicar, on "Books;" and by Mr. Crowther, a factory operative, on "Social Duties." The Todmorden band and a party of glee singers took part in the proceedings. *Halton Institute.*—The annual lecture was given by Mr. Henry H. Sales, on the 29th ult., subject, "The history of the manufacture of clocks." The Rev. G. M. Platt, vicar of Whitkirk, occupied the chair. *Hunslet Mechanics' Institute.*—The annual *soirée* and distribution of prizes and certificates took place on the 27th ult. The large hall was densely crowded. Sir A. Fairbairn presided, and was supported by Mr. E. Baines, M.P., Aldermen Carter and Blackburn, Councillors Gaunt and Shepherd, &c. Letters of apology for unavoidable absence had been received from Alderman Luccock, Mr. Sales, and other gentlemen. *Gomersal Mechanics' Institution.*—A public meeting was held at this Institution on the 30th ult., to take into consideration the formation of science classes. Mr. H. Ellis, the president, who occupied the chair, urged upon the audience the importance of the subject they had met to consider, by reference to the circumstances of his own mill. After Mr. Henry H. Sales had detailed the scheme of the Department of Science and Art, and Mr. J. Patchett the programme of the proposed classes, together with the mode of instruction therein, it was unanimously resolved to establish the classes forthwith. *Hebden-bridge Mechanics' Institution.*—The fourteenth annual *soirée* was held in the mill of Messrs. Crossley, on the 31st ult., and as usual was largely attended. Mr. H. Horsfall, president, in the chair. The following addresses were given:—"On Science Classes," by Mr. Henry H. Sales; "On Perseverance," by Mr. Buckley; and "On the value of Knowledge," by the Rev. S. D. Hillman. *Pudsey Mechanics' Institution.*—On October 26th, the twenty-first annual *soirée* of the Pudsey Mechanics' Institute was held at the Town Hall at Pudsey. The *soirée* commenced about four o'clock; there were several "sittings down," and it is calculated that upwards of 400 partook of tea. In the evening a public meeting and concert was held, presided over by the Rev. H. J. Graham. Amusing and instructive addresses were delivered by the Rev. G. Robinson, C. B. Ellis, W. Jowett, and J. Bevan, Messrs. H. H. Sales, J. Walker, J. Town, S. Rayner, and J. Boyes. The annual report was read by one of the secretaries, Mr. Robert Salter, jun. The report stated that the premises were so limited that it had necessarily prevented them from accommodating their classes in a desirable manner,

and they had consequently to report a slight falling off in their numbers. The project for the erection of a new Mechanics' Institute met with the hearty support of their fellow-townspeople, and the committee strenuously endeavoured to give effect to their benevolent promises by the selection of a suitable site, though as yet without result. The committee, however, trust for aid from their public-spirited friends to help them out of their difficulty, and they were more encouraged to hope this from the fact of the noble aid hitherto afforded. The news-room was supplied with five newspapers daily, and seven weekly publications. It was well attended, and seemed to be much valued. There were male and female classes, attended by 85 male members and 44 females. The report, which was considered satisfactory, was unanimously adopted. The musical part of the entertainment was carried out by Miss Newbound, Miss Anna Hiles, and Mr. Pickles. Mr. Wilson presided at the pianoforte.

HAVRE EXHIBITION.

This exhibition has been closed, according to previous announcement, by a ceremony and banquet, at which the Minister of Commerce was the guest of honour, and was supported by all the notabilities of the town and department.

The minister made an excellent practical speech, in which he referred to the importance of the commercial relations between England and France, which since 1848 had grown in value from eight to seventy-two millions sterling per annum. He also made special reference to the large proportion of English amongst the foreign exhibitors, the numbers in the official report being as follows:—

Great Britain	494
North and South America	262
Germany	193
Belgium	178
Holland	123
Denmark	52
Switzerland	36
Turkey	32
Italy	23
Spain	21
Portugal	11
Persia	2
Siam (The King)	1
	1,428

The number of French exhibitors amounted to 4,427, exclusive of the fine art department, agricultural, horticultural, and other shows, in which foreigners took no part.

The lists of awards are not yet completely made up, but the following are the principal recompenses accorded to British exhibitors:—

DIPLOMAS OF HONOUR.

Messrs. Napier and Sons, Glasgow, the only recipients in the shipbuilding class of this highest award, with the exception of the Great Steam Company of the Messageries Impériales.
Messrs. Parkinson and Frodsham, London.—Chronometers.
Frank Buckland, Esq.—Pisciculture.
The Barrow Hæmatite Steel Company.
James Russell, Wednesbury.—Iron tubes.
Thomas Daniel and Co., London.—Colonial products.
Wayne and Co., Cardiff.—Coal.

GOLD MEDALS.

Mr. Claude Martin, Newcastle.—Anchors.
Kulberg, London.—Chronometers.
The Board of Trade, London.—Rocket life-saving apparatus.
Mr. George Borwick, London.—Baking powder.
Mr. Schmidt, Liverpool.—Road locomotive.
Price's Patent Candle Co.
Crace Calvert and Co., Manchester.—Phenic Acid.
Sir William Rose and Co., London.—Railway grease.
J. C. and J. Field, London.—Candles.
John Bowes and Co.—Coke.
John Brogden and Sons.—Coal.
Johnson and Co., London.—Cements.
Francis and Co., London.—Cements.
Hinks, Wells, and Co.—Steel pens.

The other medals and awards cannot be given with accuracy at present, and the list is long. In class I., shipbuilding, &c., there are a dozen awards to English exhibitors, and in classes III. and IV. as many, if not more.

PHOSPHATES IN AGRICULTURE.

Much attention has been given of late in France to the treatment of coprolites and other bodies containing phosphates applicable as manures; and an agricultural writer, M. Adolphe Bobierre, has given, in the *Journal de l'Agriculture*, of Paris, an account of the methods in action, and experiments in connection with, this important question.

"Guanos from tropical regions," says M. Bobierre, "bone ashes from the pampas of Central America, phosphorites and apatites from Spain and Portugal, coprolites and nodules from the early limestone formation, the refuse of sugar-houses and refineries, gelatine and button manufactories, everything in fact which contains phosphoric acid in any quantity, is now the object of serious, and generally profitable, application. Guano is obtained from the giddy heights of the mountain peaks in sight of the coast of Bolivia, while in the Ardennes it is found worth while to remove sixty or more mètres of argillaceous earth to obtain a ton of phosphated nodules, which, when washed and pulverised, rival bone-black."

The writer recognises the great activity of English chemists and agriculturists with respect to phosphates and the production of superphosphates, and the immense services which they have rendered; but adds, that the manufacture of superphosphates cannot be said to be perfect so long as the sulphuric acid is lost.

With respect to what has been done in France, M. Bobierre gives some interesting examples. The nodules of phosphate of lime have been largely employed in Brittany, in the cultivation of the Landes, in the place of bone-black, which has been used largely for thirty or forty years; this has created a very important employment; and we are told that many of the dealers in manure have entirely given up the sale of bone-black for that of pulverised fossil phosphates. Attempts have been made to separate the phosphates from the thirty per cent. or more of silicious matter with which they are associated, and also, on the other hand, to produce mixed manures, in which the activity of the phosphoric acid should be brought out in the most effective manner; these desiderata have been realised with considerable success. One process is to treat the rough phosphates with chlorohydric acid, and to recover the acid by evaporation. Another process mentioned is to convert the nodules into metallic phosphites by calcination in a blast furnace, in contact with iron ore, and then to transform the metallic phosphites into alkaline phosphates by the action of chloride of sodium at a high temperature. A third method is to attack the fossil phosphates by means of chloride of manganese with an excess of acid, obtained from the manufactories of chlorides for bleaching and other purposes; and, lastly, the fossils are sometimes simply calcined with gas tar or other similar substances.

The writer says that the results of the above methods and experiments have confirmed him in a previously expressed opinion, that if the nodules be reduced to a powder, and the powder exposed to the action of the air, and applied to soil requiring the application of phosphoric acid the fossil phosphates are perfectly assimi-

lated; and, further, that a mixture of fossil phosphates with ordinary manure yields the most admirable results, even in the case of old cultivated lands. "Let farmers only adopt the habit of throwing fossil phosphates under the animals," says the writer; "nothing more is required."

M. Bobierre seems to consider the treatment of nodules by means of acids as scarcely called for, but recommends this process strongly in the case of phosphorites, apatites, and certain phosphatic guanos found almost in a vitrified condition.

With respect to France, the writer observes that within a short distance of the coasts of Spain and Portugal, where the tribasic phosphates, containing 70 to 90 per cent. of phosphate, may be obtained at the rate of 2s. 6d. to 3s. 4d. per cwt., enormous quanties of hydrochloric acid are wasted, and worse than wasted, by being allowed to vitiate the air; the town of Marseilles, which converts large quantites of sea-salt into sulphate of soda, is destined to waste annually fifty millions of pounds of hydrochloric acid, which could, with very little trouble, be made to dissolve the natural phosphates.

In connection with the above may be mentioned a communication made by MM. Dusart and Pelouze, to the Academy of Sciences. One of these gentlemen, in a work entitled "Researches on the Assimilation of Phosphate of Lime," showed that, when acted upon by the gastric juice and very diluted lactic acid, phosphate of lime underwent partial decomposition, yielding a mixture of lactate and acid phosphate of lime; this led to experiments on the action of carbonic acid on phosphate of lime, with the view to throw some light on the obscure subject of the assimilation of phosphate of lime by plants. In 1864, M. Dumas noticed that carbonic acid was a solvent for phosphate of lime, by the effect of seltzer water, in softening ivory and abstracting all the calcareous phosphate therefrom. Other chemists have regarded this action as merely a solution of the salt by the carbonic acid, but MM. Dusart and Pelouze are of opinion that the action referred to is of a more complicated character, and that the acid absorbed gives birth to new products.

These gentlemen treated gelatinous phosphate of lime with water, saturated with carbonic acid, and found that after some time the acid had partly disappeared, and the phosphate itself had notably diminished; the transparent liquid obtained by filtration deposits by heat a crystalline precipitate, composed of phosphate and carbonate of lime. A series of nice experiments is then detailed to prove that bibasic phosphate of lime is produced, either by the action of carbonic acid on tribasic phosphate of lime, or by that of acid phosphate of lime on the carbonate. On this principle, say MM. Dusart and Pelouze, we have been able to produce it, by the following economic practical method, in such a state of purity that, compared with superphosphate, it contains double the active power in an equal volume. The matter to be dealt with, natural phosphates, coprolites, bones or animal charcoal, are placed in wooden vats lined with lead, communicating with each other and covered with a mixture of water and acid; any acid will effect the transformation, but we prefer hydrochloric acid or the weak nitric acid, which is wasted in so many works. When the acid has macerated in one vat, we remove it into a second, and if necessary a third, and the clear liquor is finally treated with pulverised carbonate of lime; effervescence is produced, carbonic acid is thrown off, and a precipitate of white crystalline bibasic phosphate of lime is thrown down. When sufficient carbonate is used the liquor is deprived of all the phosphate that it contains, and the precipitate is easily dried and washed.

These facts enable the chemists in question to form the following hypothesis concerning the manner in which nature enables plants to take up phosphates. It is evidently in the soluble form that the plant uses them for its nutrition; the common phosphate of lime, completely insoluble in water, should therefore be rendered soluble. Carbonic acid dissolved in water performs this first transformation in the same way that the stomach of an animal renders it soluble by converting it into acid phosphate and lactate of lime. The enormous quantity of superphosphate of lime employed in England, a practice now adopted in France, is quoted in support of the above theory. The superphosphate, which, according to these gentlemen, is only an impure acid phosphate of lime, when introduced into the soil attacks the carbonate of lime, under the influence of humidity, and is thus transformed into a bibasic phosphate. As it is impossible to imagine that any substance can be entirely absorbed by plants during the first few days of its being spread upon the ground, if the superphosphates do not undergo this transformation, which diminishes their too great solubility, they would certainly be carried down to the sub-soil by the first heavy rain, and part of their value thus lost. The facility with which bibasic phosphate of lime can be produced in a state of great purity renders it a promising substitute for common phosphate, and even for superphosphate, which is always mixed with a large proportion of other matters, which have no value as manure, and of which the cost of carriage is, therefore, at any rate, a loss to the farmer.

HIRN'S TELODYNAMIC TRANSMITTER.

This invention, already referred to in the *Journal* (present vol., p. 608), is thus described by Mr. Scott Russell, in his "Report on Prime Movers, Boilers, and Engines, specially adapted to the Requirements of the (Paris) Exhibition.*"

"It will now be necessary to say a few words to justify the selection I have made of the telodynamic transmitter of mechanical power, invented by M. Hirn, as a discovery or invention possessing high virtue as an engine for the future development of the mechanical resources of power for manufacturing nations. Who can have stood beside the Falls of Niagara, of the Rhine, or of the Clyde, without feeling awed by an overwhelming sense of the development of enormous power in the descent of these huge masses of water continually pouring, night and day, millions of tons through millions of feet? What engineer could stand by these millions of horse-power wasted and not feel the irresistible longing to turn this wasted power into sources of useful work? Unhappily, the situation of such a waterfall is not a matter of choice; it is there, and ordinarily not in a place convenient or capable of serving as the home of an industrious manufacturing community. It is impossible not to feel the wish to transport this waterfall into the midst of the adjacent town, to give life and motion to its mills and manufactories, so as to supersede its smoke and economise its fuel by the simple weight of falling water. M. Hirn has proposed to himself this simple problem:—'How shall I take the power of the water away to a distance from the waterfall without having the trouble of taking here also the water itself?' The solution he attained is remarkable, equally for its fascinating simplicity and its philosophical depth. 'I cannot carry the matter of the waterfall, but I will carry its spirit.' The essence of its power, the spirit of the waterfall, is *speed*. 'I will carry speed, velocity, force, from the waterfall; but I will not carry water, matter, weight, or, if I do, I will carry as little as I can of dead matter, and as much as I can of living speed.' This is what he sought to do—how to transport speed.

"This transport of power to great distances at small expense, both of capital and current cost, is what I have ventured to consider as a discovery or invention of no common importance in the future economy of nations. A river rushes down a broad valley; villages

* These "Reports" were prepared for the Science and Art Department, and are published in a Blue book.

and towns dot the valley and fringe the mountains; there is an industrious population which can only develop its manufacturing industry by the aid of foreign far-fetched supplies of fuel. M. Hirn leaves the villages where they are, but spreads out on each side of the river from river bank to mountain foot — one, two, three, or five miles on each hand — the long lines of his telodynamic communication. On the river itself he erects his water-wheels or prime movers, and there extracts from the water its moving force. He uses, to embody that force, a small mass of steel or iron, not more than a finger's thickness, or about the diameter of a musket-ball: this steel cord he shoots along, with a velocity of 100ft. in a second, or 6,000ft. a minute. Flying with this speed of 30 or 60 miles an hour, this dynamic messenger carries its deposit of power and delivers it out at the end of a journey of a few miles with only a moderate per-centage of loss on the way. How small this loss, it must have required the most sanguine of inventors to believe! indeed, at starting it was anything but small; his early transmitter of speed flew to pieces in the act of transmission, his steel rope wore out long before it had paid for its cost, and his wheels eat themselves to pieces faster than their work would pay for duty done. M. Hirn had everything to invent, and it was years before he taught his egg to stand on end merely by the gentle crack of Columbus. The Columbus egg, to him, was the discovery of gutta-percha, and how he employed it to transmit speed by steel without waste may be told here in a few words.

"The mechanism by which M. Hirn accomplishes this transfer is so simple, and, after it has been described, so obviously effectual, that a few words put us in possession of the entire system and method. Given a waterfall of 100-horse power and a town five miles away, an ordinary water-wheel is erected at the fall to receive its power, and the ordinary machinery of the factory to be driven is erected in the town. On a framing, some height above the ground, is erected a simple iron wheel or pulley, 12ft. in diameter, with a groove in its circumference. A similar framing, with a similar wheel, is erected at the factory in the town. A wire or steel rope not thicker than one's finger traverses the whole distance along pulleys, some 6ft. in diameter, placed 150 yards apart, and this simple rope transfers through the whole five miles the whole force of the water-wheel at the fall with the loss of some 20-horse power only in the transmission. Here, it will be said, is no invention. Nevertheless, the process, as I have now described it, would not be successful. So small a rope could not transfer 100-horse power, neither would the ropes nor the pulleys last; it has neither economy nor endurance. To make the arrangement successful, we must add M. Hirn's idea of speed—of extremely high speed. Instead of driving his pulleys at an ordinary pace, he makes the rope travel 20, 30, 50 miles an hour; and it is this speed alone which enables so slender a cord to transmit so enormous a power. When he had made this discovery his invention failed, for no materials would endure at this high speed either for his rope or his wheels; iron, steel, copper, brass, bronze, leather, wood—all were tried and failed. At last he discovered a simple expedient: all round his pulleys he cuts a deep dovetailed groove, into which he hammers, till it is filled, a hard compact mass of gutta-percha, and in the gutta-percha he leaves a groove. This done, his invention is complete, effectual, durable, economical. It has lasted seven years in this state, and has been successfully applied in some 400 instances."

On the same subject, Mr. Robert Mallet, in his Report "On Machines and Mechanical Apparatus in General," writes:—

"No more remarkable, nor, probably, as regards its future, more important object, is exhibited on this occasion, than is the arrangement of M. Hirn for the transfer to great distances of power and motion by the rapid transfer of an endless wire of small diameter over large and peculiarly-constructed pulleys, one of which is at the transmitting and the other at the receiving end of the telodynamic range. At first sight, or to the casual observer, M. Hirn's arrangement, which was without interruption at work in the park, where it transmitted through a wire not thicker than a large pencil, about 25-horse power (nominal), to actuate pumps (supplying the building) at a distance from the source of power of several hundred feet, appears but one form of the old well-known strap or belt, with its strap pulleys; and it is so much, but it is also much more, for it involves and is based upon a principle which had not before been made available for the transmission of power to great distances.

"This may be popularly stated thus:—When work, that is pressure and motion together, has to be trnsmitted by tension through a cord or fibre, such as a wire or rod of iron, or other material, a given amount of work in a unit of time can be always transmitted through a smaller and smaller section of fibre or rod in proportion as we increase the velocity with which a point in the transmitting fibre or rod travels; so that the product of the pressure and of the velocity with which it acts to produce work shall be constant. For example, a cylindrical bar of iron of 1in. diameter, we may say, can transmit a pull of 10 tons through itself without stretching; and if, that pull being always on the rod, a point in its length passes a given fixed point at the rate, let us say, of 5ft. per second, then at that point the rod is transmitting work at the rate of 10 tons $\times$ 5ft., = 50-foot tons per second.

"But if we have another rod of the same material, of only one-tenth of an inch in diameter, which will therefore have 1-100th the cross section of the 1-inch bar, this will bear, without stretching permanently, the 1-100th of 10 tons, or 1-10th of a ton. Now, if this last rod transmits this pressure of 1-10th of a ton past a given fixed point at a rate one hundred times as fast as in the former instance, then the work transmitted by the small and the great rod shall be equal in equal time. Or—

1-in. bar, 10 tons $\times$ 5ft. = 50-foot tons.
1-10th-in. bar, 1-10th tons $\times$ 5ft. $\times$ 100 = 50-foot tons.

But this last is a mere wire, and will be light and flexible enough to be passed round the rims of large pulleys at such high speed, and by friction on these rims (friction for equal pressures being the same at all velocities within large limits) to transfer the work to their axes in way of rotation. Thus, theoretically, the power of the largest steam-engine in the world might be transmitted to any distance through a human hair. The practical limit with steel wire is found, however, about where the diameter is reduced from two to three-tenths of an inch. The limit of velocity is only that at which by centrifugal force or want of perfect balance the pulleys might become deranged or unsafe.

"M. Hirn has, by this beautiful simple adaptation in practice of a dynamic principle, succeeded in transmitting the power which drives large factories to great distances; in some cases as far as across the Rhine near Schaffhausen."

Fine Arts.

The Fine Arts in Russia.—The Russian Government is busily occupied in improving its means of artistic and scientific education; all the establishments connected therewith being enlarged or improved. The annual report on the Imperial Academy of the Beaux Arts details the improvements that have been made in its galleries and classes; a considerable number of pictures and other works of art, which had remained almost forgotten in the lumber-rooms of the Academy, have been carefully examined, and those which were deemed worthy of it have been, or are now being restored. The library of the Academy, which includes

30,000 volumes and 120,000 engravings and plates, has been placed in a new building, offering every desirable convenience for study, and a catalogue of the contents is now being prepared by Mr. Klagès, member of the Academy.

Manufactures.

THE FUTURE OF DEPTFORD DOCK-YARD.—The following is from the *Greenwich and Deptford Chronicle*:—"We understand that a movement is being made for the purpase of utilising and giving practical effect to what is considered of great importance and moment to the locality. The Lords Commissioners of the Admiralty having decided upon closing the Royal Yard, Deptford, and there being no probability of its being required for ship-building purposes, the question has been considered what can best be done to create a new trade, and give profitable employment to the artisans and other workmen, and be a source of profit and prosperity to the general neighbourhood. There has been a futile idea that it will be required by the War Department for stores from the Tower and other places, but there has not been the least official intimation, and seeing the large reduction in all departments, the report is shown to be entirely groundless. It has, therefore, been proposed, and has received the assent of a large number of the inhabitants, to make an arrangement with the Government to let the different workshops, all of which may be converted into workshops with motive power, and the various appliances and machinery to different mechanical trades and handicrafts. It is well-known that there are a large number of manufacturers in and about London who would highly prize the opportunity of such accommodation, who are now compelled to carry on their business in places prejudicial to health, and at a very large expense. There is another purpose to which a part may be usefully applied. It has been concluded by the artisans and others who visited the late Paris Exhibition that workmen in this country have not the same facilities as in France. Technical and the higher branches of mechanical education is now considered by all practical men of the highest importance. In order, therefore, to give an impetus in this direction, model workshops for new designs and inventions must be established. It is to be regretted that, while encouragement, and rightly too, has been given to what in common phraseology may be termed the science of figures, little or no assistance has been given to mechanical art science; we hope that local efforts will not be wanting to carry out the object in view. We are glad to see the approaches to the dock-yard, as if in anticipation of a successful issue, likely to be greatly improved, and the new edifices that are being raised are indications of anticipated prosperity. Such a prospect will commend itself, we think, to every man of progress, and be highly advantageous to genius and science, and give recreative pleasure and profit to the sons of toil, be conducive to an increase of trade and commerce in this borough, and the development of increased prosperity to the nation."

SECURE CEMENT FOR ENVELOPES.—The editor of the *Practical Mechanics' Journal* says that the thick glutinous juice which is found in considerable quantities in the interior folds of the leaves of the New Zealand flax *(Phormium tenax)*, and which is, in fact, a sort of hemp in natural solution, possesses the properties desired. While liquid it can be used as common gum; but once dry, no ordinary solvent has any action upon it. This natural product might be collected, and probably without prohibitory expense and in sufficient abundance, as the *Phormium* is a New Zealand weed, covering whole square miles. It is still open to experiment for the colonists there to add this to their produce, and it is for some of our Waterlows or Spottiswoodes to initiate it, by getting to England such a first supply of the juice as would enable our chemists to examine its precise natnre, and to assign the conditions for, and limitations to, its use for envelopes. It is said that silk dissolved in chloride of zinc affords another sort of liquid cement presenting some, at least, of the characters here needed; but it has others which are objectionable, as tending to destroy in time the paper. Again, it is stated that a solution of pure woody fibre in ammonio-chloride of copper embraces the requisite properties. Dr. Scoffern has, the writer believes, experimented a good deal upon this and other uses for this very singular compound, but he is not aware how far it has been found suited to closing envelopes. He does not anticipate well of it in some respects, and those the same as render the silk solution objectionable.

Commerce.

THE IRON TRADE IN BELGIUM.—During the first seven months of the present year the exports of cast iron from Belgium amounted to 10,509 tons, as compared with 7,082 tons in 1867, and 10,404 tons in 1866. This shows an increase of 3,427 tons in the exports during the same period in 1867, and 105 on those of 1866. The imports which in 1867 were 34,548 tons, in 1868 amounted to only 24,532 tons.

THE VINTAGE IN FRANCE.—The vintage in France, according to the *Moniteur Universel*, amounted this year to from 50 to 60 millions of hectolitres. In 1865, the production of wine amounted to 68,393,000 hectolitres; in 1866, to 63,838,000 hectolitres; and in 1867, to 55,000,000 hectolitres.

BRITISH CAPITAL AND THE SHERRY TRADE. — "The sherry trade in Andalusia," says the *Produce Markets Review*, "about twenty-five years ago, assumed greatly increased proportions, and now a vast amount of British property is accumulated in this district, represented by various stocks of wines of various qualities, vineyards, agricultural and pastoral farms, and also by mining investments. In Jerez de la Frontera, alone, for instance, there are about twelve English houses, whose property in wine and land are estimated at £2,230,000. The Spaniards generally value the British property at Jerez at £4,000,000. The British property at Port St. Mary's represents a sum of £453,000; at Seville, £360,000. In the mining districts near Cordova, about £480,000 British capital is invested in the Huelva districts; £580,000 in Cadiz and other towns; general trade and ship-owning, £350,000. There is, besides, an English railway between Utrera and Moron, the capital of which amounts to £650,000."

Colonies.

COPPER AT THE CAPE OF GOOD HOPE.—The site of the first discovery of copper in Kafirland is in a part of the Insizwa Mountains, at a point about twelve miles from the southern boundary of Natal. The mountain itself has an area of one hundred square miles, and is situated on the right bank of the Umzimkulu, a branch of the Umzimvubu. The mine, if mine it is to be, is not more than eighty miles from the Port St. John, and the road between the two places could be easily made good throughout. About ten miles to the south-west of the Insizwa there is another mountain, of the same character and size, which is said to contain copper. This mountain is also near the same feeder of the Umzimvubu. When Dr. Sutherland, Surveyor-General of Natal, visited the mines, the quantity of ore excavated was about one-quarter of a ton, all taken from the surface. By the aid of natives the main vein was laid open, and traced into a mountain to a distance of eleven feet. This vein is about eighteen by two and a half feet in depth and thickness. The ore is replaced by a yellow ocherous deposit containing nodules of very pure carbonate of copper or malachite,

varying in size from a pea to masses of ten or fifteen pounds weight. At a vertical height above the vein masses of ore are found very different from that in the vein itself. The ore varies in quality, the chief impurities being iron and clay. In one section of the rock there is a perceptible infiltration of carbonate of copper, filling all the fissures in the lines of cleavage. This has been traced to a depth of one foot. A party of miners from Durban subsequently carried the excavations seventeen feet further into the mountain, when the vein was again struck, and ore of superior quality obtained. Portions of considerable masses have been found to contain as high as 56 per cent. of metal, and others from 15 to 25 per cent., the average of all being 30 to 40 per cent. The mines are in Faku's territory, the Insizwa mountain being, however, occupied by the petty chief Jojo. It is this fact which makes it difficult for the Natal or Cape Government to move in the matter. The per-centage of copper is put down at 20·50 per cent. Silver was found to the extent of 5·30 ounces per ton of 21 cwt. A trace of gold was also detected. The value of the ore was placed at 14s. 6d. per cent., or £14 17s. 3d. per ton of 21 cwt.

Live Stock in the Australian Colonies.—The Registrar-General of New South Wales has published an interesting statement as to the live stock in the Australian colonies. From this it appears that in New South Wales the horses had increased in number from 273,389 in 1863 to 280,201 in 1868; the horned cattle had fallen off from 2,620,383 to 1,728,427; the sheep had multiplied from 6,145,651 to 13,909,574; and the pigs from 125,541 to 173,168. In Victoria, between 1862 and 1867, the increase had been:—Horses, from 86,067 to 121,381; cattle, from 576,601 to 598,968; sheep, from 6,764,857 to 8,883,139; pigs, from 52,991 to 74,708. In South Australia, between 1863 and 1868, the differences were expressed as follows:—Horses, increase from 56,251 to 74,228; cattle, decrease from 258,342 to 122,200; sheep, increase from 3,431,000 to 4,477,445; and pigs, from 58,850 to 89,304. In Tasmania, during the same period, horses had increased from 21,964 to 23,299, cattle had diminished from 90,446 to 86,598, sheep had fallen off from 1,800,511 to 1,742,914, whilst pigs had increased from 41,986 to 54,287. New Zealand returns, from 1864 to the end of 1867, showed an increase in horse stock from 49,409 to 65,704; in cattle, from 249,760 to 312,829; in sheep, from 4,937,273 to 8,418,579; and in pigs, from 61,276 to 115,090. Queensland, between 1861 and the middle of 1866, had increased her stock of horses from 28,983 to 52,311; of cattle, from 560,196 to 919,414; of sheep, from 4,093,381 to 7,278,778; and of pigs, from 7,465 to 13,529. In general, steady progress is shown in every colony but Tasmania, which has been decidedly retrograding.

Oil Mill in Victoria.—An enterprising Frenchman, M. Jouvet, has made an addition to the manufactures of the colony, by erecting a mill for the manufacture of seed oils. He is well acquainted with the business, having been engaged in it in Europe, and has been led to believe that a seed oil manufactory would prove a profitable investment for capital in this colony by observing how well calculated the soil and climate are for the growth of oleaginous seeds. It might have seemed a more natural arrangement that oil seeds should have been grown before a mill was erected to crush them. But that has not been the order observed in the establishment of this new Victorian industry. The manufactory has had to look to India for its necessary supply of raw material, and the supplies which have been operated upon, up to the present time, have been imported rape and poppy seeds. A large quantity of cotton seeds has been sent from Queensland, and as these are highly oleiferous, the manufacturer hoped to succeed in turning them to account by-and-bye; but, in the meantime, they are so closely enveloped in cotton wool as to be unsuited to the ordinary process of expression. Owing to some defect in the manipulation of the Queensland cotton crop, some of the wool is unnecessarily lost, and the seed rendered unmanageable by the oil maker. As to M. Jouvet's prospects in regard to a local supply of oil seeds there is not much to be said at present. In some parts flax is being grown for its fibre, and no doubt the seed will also be duly cared for, now that a market for it has been created. It also grows to some extent in Tasmania, and negotiations have been commenced that may probably result in the seed produced there finding its way to the Melbourne market.

Sugar Cultivation in New South Wales.—A Sydney paper says:—"A society has been formed at Richmond River to encourage and promote the cultivation of the sugar-cane. A very sensible proposition was made at one of these branch meetings, probably with an eye to the proposals of the Sydney Sugar Refining Company, that the river should be divided into districts, in each of which it shall be stipulated, by the planters resident in it, that a specified number of acres of sugar-cane should be planted this season. The failure of some of the sugar-growing associations in Queensland would not have occurred, if this stipulation had formed part of their programme. A company has been formed at the Clarence, for the purpose of sugar-manufacturing, including, as a matter of course, the purchase of one or two cane crushing-mills. Attention has again been prominently directed to the growth of beet-root, with the view of extracting the saccharine matter, but, as in California, where the thing has been under consideration for the past ten years, the suggestions do not assume a very practicable shape."

Notes.

Aqueducts for the Supply of Paris.—A second enormous reservoir for the supply of Paris with water is now in course of completion at Montrouge; this is to receive the waters of the river Vanne, which will be brought to the capital by means of an aqueduct which will be remarkable not only as a fine specimen of construction and a picturesque object in the landscape, but also in an historical point of view. This aqueduct crosses the picturesque valley of the Bièvre, and is constructed upon the arches of the Aqueduct of Arcueil, originally built to bring the water from Rungis for the gardens and fountains of the Luxembourg. In the time of Henri Quatre, the Minister Sully caused researches to be made to discover whence the Romans obtained water for the Palais des Thermes, the remains of which are annexed to the museum of the Hôtel Cluny, but it was not until the year 1643 that the works were commenced for bringing water from Rungis to Paris; the aqueduct was designed by Jacques Desbrosses—executed by Jean Coing, at a cost of £18,400, and terminated in 1864; it is on the old arches of this aqueduct that those of the new one are being constructed.

Proposed Popular Restaurants in Paris.—The great success of the bouillon establishments, and perhaps also of the great popular restaurant in the grounds of the late Paris Exhibition, has induced some charitable persons to open during the winter months a number of *buffets, réfectoires*, or luncheon houses, in those quarters where large numbers of operatives are employed, and the details are now being carefully studied. It is proposed to limit the articles to be supplied to soup and bouilli, bread, wine, and beer, and to supply the following meal for twenty-five centimes, or two-pence half-penny:—

	d.
Soup, called *croûte-au-pot*	0½
A slice of boiled beef out of the soup	1
Bread, about 6½ ozs.	0½
A small measure of wine or beer	0½
	2½

Each person on entering will have to pay at the door for what he desires to take, either the whole or part of that above quoted, and will receive a cheque for the amount. Everything is to be consumed on the spot, as the *Fourneaux du Prince Imperial*, like the London soup kitchens, supply all who want it with good soup and bouilli to carry home to their families at extremely low prices. With these two kinds of restaurants in operation the poor of Paris will be fairly assured against privation in bad seasons.

RUSSIAN TELEGRAPHS.—The establishment of electric telegraphs in Russia dates from 1853. The first laid down were from Petersburg to Moscow, Cronstadt, Varsovia, and Kœnisberg. An agreement was made with Prussia for the establishment of the latter line, and with that commenced the international telegraphic correspondence with the other European states. The telegraphic network spread in a short time over all Russia. In the space of thirteeen years the two capitals were placed in communication with the most important and distant towns, and with the bordering states. Laying down the electric telegraph in Russia presents infinitely greater difficulties there than in the rest of Europe, not so much on account of the immense distances as of the climate, smallness of population, variety of governments, high salaries of workmen, and the expense of the transport of materials. In 1865, there were already 61,450 versts of telegraphs, with 323 stations, and 1,644,375 messages were dispatched. What would it have cost formerly, in time and money, to send these messages, not reckoning the wear and tear of horse-flesh? To complete the telegraphic network there remains the line which, passing through Siberia, will join America, and which, it is supposed, can be opened in 1870. In the years 1864 and 1865 a telegraphic communication was established with Persia by the Caucasus; the line is continued beyond, towards India. A special agency has been established at Pekin for the sending of Russian-Chinese messages. This agency has the difficulty of overcoming the distrust of the Chinese Government in regard to telegraph communication. Up to the present time this government has telegraphed news to their distant provinces by means of beacon fires. It takes six days for the transmission of news by this means through Tartary. The Russian messages are still even sent to the frontier of Pekin by post.

THE MONT CENIS TUNNEL.—During the first fortnight of the past month (October) the progress made at the Mont Cenis Tunnel was 53·05 metres; of which 23·90 were driven on the Italian side at Bardonnèche, whilst the advancement made on the French side at Modane was 29·15. The position of these works up to the 15th October was as follows:—

	Metres.
Length driven at Bardonnèche	5,235·00
Length driven at Modane..........	3,660·65
Total length of tunnel driven	8,895·65
Length remaining to be driven	3,324·35
Total length of tunnel	12,220·00

Correspondence.

LIQUID FUEL.—SIR,—In the paper which I had the honour of reading before the Society on this subject, last April,* the advantages of the material known as "creasote," or "dead oil," obtained in rectifying coal-gas tar, were briefly referred to, and its superiority to petroleum or shale oil pointed out; but the extent to which this material is capable of producing heat when burnt, and of generating steam, was not gone into. Since that time, however, the use of this material appears to have chiefly attracted attention in the various attempts to apply liquid fuel, and therefore it becomes a question of especial interest to consider what may be its capabilities as fuel compared with coal and with various kinds of petroleum and shale oil. For this reason I have computed the evaporative power and evaporative duty corresponding to the composition of this material on the same general principle which was applied in the case of petroleum and its more closely related analogies, and I shall feel glad if you think the subject of sufficient interest to afford the results a place in your *Journal*. Although the term "creasote" is frequently applied to the material now referred to, it consists only in part of the substance known to chemists as creasote, or to the extent of about 20 to 30 per cent. of its bulk. The remaining portion consists chiefly of a mixture of napthalin, anthracene, and liquid hydrocarbons, known by the names xylol, cumol, and cymol. The crude creasote itself consists of two substances, known by the names phenol and cressol. The composition of these substances respectively is as follows:—

	Carbon.	Hydrogen.	Oxygen.
Phenol ..	76·60	6·40	17·00
Cressol ..	77·70	7·41	14·82
Napthalin	95·75	6·25	—
Anthracene	94·38	5·62	—
Xylol	90·56	9·44	—
Cumol ..	90·00	10·00	—
Cymol....	89·55	10·45	—

According to these data, and on the assumption that the combustible carbon and hydrogen contained in these substances will generate—when burnt with just sufficient air for perfect combustion—quantities of heat capable of converting respectively 11·359 lbs. and 41·895 lbs. of water at 60° Fahr. into steam at 212° Fahr. for each pound of carbon or hydrogen burnt, the theoretical evaporative power of these substances, and the evaporative duty they are capable of effecting when the furnace gas is discharged at 600° Fahr. above the temperature of the air supplied to the furnace, will be as follows for each pound of substance burnt:—

	Evaporative power.	Evaporative duty.
	lbs. of water at 212° F.	lbs. of water at 60°F.
Phenol	12·2437	10·5025
Cressol	13·0096	11·1632
Anthracene	15·2417	13·0751
Napthalin	15·4635	13·2675
Xylol	16·5866	14·2415
Cumol	16·7838	14·4126
Cymol	16·9422	14·5500

Dead oil may possibly contain some other substances richer in hydrogen than any of those above named, and in such case the oil would have a proportionately greater evaporative power; but these substances may be fairly taken as representing the composition of dead oil; and as their evaporative power varies from 12·24 to 16·94, while the corresponding evaporative duty varies from 10·5 to 14·5, the mean values being 15·18 and 13·03, the evaporative duty of which dead oil is capable will average about 13lbs. of water, heated from 60°, and converted into steam at 212° F., and it will vary more or less in this respect according to the relative proportion of the substances it may happen to contain. At the same time it will be seen that 14lbs. of water heated from 60°, and evaporated at 212°, is the maximum that could be expected in any case. In order to complete the comparison between this material and coal as fuel for steam vessels, if the average duty realised with coal on board ship be taken as equal to 7lbs. of water heated from 60° and evaporated at 212° F., the maximum efficacy of dead oil might be about 100 per cent. greater than that of coal, as now ordinarily used. Consequently the weight of oil required to fuel a vessel would be only half that of the coal required. Then, taking the ton of coal as stowed on board ship to occupy 43 cubic feet,

* *Journal of the Society of Arts*, vol. xvi., p. 404.

and the ton of dead oil as occupying 34 cubic feet, a quantity of oil equivalent to one ton of coal would occupy only 17 cubic feet. Therefore the use of this oil as fuel would be attended with a saving of one-half the weight of coal to be carried, and to about 60 per cent. of the stowage space required for coal. These results fall very far short of some of the results reported to have been obtained in practice; but as we are still without any satisfactory evidence that these practical results are to be depended upon, notwithstanding the great length of time which has elapsed since I first pointed out this deficiency, and although the use of liquid fuel is advertised as having been adopted by her Majesty's Government,* it appears to me that we must, for the present at least, adhere to that method of estimating the relative efficacy of fuel which has hitherto been customary, and take the results which it furnishes as above stated to represent the facts of the case pretty nearly.—I am, &c., Benjamin H. Paul.

MEETINGS FOR THE ENSUING WEEK.

Mon......Royal Geographical, 8½. 1. Opening Address of the President. 2. M. Severtsof, "Exploration of the Thian Shan Mountains." 3. Major-Gen. Sir H. C. Rawlinson, K.C.B., "Routes between Eastern Turkestan and N.W. India."

Tues ...Ethnological, 8. 1. Dr. Blanc, "On the Abyssinians." 2. Mr. R. A. Cole, "On the Discovery of Cromlechs in India." 3. Lieut. Steel, "On the Khasia Tribes."

Thur ...Zoological, 8½. 1. Letters from Sir Rutherford Alcock, Mr. Swinhoe, and other correspondents. 2. Report by the Secretary on recent additions to the Society's Menagerie. 3. Mr. Robert Brown, "Notes on the History and Geographical Relations of the *Cetacea* frequenting Davis Strait and Baffin's Bay."

Patents.

From Commissioners of Patents' Journal, October 30.

Grants of Provisional Protection.

Augers, boring bits, &c.—3191—C. Whitehouse.
Boats, propelling on canals, &c.—3100—E. Evans.
Boilers—3084—J. Arnold.
Boots, &c., soles of—3090—M. P. Manfield.
Bottles, treating, to prepare them to receive beer, &c.—3106—W. T. Read.
Bottles, &c., packing—1985—J. Perry.
Buildings, constructing—3162—I. A. Vacherot.
Buttons, &c.—3092—A. MacMillan.
Carts, dust and water—3195—J. Rae.
Casks, &c., bung bushes for—3110—G. P. Grant.
Cisterns, &c., cast-iron—3105—J. C. Morgan, H. Macaulay, and F. W. Waide.
Cocks, taps, &c.—3116—W. H. S. Aubin and B. Benton.
Drags for the wheels of vehicles—3179—D. Wilson.
Fire-arms, breech-loading—2942—C. E. Brooman.
Fire-arms, revolving and repeating—3131—F. A. Le Mat.
Furnaces, burning combustible liquids in—3183—H. Bunning, jun.
Furniture, &c., extending frames for—3088—F. Zysel.
Gaseliers, &c., holders for glass and other globes or shades for—3209—D. and A. Posener and M. Unger.
Glass, &c., polishing—2880—E. T. Hughes.
Iron and steel—3108—J. Griffiths.
Lace—3161—J. and A. Ball.
Lattices, travelling, for conveying fibrous materials into or out of machines—3147—E. Leach.
Lead pencil and eraser combined—3077—F. Ayckbourn.
Locks and latches—3153—C. G. Gumpel.
Looking-glasses, &c.—3193—W. H. Howes.
Looms—3076—T. Sagar and T. Richmond.
Looms—3082—W. Bland.
Looms—3187—T. Wrigley.
Mattresses, spring—3159—E. Peyton.
Mines, &c., sinking shafts for—3072—J. Chaudron.
Motive-power engines—3197—W. Gore and J. Thornhill.
Motive-power, obtaining by means of the wind—3014—J. Olivier.
Mules for spinning and doubling—3199—J. Elce.
Ores and minerals, calcining—2950—R. Oxland and J. Hocking, jun.
Ores, minerals, &c., calcining—3112—T. Merz and G. Thomson.
Ores, &c., washing—3181—W. T. Rickard and W. C. Paul.
Paving—3111—F. Barnett.
Poison bottles, &c., label attachments for—3096—W. Jarvis.
Printed works, preparing the folded paper sheets used for—3185—R. A. Green.
Pumps—3094—H. A. Bonneville.
Railway breaks—3201—G. Voigt.
Railway trains, apparatus for communicating between the passengers, guards, and drivers of—3127—J. Ward.
Scarves, &c., fastening—3157—G. C. Attree and T. Dermer.
Scissors—3189—B. Hunt.
Screws, cutting—2004—S. Bowen, C. Glover, R. H. Davis, T. Standford, T. Scott, A. M. Bell, E. Sheldon, W. Farmer, L. Maskall, E. Colburn, and J. C. Cole.
Sewage, treating—3203—G. Chapman.
Ships of war, constructing—2452—T. R. Oswald.
Silver and gold, separation of copper, &c., from—3167—R. Pearce.
Syrup and sugar—3171—W. E. Newton.
Tobacco pipes—3207—J. Lorkin.
Tobacco pipes, &c., manufacturing—2910—W. H. J. Grout.
Vegetable, animal, or mineral substances, apparatus for washing, dyeing, cooking, &c.—3104—S. Tragheim.
Wearing apparel, fastening for—3114—S. J. Maccarthy.

Inventions with Complete Specifications Filed.

Carriage wheels—3227—W. K. Foster.
Refrigerators—3278—W. Mort.
Steel, converting cast-iron into—3237—A. B. Bérard.
Water craft, propelling—3233—G. T. Bousfield.

Patents Sealed.

1152. J. Dunbar & R. Nicholson.
1383. J. and M. Pearson.
1384. G. T. Bousfield.
1385. G. A. Cox.
1388. A. Dietz.
1389. H. Waugh.
1392. J. Bottomley.
1394. S. Robotham.
1396. T. and G. Cope.
1397. W. Wright.
1399. C. D. Fox.
1401. J. J. Long.
1404. R. Scott.
1409. J. Gough.
1410. W. Ferrie.
1411. J. Dendy and J. R. Beard.
1412. J. Betteley.
1416. S. Parr and A. Strong.
1418. B. F. Weatherdon.
1421. T. Beeley.
1423. J. Lillie.
1426. A. Munro.
1427. A. B. Childs.
1428. J. Warne.
1429. W. E. Everitt.
1431. J. H. Johnson.
1432. J. Heaton.
1433. F. Barnett.
1440. J. Maistre.
1441. A. Smith.
1442. J. E. Boyce & R. Harrington.
1443. J. H. Johnson.
1444. W. R. Lake.
1446. W. R. Lake.
1451. I. Matheï.
1490. S. Holt and J. Kearsley.
1491. J. G. Walker and C. Stein.
1492. J. G. Walker.
1508. J. Bruce and R. Evans.
1514. A. James.
1516. J. A. Jones.
1520. W. E. Everitt.
1554. H. B. Barlow.
1566. W. E. Newton.
1580. W. E. Newton.
1581. W. E. Newton.
1584. N. Basevi.
1591. J. H. Johnson.
1598. A. V. Newton.
1603. J. Price.
1608. A. J. Murray.
1614. A. Parkes.
1701. W. Seck.
1741. F. Wirth.
1954. W. C. and R. G. Sillar and G. W. Wigner.
1955. L. B. Prindle.
2023. A. V. Newton.
2048. H. Highton.
2189. J. Jefferys.
2264. J. Gill.
2440. H. A. Bonneville.
2567. J. H. Johnson.

From Commissioners of Patents' Journal, November 3.

Patents Sealed.

1449. W. E. Gedge.
1455. E. and G. H. Morgan.
1456. W. Marshall.
1457. W. Estor and M. Terrero.
1459. D. P. Wright.
1466. J. Clough.
1469. G. Kent.
1470. D. R. Macgregor and P. Taysen.
1471. W. Beale.
1473. F. J. King.
1479. R. Lublinski.
1480. T. Warren.
1487. F. T. Hail.
1489. M. Henry.
1493. W. Harvie.
1495. M. A. Muir & J. McIlwham.
1496. H. A. Bonneville.
1497. B. Pickering.
1499. A. C. Henderson.
1500. A. C. Henderson.
1504. J. H. Johnson.
1510. G. Bowden and J. R. Dickinson.
1524. A. M. Clark.
1527. G. T. Seydel.
1529. J. H. W. Biggs.
1533. A. D. E. Boucher.
1534. A. D. E. Boucher.
1564. C. Iles.
1569. W. Tasker, jun.
1575. T. B. Kay.
1638. J. Pollock.
1686. C. Fusnot.
1689. W. E. Newton.
1692. J. Oury.
1724. J. Adams.
1732. W. E. Newton.
1808. W. E. Newton.
1809. W. E. Newton.
1814. R. Soans.
1816. J. H. Johnson.
1930. C. Rostaing and E. Vivet.
2050. J. Hine.
2145. G. Davies.
2148. G. Davies.
2313. W. Gilbert.
2321. J. Kilner.
2323. A. Bochkoltz.
2329. G. A. Thibierge.
2417. J. Heaton.
2418. J. Heaton.
2620. H. Thompson.

Patents on which the Stamp Duty of £50 has been Paid.

2760. J. Johnson.
2839. R. Smith, jun.
2898. E. J. Davis.
2789. W. Whittle.
2795. W. Deakin and J. B. Johnson.
2806. M. Bayliss.
2826. E. Rushton.

Patents on which the Stamp Duty of £100 has been Paid.

2745. M. & M. Myers & W. Hill.
2900. G. Parry.

* *Journal of the Royal United Service Institution*, Vol. ix., p. 79-82.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 13, 1868.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Fifteenth Session of the Society will commence on MONDAY,* the 23rd NOVEMBER inst., when the Opening Address will be delivered by Lord Henry G. Lennox, M.P., Chairman of the Council.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock :—

1868.	November	—	—	23*	25	
,,	December	2	9	16	23	—
1869.	January	—	—	20	27	
,,	February	3	10	17	24	
,,	March............	3	10	17	—	31
,,	April	7	14	21	28	
,,	May..............	5	12	19	26	
,,	June	—	—	—	—	30†

For the Meetings previous to Christmas, the following arrangements have been made :—

NOVEMBER 23.—Monday.—Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.

November 25.—"A Glance at the Past and Present of the Society of Arts, with some Suggestions as to the Future." By S. T. Davenport, Esq., Financial Officer of the Society.

December 2.—"Further Notes on the Productive Industries of Natal." By Dr. Mann, Superintendent of Education and Special Commissioner for the Colony.

December 9.—"On the Theory of Boiling, in connection with some Processes in the Useful Arts." By Chas. Tomlinson, Esq., F.R.S., F.C.S.

December 16.—"On Artificial Freezing." By Dr. B. H. Paul.

December 23.—"Description of the Electric Organ." By Henry Bryceson, Esq.

A book of blank Tickets of Admission to the Meetings is now being sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

The first Course of Cantor Lectures for the ensuing Session will be "On the Aniline or Coal Tar Colours," by W. H. Perkin, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 7th, 14th, and 21st December, at Eight o'clock.

* As the Elections render it impossible for the Chairman of the Council to attend on the 18th inst., the Opening Meeting is unavoidably postponed to Monday, the 23rd of November.

† The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

Other courses are being arranged, particulars of which will appear in the *Journal.* These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

Prizes.

The Council, at the suggestion of the Food Committee, offer the following prizes for Improved Railway Meat Vans, Milk Vans, and Milk Cans :—

1. For an improved method of conveying meat by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which meat now suffers in its transit by rail. The principal evils to be avoided are—excessive changes of temperature, and injuries by pressure, by handling, exposure to dust, insects, &c. This prize may be awarded for an improved railway meat van or for a travelling meat larder suitable for railways.

Model on a scale of half an inch to a foot to be sent in.

2. For an improved method of conveying milk cans by rail, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary open trucks. The principal evils to be avoided are—the heating and shaking of the milk cans.

Model of an improved railway milk van, on a scale of half an inch to the foot, to be sent in.

3. For an improved railway milk can, the Society's *Silver Medal* and £10.

The object in view is to reduce to a minimum the deterioration which milk now suffers in its transit by rail in the ordinary milk cans, or "churns." The principal evils to be avoided are—the heating of the milk, and all motion within the can which may cause the buttery particles to separate.

A specimen of the improved railway milk-can to be sent in.

The models and specimens for competition must be forwarded to the Secretary of the Society of Arts before the 1st February, 1869.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

TECHNICAL EDUCATION.—ROYAL SCOTTISH SOCIETY OF ARTS.

The following are some of the principal portions of an address by the President of the above Society, George Robertson, Esq., M. Inst. C.E., F.R.S.E., concluding the session of 1867-68, delivered at the general meeting of the Society held on the 9th inst.

After a few remarks on the attention that this subject has recently excited, the President said :—

I am not going deeply into the subject of primary education, or farther into the question of compulsory

education, than to say that it appears to me that the time is near at hand when education will be made as compulsory in Great Britain as it is at present in Prussia, Saxony, Massachusetts, and some other countries. I believe that the difficulties, when faced, would be found to vanish; and that, in a short time, no more compulsion would be required than is now required to enforce other branches of the law. We do not regard it as a hardship to be compelled to keep our hands out of our neighbour's pockets; nor would it, I think, be regarded as a hardship to be compelled to send our children to school. The working men of England would soon cheerfully acknowledge, even in the agricultural districts, that a man has no right to profit by the labour of his child to the destruction of its mind.

Every branch of learning, every species of knowledge, every kind of trade, has a science in it, and may be technically taught; that is, the theory of it may be taught so as usefully to be entwined with the practice. Technical education, properly speaking, does not include the manual instruction which can only thoroughly be acquired in the workshop. In every department of industry it is the combination of theory with practice which produces the highest result, and that with a certainty and avoidance of waste quite unapproachable by rule of thumb, or practical knowledge alone.

The value of technical education of the higher kind, though considerable for what are at present called the learned professions, the Church, the law, and physic, is more immediately applicable to the engineer and the architect, the metallurgist and the miner, the agriculturist and the chemical manufacturer. It is also of great service now-a-days to the officers of the navy, army, and mercantile marine. When we think of the numbers engaged in these professions, and their enormous value to the prosperity of England, we at once gain a notion of the importance of the question.

There is but one way of supplying scientific education to the adults of the artizan class, those who have passed the age of school, and are now labouring with the sweat of their brow for daily bread; and that is, by giving them opportunities of attending cheap, but good, systematic courses of evening lectures, similar to those delivered at our admirable School of Arts in Edinburgh. They must also have every opportunity given them of studying the collections of industry and natural science which I hope will soon be formed in every one of our large towns.

The difficulties regarding the scientific education of the future apply, not so much to the present adult generation, as to that which is springing up. In my opinion, the technical education of the young may be commenced along with the common elements of rudimentary education at present taught.

. . . .

It may be commenced at once throughout the country, in every parish school, and in all classes of society, with the existing machinery, and with the existing subjects of ordinary education, by the science of those everyday subjects being more efficiently taught than it is at present.

The question as to the exact character of the schools, graded or otherwise, it would be desirable to establish, on the large scale, of a purely technical nature, such as those on the Continent, I do not think (and I say it with deference) can be settled just at once. In the present state of matters the country is hardly ripe even for immediate, certainly not for hasty action in this respect. Full use is not made of the technical institutions now in existence, such as the School of Mines; and a healthy and not spasmodic demand must first set in before any purely scientific establishment on a large scale would be quite free from the risk of failure.

Having glanced at the want of success in many of the higher technical schools and colleges which have hitherto been established in England, and traced what he believed to be the causes for their failure, the president went on to say:—

I trust that the governors of educational institutions (with educational endowments), while considering impending changes, will bear in mind the enormous help they may give towards training the rising generation in the principles of science, and will endeavour to impart that class of information which is most useful to boys who have to make their bread in the middle of the nineteenth century, even though it may not be in exact accordance with the recorded wishes of the pious founders, who lived, it may be, centuries ago.

To give an impetus just at the right moment, we have Mr. Whitworth nobly coming forward and devoting £100,000 of the profits of his own industrial career towards the technical education of his professional brethren. The foundation of a chair of engineering in Edinburgh University by Sir David Baxter, and the better endowment of the chair of agriculture by the Highland Society, are also matters of more than local interest. In both these cases the Government promptly came forward, in answer to the memorials presented to the Treasury, in which, I may mention, our Society took part. The Government appear to act on the principle of helping those who help themselves, but it will not do for them in all cases to wait for localities to stir, for in matters connected with education it very often happens that the place where education is most wanted is the very place that does not know its own wants; and even if wants be suspected, people are not always willing to put their hands in their pockets, unless the wants are very clearly proved.

The Universities are beginning to move in the required direction. Both Oxford and Cambridge are opening their arms to science; the General Council of the University of Edinburgh has agreed to add natural science to its Arts curriculum; the University of St. Andrews has also agreed to include chemistry in its curriculum; the High School, the Edinburgh Institution, and other schools, are taking steps in the same direction; and I cannot help expressing the hope that the trustees of the new Fettes College (which is to be founded on the English system) will bear in mind that Harrow, Rugby, and even Eton, that stronghold of the old system, have at length given way to the science education movement. All these are hopeful signs that the present is no mere surface agitation, and that the system of modern education will be stirred to its inmost depths.

There is one great difference which must always exist between classical and scientific education. The foundation upon which classical education is based was laid centuries ago; the edifice is complete; every stone is laid that ever can be laid, and the building is now exposed to the destructive hand of time. It can never be rebuilt, or even repaired. You may have what is called a classical style—in English, French, German, or other languages, imitations of the original structure—but the classics themselves are dead and gone: the works of their standard writers are embalmed in amber! In this, probably, consists one of their chief values, that for all time the ancient authors remain of the same importance for educational purposes.

Very different is it with science. It is always, and must be always, progressive. It is impossible to conceive any such standard writers, for all time, in science, as Homer and Virgil are in classics. The standards will always be changing, will always be in process of being improved. A student in science is always on the march, is always learning something new. To some minds this may appear a disadvantage, to others an advantage.

I have no wish to depreciate the study of the dead languages as a means, perhaps the best means, of intellectual culture, but the past ought not to be put in too great prominence over the present, for the present is

absolutely necessary, while the past is not. The greater part of mankind make their bread by the present, and not by the past.

Of the practical advantage of the two systems, there cannot be a doubt as to which is the most valuable in this work-a-day world. Take any science—take astronomy, for example. What more wonderful and more useful book is there, written by uninspired man, than the Nautical Almanac? As a practical means of making a nation great, rich, and prosperous, it excels all the volumes classical authors ever wrote. . . . Without astronomy, the commerce of England would shrink into a mere coasting-trade, the perils both of sea and land would be enormously increased, and time and space would be a confused chaos.

. . . .

It is stated in the Report of the Committee of the British Association, that at Rugby, where the study of natural science has been made compulsory since 1864, the masters are of opinion that the school, as a whole, is the better for it, and that the scholarship is not worse. This agrees with the experience of Germany, where both the mathematician and scholars are at least equal to those of England, and where natural science is much cultivated. I think, therefore, that I am fully justified in saying that classics and science need not clash, but might be made to assist each other.

Nor am I willing to concede that the study of the various natural sciences may not, in course of time, as they become better understood and are more systematically taught, prove to the full as valuable a mental discipline as classics, and be as useful towards the cultivation of the mind. And why not? The end and object of the study of the dead languages is the cultivation of literature. The love of letters existed in the mind of man before the dawn of science, and for many a long year the means of cultivating letters existed alone in the dead languages. A happier day has been reserved for us. Science, like poetry, like history, has also its literature—is born a new sister to the lovely nine—and letters may now be cultivated in the works of Herschel, Whewell, Chalmers, and Hugh Miller, as well as in those of Homer, Virgil, Plato, and Aristotle.

One part of the first resolution adopted at the Conference at the Society of Arts (in London), was that "special institutions for technical instruction, including museums, adapted to the wants of the various classes of society, and to the industries of the country, should be established and maintained in the United Kingdom." The words "including museums," were not in the original motion proposed by Dr. Lyon Playfair and seconded by Earl Russell, but were added in accordance with an amendment suggested by one of the representatives of the working-classes, who strongly urged the value of museums and industrial exhibitions, and told us how much they were appreciated by the classes he represented. Indeed, museums are almost a necessity to, and a result of, the extension of science, and one might be established in every large town. I do not mean a vast collection of expensive and miscellaneous curiosities, that is more sensational than useful, but a systematic collection illustrative of the geology, botany, and natural history of the district at least. Every manufacturing town, or the seat of any special industry, should also have an exhaustive collection of the industries of the district, renewed and kept up to the latest improvements.

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The appreciation of museums is on the increase; for I see from the last Report from the Science and Art Department that in 1867 the number of persons who visited the various collections in London, Edinburgh, and Dublin was 1,305,374, an increase of 14 per cent. on the previous year.

The convention which has been entered into this year between the princes of Europe, in which they agree, mutually, to assist museums in interchanging casts and copies of national objects for the promotion of art, will render the formation of collections much easier and less expensive than formerly.

. . . .

I have heard it objected that the Government Department always talk of technical education as if it were something separate and distinct from general education. How could they do otherwise? There was no science in the ordinary system of national education, and the Department was created for the purpose of grafting science on to it. When the two are thoroughly incorporated they will grow together, but till then they must of necessity be spoken of as distinct.

After enlarging generally upon the system of the Department of Science and Art, and defending the principle of "payment on results," the President continued as follows:—

I think that the people of Scotland ought to lend a helping hand to the Government scheme, and not condemn and criticise it without trial. It is working well in England and Ireland, and will no doubt work better as the weak points are found out and remedied. Nothing is perfect at first, or turned out complete in every detail, and great improvements have been made by degrees on the original scheme. If it be found on trial (and it cannot be proved except by trial) that some modifications are required to suit the system of education or the temperament of the people of Scotland, I have no doubt that Government would take such alterations into careful consideration.

. . . .

Learned and scientific societies might do a great deal to give a stimulus to the present movement, if they were to follow the good example set by the Royal Geographical Society, who propose to give annually two gold and two bronze medals for general competition among the boys of our principal public schools. The medals are to be given for pre-eminence in political geography and in physical geography, and are to be competed for on the first Monday of May in each year.

The Chemical, Botanical, Geological, and other Societies and Institutions would do well to follow this good example.

To be the gold medallist for the year of one of these societies would be a great feather in a boy's cap. The competition for the medals would keep up a healthy and friendly rivalry between our principal public schools, and would no doubt stimulate the demand for the modern system of education.

After all, perhaps, the most valuable and practical way of promoting scientific education is to rouse up, interest, and convince the employers of labour of its value. Were the manufacturers all over the country thoroughly convinced of this, and determined to show that they appreciated it, by promoting and giving higher wages to those workmen who were technically trained, they would rouse up such a demand as would satisfy the most ardent well-wishers of the cause. It is the employers of labour who may be said to have the great prizes of life to give away, in comparison with which all the medals and certificates a department can grant are only the means towards an end. If the artisans who are employed in engineers' shops find that they get on because they know the principles of mechanics; if those who are engaged in dye-works, glass-works, and the like, find that they advance because they know something about the science of chemistry; if the stone-mason finds himself promoted beaause he is acquainted with descriptive geometry and drawing; if the miner finds himself the captain of a mine because he understands geology—then there will be no fear for the technical education of either the present or the future race of artisans. And if the rewards of life, whether at college or in professions, be in like manner thrown more open to science-trained men, there need be still less fear for the education of the middle and upper classes. Teachers and schools of science would soon spring up if

the people found that science would "pay." The demand having once been created, it is against all the experience of commerce if the supply does not keep pace with it.

In throwing out these somewhat rambling observations on the science education movement, I have endeavoured not to dogmatise or to enter too much into minute details of how, in my opinion, the objects of the movement may be best promoted. It is an easy thing to say that we require scientific training; it is a very difficult thing to lay down a system which shall at once be satisfactory and complete in all its parts. I doubt if any man living can do that just at present, and I shall certainly not attempt it. It must be done by cautious trial, but without loss of time. For any details of what are the opinions of the men most competent to judge of this subject, I must refer you to the reports of the House of Commons Select Committee, and of the committees appointed by the British Association, and by the Society of Arts. I think the most valuable point of all is that the attention of the country is seriously roused. During last year, about 123,500 persons received direct instruction from the Science and Art Department,—an increase of 10,000 or nearly 9 per cent. on the previous year. Many great minds are thinking of how the nation can be best trained in the principles of science; and no doubt, after a little experience, the question will work itself out to a practical result.

PROPOSED BRIDGE OVER THE CHANNEL.

Many vast engineering feats have occupied attention during the last fifteen years; one of the most daring is that now projected for the purpose of overcoming the obstacles that nature has placed in the way of direct railway communication between the two most important cities of Western Europe, viz., a bridge across the Straits of Dover, by means of which Paris will be brought within a few hours of London, and passengers for the principal cities of the Continent may be enabled to arrive at their destinations in the same carriages in which they started from England, and be saved the inconvenience and delay of embarkation and debarkation involved in the present system, as well as, that misery of all miseries, sea-sickness. The Emperor of the French, to whom, by his Majesty's express desire, the plans of the proposed bridge were submitted, gave its projector, M. Ch. Boutet, considerable encouragement.

From a pamphlet, recently published in England with a view to explain the details of the undertaking, it appears that the proposed viaduct will spring from a point on the English coast, near the Shakspeare Cliff, Dover, at an altitude of 360ft. above the sea, and will terminate on the French coast at an equally lofty hill, known as Cap Blanc Nez, at a short distance from Calais. M. Boutet avoids the enormous expense and risk involved in any attempt to construct piers on artificial islets in the middle of the Channel, by carrying his bridge across nine piers of cast iron of unusual dimensions, the bases of which are to be put together and bolted on the shore, and floated to the positions they are intended to occupy by means of large sheet-iron buoys, one of which, situated directly in the centre of the structure, is to be acted upon by a powerful screw, by means of which the huge base can be gradually lowered until the screw pile feet, upon which it is to stand, touch the bottom or bed of the sea, which has been ascertained to consist of solid chalk, into which the pile-screws are then turned. This method of binding the pier firmly to the bottom also serves as a means of rectifying the levels if necessary. The soundings in line of the proposed bridge show a maximum depth of 157ft. The top of the base will be just above the level of the sea when the feet are screwed to the bottom, and upon this the upper portions are to be erected, above water, piece by piece, in the usual manner. Except the centre one, all the piers at their foundations measure 130 yards in width, and 87 in length, diminishing upwards, and forming at the summit a square of 66 yards on each side. The centre pier will be half as large again as the others. In addition to their own weight, of 2,500 tons each, these piers have to support an arch, of 3,282 yards in length, weighing about 14,000 tons.

To guard against the destructive action of the sea-water, all the submerged parts and those likely to be affected will be covered with a solution of gutta-percha or some other covering suitable for their protection. Between the abutment on the shore and the first large pier, five temporary piers are placed at equal distances in six lengths, of 550 yards each. This done, there are stretched in parallel lines 31 wire cables, two metres (*i..e*, two yards six inches) apart. They are connected and bound together by ties made of smaller cables which interlace the large ones, and hold each in its place. The whole forms a tress of 63 yards wide. The tress thus made is covered by a wooden flooring, a guard is fixed on each side, and there is at once obtained a service bridge, upon which scaffolding is erected to support the beams of the bridge during their construction, the scaffolding being always of a sufficient height above the sea to allow the largest vessels to pass under it. The beam or tress of the bridge itself (in which the originality of the project mainly consists) is composed of a series of 120 cables of iron wire two inches in diameter, of which the number gradually diminishes to the middle, where there are but 30 stretched horizontally along the line of the bridge, at a distance of 20 inches, one above the other, connected every 22 yards, first by perpendicular cables fixed vertically, and then by strong iron transoms, also placed vertically. Each tress seen laterally presents the appearance of a vast net, the rectangular meshes of which are 20 inches square. Upon the vertical transoms rise small metal arches intended to support the planking or roadway of the bridge. Thus, M. Boutet obtains thorough rigidity, making in the meshes of the tress a complete weft. The interlacing the longitudinal cables by others less bulky, woven in the form of a lozenge, and the use of vertical transoms, augment the rigidity of each, and consequently that of the beam itself. On the other hand, this divides infinitesimally the effect of weight upon it, and weakens, to a certain extent, its effect before the lower parts of the beam are bent under the influence of a passing pressure. Five tresses of this sort, each 3,282 yards in length, fixed at a distance of 11 yards apart transversely to the bridge, are under-propped strongly against each other, and constitute together the body of the work. The width of the roadway is thus brought to 57 yards. At the piers the longitudinal tresses measure 66 yards in height, but 17 yards only in the middle of the length, without reckoning the height of the parapet, which would be 14 feet. The beams thus have the form of an elliptical arch of 3,282 yards in span; but, to augment the stability of the work, the author raises the central point of each tress by giving an inclination of 6 in 1,000 to the two sides. The beams or open tresses of M. Boutet are stated to offer a considerable resistance, possess a perfect rigidity, and are of very light weight as compared with their enormous length and bearing power. It is stated that they are estimated to support 24 trains fully loaded, meeting together in the middle between any two piers, and that the weight of the erection is 36 times greater than the maximum force of tempestuous winds, which would therefore be powerless to shake its ponderous mass.

M. Boutet estimates the cost of the undertaking at less than eight millions sterling, and expects that it would be finished in three years. A company has been formed in France (half the capital of which is being subscribed in England) for the purpose of promoting this great international undertaking.

MANUFACTURE OF COMPRESSED FUEL.

Mr. Warington W. Smyth, F.R.S., in his Paris Exhibition report "On Apparatus and Processes of the Art of Mining and Metallurgy," writes as follows :—

Within the last few years careful experiments, conducted by the administration, have proved, what was long doubted, that France possesses coals excellently adapted for sea service; and for some time past no other than French coal has been used in the Imperial navy. But for these purposes the fossil fuels from different localities have to be judiciously selected and mingled in certain proportions. Taking the coal as a whole, it is noticeable that it makes much more small and dust than our own, and is more frequently apt to be "dirty" or mixed with shale and clay. It hence results that the French coalmasters have been driven to pay a special attention to methods of cleaning their produce and utilizing the "slack," *menu*, or small coal. At the Great Exhibition, in 1851, Bérard's coal-washing machine came before us as a novelty, although it was only in certain details that it could rightly be so considered; and, besides several contrivances for that purpose introduced more recently, a great variety of ingenious apparatus has been brought into use for making "patent fuel," *agglomérés*—*i.e.*, for pressing the small coal into cakes of various form by the aid of a small amount of some binding material. These *briquettes* are highly reported upon for naval use; in their carriage to the ports there is a loss of only 1 per cent. against from 6 to 10 per cent. on lump coal; and when stored abroad they are found after two years' exposure scarcely at all injured, whilst ordinary coal would have suffered to the extent of 50 per cent. Moreover, they are very free from ash, and may be made of a mixture of flaming and of dry coal, or of those varieties which have a more free-burning and a more calorific property respectively, in such a ratio as to give the best effect in getting up and maintaining steam. The present Exposition abounds with examples of the machinery and the products of this manufacture; and, although we are not in Great Britain without a similar industry, attention may fairly be called to the subject in the interest of the millions of tons of small coal and of inferior qualities which we are every year actually getting rid of as refuse.

As early as 1833 Messrs. Marsais and Ferrand took out a patent for this purpose, but it was not until 1843 that the agglomerated coal began to be produced in any quantity, and some years more elapsed before the machinery was so far improved by several different engineers as to lead to the present large scale of the manufacture. The St. Etienne Company exhibit a model of their apparatus as employed at Givors, where, by introducing an enormous hydraulic pressure, they need only to add $5\frac{1}{2}$ per cent. of pitch *(brai sec)* to solidify the mass. The stack of rectangular blocks left outside the St. Etienne shed in the "park" throughout the heavy rains of April gave good testimony to the thorough compactness and durability which had been thus attained.

The greater part of the French makers appear to have adopted the circular arrangement of the Messrs. Revollier, and of Mr. Evrard and M. Dehaynin. A beautifully finished model is exhibited by the company of La Chazotte (M. Max Evrard, engineer), having 16 cylinders disposed as the radii of a circle, in which the slack, after being heated by a current of steam and mingled by very ingenious apparatus with the pitch, is pressed by pistons and formed either into cylindrical or hexagonal blocks of convenient length. The rate of production appears to be in practice 10 tons per hour with one machine (of which La Chazotte works four), requiring an engine of 50-horse power to work it, and the extreme limit of pressure being 100 atmospheres.

The prices of the St. Etienne compressed fuel are high; the first quality, which contains only 2·10 per cent. of ash, is marked at 28f. per ton; the second, with 5 per cent., at 26f.; whilst the best block coal rules at from 19f. to $23\frac{1}{2}$f., and the small at $9\frac{1}{2}$f. to $15\frac{1}{2}$f. The very small proportion of gas tar or pitchy matter introduced into the mass at this work can scarcely be considered as a general guide, since different qualities of coal will need some more and some less of binding material.

M. Felix Dehaynin, a producer of no less than 175,000 tons of *agglomérés* in the year, exhibits (in class 40) drawings of the Evrard machine as modified by himself and employed at his three works, in which 500 people are engaged. The company called the "Océan," at Paris, are also exhibitors of drawings and of the apparatus for the same purpose known by the name of its inventor, M. Mazeline.

As an adjunct in these operations, an ingenious machine by Hanrez and Co. (Belgium, 12) may be noticed. It is constructed for the drying of small washed coal by the revolution of a screw within a revolving perforated cylinder, and is stated to dry five tons per hour.

We could wish that coalworkers, mineral landowners, and capitalists would note these various indications of what is now becoming in France an important trade. Without being unmindful that several companies have been established in South Wales and elsewhere for a similar manufacture, we cannot but be conscious that their action is but an infinitesimal set-off against the wholesale waste of slack that takes place in this country. It is not only that the small coal cut and broken from the saleable part of seams is in most of our districts thrown into goaf and gob by the tens of thousands of tons, but those portions of beds, often some feet in thickness, which are intermixed with stone or "sulphur," or which make a larger than usual proportion of slack, are at once rejected as useless, and acres of such coal are abandoned to be inextricably mixed up with broken roof and heaving floor, although of no worse quality than would be turned to advantage in many a French colliery. It is impossible, in the hard competition of the times, to blame individuals for this sin against the economical use of Nature's gifts; but it is a discredit to the country at large, and will, among our descendants, entail many an anathema on the selfish stupidity of their forefathers.

POISONOUS MUSHROOMS.

The following is extracted from the *Lancet*:—

"It is to be hoped that the ardent fungologists who are seeking to popularise the mushroom tribe as an article of food will do their utmost to spread as widely as possible a knowledge how to discriminate between those species that are safely edible and those that are poisonous; otherwise, we may anticipate a great many mistakes with very serious results. An inquest has lately been held in South London, on the body of a waterman who ate mushrooms at Gravesend, returned to his home in town the same evening, in apparently good health, but before the next night died, with all the symptoms of mushroom poisoning. The verdict of the jury on the medical evidence was, that the death resulted from eating poisonous mushrooms. Botanical distinctions of the species are not as yet familiar to a very large proportion of the population, and it is as well that it should be known, as regards the mushroom family, that it contains some species which, however 'pleasant to the eyes' of a fungologist, are certainly not 'good for food.'"

Upon this subject Mr. Christopher Cooke writes to the editor of the *Journal of the Society of Arts* as follows:—

"According to the Registrar-General's last report, 'a lighterman, aged 28 years, died on the 25th of October, at No. 7, Devonshire-street, Newington,' having been 'poisoned by eating mushrooms,' according to the verdict of the jury, at the coroner's inquest, in London. Such fatal cases frequently occur, not by eating real mushrooms, but spurious specimens. It becomes, therefore, a serious and important question whether the real can be distinguished from the spurious, or poisonous, specimens of mushroom without chemical assistance. During my recent visit to the Orkneys and Shetlands, I gathered mushrooms real and fictitious, but the test of

their quality seemed to vary without any fixed rule for the opinion; at Stromness only the round, ball-shaped, specimens were rejected by the cook at the inn. At Kirkwall all specimens were accepted, although, certainly, some appeared dubious with respect to colour, form, and smell. At Lerwick, the colour was taken as the test of some fine specimens; one as large as a saucer, which I had picked out of Noss Isle. The colour was dark-chocolate, and the smell was fresh and pleasant. But, at Pierowall, in Westray Isle, out of a large collection of specimens, similarly coloured, only a few of the smaller kind were admitted by the niece of the keeper of the hotel, who declined to venture an opinion for herself, but deemed the whole to be worthless! The reason alleged for partial rejection in this instance was, that the specimens, although genuine, were chiefly old, and therefore poisonous. In the Isle of Lewis, I could not find any mushrooms. In your *Journal*, vol. xvi., pp. 467—471, Mr. Berkeley gave much useful information about fungi. At p. 517, Mr. John Bell recommended that a piece of the specimen should be tasted, as 'pungency, like pepper, not like cress,' shows unwholesomeness. As few persons understand the nature of fungi, this test is valuable, if reliable. In 'White's Selborne,' by Capt. Brown, R.N., it was stated that 'pixie stools,' or fairy rings in the green turf circles, where real mushrooms abound, in the southern counties, are caused by the guano of starlings. Mr. Smith's 'Charts of Fungi' (see vol. xvi., *ante*, p. 529, are admirable, but some practical tests are yet required, and Mr. Bell seems to have discovered one of general utility. In my cases no evil result occurred, but at Pierowall my companions advised me to reject all the specimens, as the colour, they thought, should be light-pink, and not chocolate, according to their experience in Shetland, to ensure safety."

CHARLIER'S SYSTEM OF SHOEING HORSES.

Captain Cockerell, in his report on this system, as shown in the Paris Exhibition, says:—

"Before entering into a description of this method of shoeing, it is necessary to understand the grounds upon which M. Charlier bases his theory. They are as follow:—

"A horse in its natural state is unshod. Placed by man to perform unnatural work upon artificial roads, it becomes necessary, in order to prevent the hoof from being injured, to protect his feet with shoes. The object, however, of all shoeing, is to interfere as little as possible with the action of the horse. How, then, has the old system succeeded in this respect? M. Charlier at once answers that it has not succeeded at all; one third of the horses one meets are lame, and three-quarters of these are lame with diseases of the feet, arising from bad shoeing. What, then, is the old system? 'It is a plate of metal, always too large, placed below the horse's foot—a sort of hard sole, inflexible, heavy, and polished by use—resting at the same time on the crust or wall of the foot, and on the sole, which is pared down so as never to touch the ground or receive any of the horse's weight upon it.' This, M. Charlier says, must be all wrong.

"1st. Why should the sole of the foot and frog not come upon the ground? Nature seems to have meant it to do so, and for this purpose has armed the former with strong and constantly-renewed horn, which modern farriers carefully remove.

"2nd. Does this heavy, hard iron shoe really protect the foot against the shock that takes place every time the latter comes to the ground? On the contrary, the hard metal plate, coming in contact with the hard road, sends into the foot a concussion, which, incessantly repeated, produces the most disastrous consequences.

"3rd. Is it right to make a horse carry a dead weight of iron on his foot double what is necessary? Must this not cause great and unnecessary expenditure of strength, and produce an immense amount of fatigue; in short, causing a great waste of power.

"4th. The want of elasticity of the present shoe must be bad. It compresses the foot, impedes the circulation, and, by this, prevents the hoof from receiving its proper amount of nourishment, thereby drying it up, and producing numberless diseases, by bringing it into an unhealthy state.

"Moved by these and similar arguments, M. Charlier resolved in his own mind that the old method of shoeing was faulty in the extreme, and he determined to study how best these defects might be remedied.

"The following is the plan that he at last decided upon, with what success I shall hereafter show:—Taking an instrument something like a square gouge, with a guide to prevent its cutting beyond the required depth, the farrier scoops a rectangular groove from the outer circle of the horse's foot. Into this groove is fitted an iron band, measuring rather more than the thickness of an ordinary horseshoe, with only half its width; this is secured with from five to seven nails. The shoe being thus sunk, the sole of the foot, which is never pared, and the frog are brought on the ground. The shock of the constant concussion of the iron shoe on the hard road is thrown into the wall of the foot, and not into the softer parts of the foot, which are protected by the tough and elastic horn of the sole; the frog being also brought on the ground allows the animal to feel, and, as it were, to grasp the earth in slippery places. The shoe, being narrow, has a certain amount of elasticity about it, and, after a few days' use, adapts itself to the natural shape of the foot, expanding with its movement, and developing the frog, bringing the whole foot into action; so much is this the case, that, after three or four months, the foot is frequently found to have entirely altered its shape.

"And here I should allude to another improvement of M. Charlier's. The holes into which the nails are driven are made oval instead of square, consequently the rectangular nails driven into them take their shape, and by this means acquire a firmness of hold which is very advantageous. As was natural on the first introduction of a new idea, M. Charlier met with the most vigorous opposition, and some of the more prominent arguments used against him were as follow:—

"Having first been told that there was nothing new in his plan, that it had been tried and had failed years ago, other objections were brought forward. It was urged that, having removed the iron from the sole of the foot, the latter remained wholly unprotected from sharp stones and rough ground. This M. Charlier refutes. The horn having been allowed to grow, becomes hard and thick, and well able to resist a sharp stone or any such substance; added to which, the shoe being imbedded in the hoof, no small stones or dirt can lodge between the foot and the shoe. Again, it is said, that the groove cut for the insertion of the iron must be so deep as to injure the sensitive parts of the foot. This is denied. At first a light shoe is used, and the groove is not deep. Eventually, as the foot strengthens and grows, a deeper iron can be used if necessary; but besides this, no sensitiveness exists in this part of the foot, and consequently there is no such danger to be apprehended if decent care is taken at first. And here I may state that M. Charlier's latest experiments lead him to think that when a horse is first shod the shoe should descend a trifle (about the eighth of an inch) below the foot to allow for wear. It is hardly necessary to observe that the shoes should vary in thickness and weight, according to the size of the foot to which they are to be applied.

"Another objection advanced is the difficulty, in the event of a horse losing a shoe at a distance from home, of having it replaced. Of course, on the general introduction of this system, this objection would disappear naturally. Meantime, we find that the thickness of the sole which has been allowed to grow is so great that an ordinary shoe can be fixed for the moment, and that on return home this can be easily again replaced by the

Charlier shoe; and I have M. Languet's authority for saying that he has never had an instance of a horse in which this could not be done."

Captain Cockerell then gives the opinions of some veterinary surgeons and horse proprietors on the above system, who generally expressed themselves as satisfied with it. "In conclusion," he says, "I would suggest that a system so highly approved of by the jury, and now so largely used in Paris, would be worth a trial in England. Any method by which we can preserve our horses from lameness, or cause them to work a year or two longer for us, is a benevolent economy which it behoves us well to try, to say nothing of the duty we owe to our most valuable and useful servant, the horse."

TECHNICAL EDUCATION.—KNOWLEDGE OF FORESTRY.

Dr. Hooker, F.R.S., in his Paris Fxhibition report "On Seeds and Saplings of Forest Trees," thus refers to the above subject:—

"Forestry, a subject so utterly neglected in this country that we are forced to send all candidates for forest appointments in India to France or Germany for instruction, both in theory and practice, holds on the Continent an honourable, and even a distinguished place amongst the branches of a liberal education. In the estimation of an average Briton, forests are of infinitely less importance than the game they shelter, and it is not long since the wanton destruction of a fine young tree was considered a venial offence compared with the snaring of a pheasant or rabbit. Wherever the English rule extends, with the single exception of India, the same apathy, or at least inaction, prevails. In South Africa, according to the colonial botanist's reports, millions of acres have been made desert, and more are being made desert annually, through the destruction of the indigenous forests; in Demerara the useful timber trees have all been removed from accessible regions, and no care or thought given to planting others; from Trinidad we have the same story; in New Zealand there is not now a good Kandi pine to be found near the coast; and I believe that the annals of almost every English colony would repeat the tale of wilful wanton waste and improvidence.

"On the other hand, in France, Prussia, Switzerland, Austria, and Russia, the forests and waste lands are the subjects of devoted attention on the part of the Government, and colleges, provided with a complete staff of accomplished professors, train youths of good birth and education to the duties of state foresters. Nor, in the case of France, is this law confined to the mother country; the Algerian forests are worked with scrupulous solicitude, and the collection of vegetable produce from the French colonies of New Caledonia, &c., contain specimens which, though not falling technically under Class 87, abound in evidence of their forest products being all diligently explored."

Fine Arts.

DECORATION OF THE NEW ASSIZE COURTS OF PARIS.—The encouragement given to artists of all classes by the Government and the City of Paris becomes more remarkable every day; no opportunity seems to be lost of furnishing employment for the pencil and the chisel. Two new courts of assize have been erected on that side of the prefecture of police which faces the quaint old Place Dauphine; the northern court has a handsome ceiling of panelled oak decorated with gold, and over the seats of the judges are the following paintings:—Justice protecting Innocence, and terrifying a culprit. The lower part of the walls are covered with oak panelling, and the upper portions with tapestries painted on canvass, and decorated with eagles and other imperial emblems. The ornamentation of the other court is of a similar character. The entrance to these courts is from a large vestibule, in which are placed magnificent bronze candelabra; the doors of this fine hall are also of bronze. The whole of the decorations have been executed under the direction of the architects, MM. Duc and Daumet. The painters employed are MM. Lehmann, member of the Institute, Bonnat, Richomme, Lefebvre, Ulmann, and Jobbé-Duval; sculptors, MM. Duret, Dumont, Jaley, Lemaire, Jouffroy, Perraud, all members of the Institute, Gumery, Chapu, Oliva, and Lequien. M. Denuelle has executed the decorative painting, and M. Hayon the sculptural ornamentation.

EXHIBITION OF A NEW FOUNTAIN.—A very laudable practice exists in Paris of exhibiting there in public any important work of art intended for the provinces. At the present moment may be seen, in the space between the Pont des Arts and the entrance of the Louvre, a colossal group in bronze of the "Three Graces supporting urns." This group, composed and modelled by M. Gumery, and cast by M. V. Thiebaut, is for a monumental fountain to be erected on the Place de la Bourse of Bordeaux. The fountain when complete will consist of a large basin, in the fine yellow-veined stone of the Jura, on a basement of the same material, decorated on three faces with children seated on dolphins. In the centre of the great basin will be a bold socle of the same stone supporting an upper basin, in which stand the figures in question. The general design is somewhat similar to that of the beautiful fountain of the Place Louvois, in the Rue Richelieu, on the site of the old Opera House, where the Duc de Berri was assassinated.

COMPLETION OF THE REPARATION OF THE CATHEDRAL OF NOTRE DAME.—The repairs and redecorating of Notre Dame, which have occupied thirty years, may now be said to be completed. The workshops and sheds which have so long disfigured the environs of the noble building are being rapidly demolished and cleared away, and the church is being surrounded with handsome wrought-iron railings in harmony with the style of the architecture. The cathedral is now open to the east and west; its southern side faces the narrow arm of the Seine, and is well seen from the opposite quay. The old hospital of the Hôtel Dieu, which abuts on the south-western corner of the edifice, will be removed when the new hospital is ready, about the end of next year, and there will then be nothing to obstruct the view of the cathedral except the houses in the street on the north side, which will probably not be long allowed to mar the effect of this fine example of the architecture of the middle ages.

Manufactures.

SUGAR MANUFACTURE.—The *Produce Markets Review* says:—"It is evident that perfection in sugar-making has not yet been reached, but to those who are still contented with the processes invented by their great grandfathers, it will perhaps be a matter for surprise that no less than 46 patents connected with sugar manufacture have already been registered in France this year. The beet is thus still receiving the closest attention, and being developed with all the strength that capital and science combined can give. Can the British West Indians say the same of their cane, or is it not dropping more helplessly in arrear year by year? They may certainly learn a lesson from the French colonists, who sent no less than 13,000 tons of fine white crystals assimilated to refines last year. While remarking on the greater desire for improvement shown by the French, we have received Messrs. Arnold Baruchson and Co.'s last circular, which sets forward in a striking way the care which must be bestowed on manufacture in France, and also mentions the startling fact that a fourth of the whole crop was turned out in the shape of fine white crystals. Speaking of the new plan of buying by analysis and saccharine rich-

ness, those gentlemen say:—'As on this system it is to the manufacturer's advantage to produce as pure sugar as possible, the deliveries to a great extent have consisted of beautiful crystallised qualities, unsurpassed, if equalled, by the best descriptions of Havana and Mauritius. Such qualities command, however, a very high price, analysing as high as 97 to 98 per cent. pure sugar. The gradual progress of our beet sugar manufacture is manifested by the fact that not less than a quarter of the whole out-turn last year, viz., 58,000 tons, has been pure white crystals, above No. 20 Dutch standard, without having first passed through the refiner's hands.'"

Technical Education.—The Mining School at Aosta.—The mining school at Aosta was established in 1865 for the purpose of educating persons intending to embrace the profession of superintendents and overseers of mines. The courses, which are gratuitous, are comprised in three years of study in the following subjects:—Mathematics, linear drawing, Italian literature, history and geography, chemistry, chemical analysis applied to mineral substances, geology, mineralogy, and metallurgy.

Commerce.

The Prices of Claret.—The Bordeaux journals publish details of the great sale of wine at Chateau Lafitte. When the estate belonging to the late Count Duchâtel was recently sold, the heirs reserved to themselves the right of selling the wine in the cellars and the furniture of the house. The former has now been disposed of without any preliminary tasting, the purchaser paying five per cent. additional as auction duty. The attendance was exceedingly large, and comprised the principal wine merchants, *gourmets* of France, proprietors of the great Paris restaurants, agents from many members of the aristocracy and finance of France and abroad, and several foreign dealers. The dates of the wine ranged from 1797 to 1864, and the competition was naturally great, such a collection never having before been offered for sale. The minimum price was 7f. the bottle for the growths of 1826 and 1863, and the highest, 121f., for that of 1811, the year of the comet. "The extraordinary prices realised," says the *Produce Markets Review*, "are, of course, simply to be regarded as another example of the length to which connoisseurs in any article of taste will go to gratify their fancy. At the same time, although in exceptional cases like the present wine fanciers will continue to give excessive prices, there can be no doubt that the days of very high-priced wine, so far as England is concerned, are past, and that the real way to increase the trade to anything like its proper limit is to reduce, and not to raise, cost. It is therefore with regret that we have heard of the heavy speculative operations in 1868 wines at Bordeaux. It is no doubt true that the quality will be very fine, and, on the other hand, that the crop will not be nearly so large as was at one time expected; but if price and not quality is to govern the demand here, we can only look with regret upon the probability of an established advance in Bordeaux wine. The English demand is probably too small to have much appreciable influence on the market, and if any considerable advance took place, the tendency would of course be to divert our consumption to other markets. Claret sellers must not flatter themselves with the idea that the continually increasing class of consumers, who are principally reached by the grocers, have any special fondness for their wine over that of other growths. Nor must they lay too much stress upon the inferior preparation of the wines most recently introduced, for the growers will no doubt be prepared to take whatever steps may be necessary to suit the English taste."

Consumption of Food at Florence.—Since the removal of the capital from Turin to Florence in 1865, a great increase has taken place in the consumption of food, as will be seen in the following comparison between that of 1864 and 1867:—The number of head of bullocks slaughtered during the year has increased from 12,526 in 1864 to 19,724 in 1866; sheep, from 89,521 to 138,324; fresh meat, from 209,452 kilogrammes to 514,909 kilogrammes; the head and inferior portions, from 147,703 kilogrammes to 267,734 kilogrammes; salt meat, from 52,403 kilogrammes to 180,083 kilogrammes; bread and flour, from 16,164,376 kilogrammes to 19,595,859 kilogrammes; wine and vinegar in barrels, from 137,921 hectolitres to 208,597 hectolitres; bottled wine, from 21,411 to 83,017 bottles; sugar, from 490,033 kilogrammes to 1,000,170 kilogrammes; coffee, from 175,692 kilogrammes to 439,512 kilogrammes. The octroi duties have increased from 2,417,826 frs. 25 centimes to 5,200,675 frs. 30 centimes. The total number of shops for the sale of provisions is 4,353, of which 3,463 are in the town, and 890 in the suburbs. Of these, 597 are for the sale of wine, 298 pork butchers, 247 bakers, 215 restaurants, 184 grocers, 188 small eating-houses, 178 cafés, and 134 cook-shops. In Florence there are 11 public baths, 6 of which are on the river Arno, 502 cabs, 80 omnibuses, and 450 porters.

The Agricultural Produce of California.—The following is from a report of Mr. Consul W. L. Brooker, on the Trade and Commerce of San Francisco:—"The area of land in this state is about 100,000,000 acres, and it has been estimated that over one-third is adapted to agriculture; this estimate is undoubtedly a sanguine one, but the capacity of the state for the growth of cereals is enormous, and vast quantities of hilly and swamp land, favourably situated, not at present tilled, will be made use of when the more desirable lands are occupied. The past year the total area of land under cultivation did not exceed 1,850,000 acres, and with a harvest below the average, we had for export 1,000,000 quarters of wheat; it is easy to see from this what a future the state has before her, with an increased population and railway communications, as a furnisher of grain to other countries; the distance from England and France, though great, is of little consequence, the grain grown here being harvested in such dry condition as to bear the voyage of from four to five months without any deterioration in quality. The absence of rain in the summer months enables the farmers to thrash in the field and thus save much labour; the dryness of the grain when harvested causes a good deal to be shed, but it is frequently made use of by being left to grow as a 'volunteer' crop the following year, and it is not unusual for this second crop to yield fifty per cent of the original. Wheat has been found the past two years to pay better than other grain, and the quantity of oats and barley sown has not increased materially in consequence. One serious thing in connection with farming is, that no attention is paid to rotation of crops; wheat follows wheat, or barley barley, without a thought being given to the inevitable exhaustion of the soil sooner or later; however, many assert that the land does not deteriorate by the system, that without the aid of guano or manure of any kind, they have grown grain for nine or ten consecutive years without any diminution of the crop. The grape vine is cultivated in all parts of the state, and although the manufacture of wine has not proved lucrative, it is estimated that the quantity will approximate to 2,000,000 gallons, a good deal of which has, however, been distilled into brandy, which is found to pay better, even with the present excise duty of 1 dollar per gallon. Fruits of almost every known variety grow luxuriantly, apples and pears are in plentiful supply throughout the year; during the past season 180,000 boxes, averaging 40 lbs. each, of peaches were sent to this market; cherries, strawberries, plums, quinces, raspberries, figs, gooseberries, and currants, were plentiful for several weeks. From the southern part of the state were received large supplies of oranges, lemons, quinces, olives, and walnuts. Apples, pears, peaches, plums, and figs are dried in considerable quantities, and we shall be able in two or three years to supply other markets. The shipments of grain

and flour during the year 1867, to all points, were as follows:—Wheat, 940,742 quarters; oats, 3,205 quarters; barley, 17,409 quarters; flour, 523,793 barrels.

The American Flower Trade.—The trade in flowers in the United States during the last few years has received a great development, and amounts annually to millions of dollars. Twenty years since there was only one florist in the whole length of Broadway. Now numerous shops, all well filled and well frequented, may be found there. One of them, managed by Mr. Henderson, does annually an enormous amount of business. The florists are generally supplied by the nurserymen of Philadelphia, Baltimore, and even Cincinnati, who are almost all of German or English extraction. The most favourable time for the sale of flowers begins in September, and ends at Easter. Christmas-day, New Year's-day, and Easter-day are the three principal days for sale; at each of these seasons the churches are literally strewed with flowers. All the year besides, in public or private ceremonies, at funerals, at political or religious meetings, an immense consumption of plants and shrubs takes place.

The Gas Supply of Milan.—The following particulars relating to the gas lighting of Milan are given by *Il Gas*, a monthly journal, just published at Milan. In 1787 this city was first lighted up, 1,158 oil lamps being used for this purpose. On the 31st July, 1845, Milan was first lighted with gas. The streets were lighted with 377 gas lamps, and 800 of the old oil lamps; in all with 1,177 lamps. The price paid for gas was 38 centimes per cubic metre for the public lighting, and 66 centimes by private consumers. In 1851, the number of gas-lamps was increased to 494, and the price per cubic metre reduced to 35 centimes for public lighting, and 50 to private consumers. The total quantity of gas consumed per annum by the street lamps was 210,295 cubic metres, and the annual expense for the lighting the city amounted to 211,913 francs (including the 770 oil lamps which were still used in some of the streets). The number of private burners was 2,608, which consumed 620,800 cubic metres of gas per annum. From 1851 to 1863, the number of lights, both public and private, was greatly increased; and in 1864 a fresh contract was made wth the municipality at 28 centimes per cubic metre, and with private consumers at 45 centimes. The following is the number of lights both public and private, the annual consumption of gas, and expenditure for lighting of Milan from 1864 to 1867:—

	1864.	1866.	1867.
Public Lighting:—			
No. of street lamps	1,764	2,469	3,082
Consumption of gas, cubic metres	761,306	1,061,154	1,195,638
Annual expenditure, francs	305,394	295,681	314,227
Private Lighting:—			
No. of burners	20,491	26,127	30,097
Consumption of gas, cubic metres	1,874,211	2,412,350	2,721,896

The illuminating standard, according to contract between the gas company and the municipality, is, that each lamp should consume not less than 120 litres of gas per hour to equal 42 grains of Colza oil, burnt in a Carcel lamp.

The Trade of Odessa.*—The following report on this subject is by Mr. Othon Trithen, Swiss Consul at Odessa:—Industrial enterprise, which had to struggle a long time before it got a firm footing in this country, begins to spread and prosper, although the year 1867 was not one of the most favourable, especially as regards sugar refineries, prices having undergone a decline in consequence of an abundant crop of beetroot. Steam flour mills have likewise given results inferior to those obtained hitherto in consequence of the dearness of corn, which prevented shipment of flour to Turkey at suitable prices. Steam saw mills prosper and multiply, as well as distilleries and breweries. In one word, we see all the industrial enterprises undertaken by experienced persons, and who have capital corresponding with the importance of the establishment, succeed and prosper, whilst the contrary effect is produced where the above conditions essential for success were wanting, which only confirms my conviction that industry can exist in South Russia, provided the management is based on experience and good sense. Agriculture has not lost its importance since the emancipation of serfs, as one would have apprehended; and although I am in want of statistics wherewith to establish how much labour was devoted to the soil ten years ago, viz., before the emancipation, and how much labour is employed now, I am convinced that the difference in excess is considerable. The culture of Merino sheep continues to develop itself in a satisfactory manner, although it is difficult to contend against the opposition of Australian and Cape wools. In 1867 import business increased greatly, and the following articles, especially, show a considerable increase on the preceding years.:—

Importations.	1866.	1867.
	Poods.	Poods.
Tea	15,469	23,062
Coffee	43,527	70,422
Oil	90,758	146,675
Tobacco	36,521	40,586
Cotton and cotton stuffs	10,068	18,921
Dye-wood	8,145	20,960
Iron	846,368	3,395,666
Coals	4,719,671	7,440,137

(63 poods = 1 ton.)

The increase on the latter articles is too considerable not to merit special remark. The increase of iron results from the enormous quantities of rails which have been imported for the various lines of railways now being formed, and the increase of coals is due to the activity which is always extending in sea and river navigations, railways, and industrial establishments. The exports in 1867 present, likewise, a very considerable increase over those in 1866—say nearly six millions of roubles—the increase would have been still more considerable if there had not been a decrease in the following articles:—

Exports.	1866.	1867.
	Chetwerts.	Chetwerts.
Flour	116,084	85,359
Oats and barley	342,128	51,563
	Poods.	Poods.
Soap	473,555	211,362
Wool	336,556	248,015
Horses and other cattle	374,515	nil.

(100 chetwerts = 72 quarters.) (63 poods = 1 ton.)

The construction of railways in South Russia is pursued with the greatest activity, and we shall probably see, in the current year (1868), the lines from Odessa to Elizabetgrad, and from Odessa to Keef, completed; and the works continued on one side to Krementchong, and on the other to the Austrian frontier at Nolotchesk, where they will join the Brody-Lemberg line. It is to be regretted that the rolling stock and material employed are quite insufficient to the wants of commerce and the public. The rate of interest and of discount for good

* This document was kindly forwarded to the editor by Mr. John Draper, of London-wall, a member of the Society.

bills was, through the year, 10 per cent., or thereabouts. The total exports of Odessa, in 1866, amounted to £6,818,377, while the imports were estimated at £804,061.

The Electric Light on the Italian Coast.—The new light-house at Brindisi will be lighted up by an electric lamp apparatus. This will be the first application of electricity for the illumination of light-houses in Italy.

Colonies.

The Cape of Good Hope.—Attention is now being devoted in the eastern provinces to the further development of the capabilities and resources of the colony. The mimosa silk is being tested; the *Ailanthus glandulosa*, if not the worm which feeds upon it, has been grown. A gentleman has just obtained some valuable seeds from Egypt, to which he will secure as favourable a trial as he can. Lucerne is taking a place as food for cattle, and as a substitute for more fickle crops. Experiments are being made in methods of agriculture with new implements, and by the economising and application of manures hitherto neglected. Much is being done in the important department of water storage. Ostrich farming and the angora are recent enterprises. The first bale of cotton has been sent from the eastern province. It was grown in the Peddie district, and is apparently of good staple. Tobacco, pronounced to be equal to the best American, has been produced; some of the leaves measure two feet ten inches. Mr. Inspector Bowker, of the Mounted Police, has prepared a sample of wax, the produce of the mimosa tree. The material from which it is made is supposed to be formed by a kind of ant or insect. It consists of a whitish substance, which abounds on the thorn trees near Maclean, in British Kaffraria, and when melted down forms wax which is not much unlike dark beeswax, though of a different smell. Two plants are reported as growing wild in the Chalumna. One of these is supposed to be the genuine sarsaparilla root, which it strongly resembles, and the other apparently a tea plant of the China species. The latter plant is said to be plentiful, and very luxuriant.

Australian Wines.—An attempt is being made to get up a public company in Melbourne, for the purpose of purchasing Australian wines, storing them till matured, and ultimately introducing them into the European and Indian markets in a manner that will secure for them a proper reception. Properly carried out, such a project would certainly prove highly useful, not only to Victoria, but also to the neighbouring colonies. In this colony alone there are, as appears from the lately-published agricultural returns, 4,176 acres under grape vines, while in New South Wales there are 2,281, and in South Australia, 6,361 acres, or 12,818 acres in all. A considerable portion of this large area is no doubt under vines not yet arrived at full bearing; but on the other hand new lands are planted with grape vines every year, so that the wine production of the three colonies is certain to attain to large dimensions within a few years. Even if there should be no extension of the wine trade beyond the natural extension that will result from the growth of the vines already planted, we might count upon having something like 5,000,000 gallons of wine produced in the three colonies within a year or two. For this we can scarcely expect to find local demand at prices that will remunerate the vignerons. The taste for colonial wine is unquestionably growing rapidly in Victoria. Indeed, in Melbourne alone there is already a very large consumption, nearly forty wine shops being kept open, in which nothing but colonial wine is supplied to the customers, while at private tables the Victorian wines are generally produced, and always partaken of to some extent when available.

The Victorian Railways.—The receipts of the current year show a total up to 6th August of £326,878 2s. 6d., against £313,333 during the corresponding portion of last year. The weekly average this year is £10,544 9s. 1d., against £10,107 10s. 7d. last year. The Melbourne Hobson's Bay Railway Company's receipts from July 1 to August 6, were £12,238 18s. 7d., against £13,242 19s. 2d. during the corresponding period of last year.

Publications Issued.

Il Gas is the title of a new publication, which, as its name implies, treats entirely of matters connected with gas lighting and manufacture. This journal is published monthly at Milan, and is the first periodical connected with this industry which has been brought out in Italy. The first number, which has just been published, contains a paper on "The Flow of Gas in Pipes, and its discharge from orifices," by an eminent gas engineer of Milan. The other articles are "The history of the lighting of Milan with Gas," "The use of Petroleum as fuel for steam boilers," besides other miscellaneous information. It also contains a share list and price current of coal, coke, and metals, and a list of freights from Newcastle to the principal Italian ports. The subscription to *Il Gas* is 12 francs per annum for England.

Colony of Victoria: Patents and Patentees, from 1854 to 1866.—By William Henry Archer, Registrar-General of Victoria. *(By authority, John Ferres, Government printer.)*—It appears by the preface that the present volume is the first of a series of publications which, it is hoped, will prove of great utility to inventors, capitalists, practical manufacturers, and others. The plan of publication is based as much as possible upon that adopted by the British Commissioners of Patents. The work contains:—1. A list in which the various patents granted or applied for during the period from 1854 to 1866, both inclusive, are systematically classified and arranged in accordance with the nature of the invention; the claim of the patentee or peculiarity of the invention being also briefly given. 2. A list of patentees lexicographically arranged, with the titles and dates of their inventions for the above period. The whole is rendered still further easy of reference by means of a carefully compiled index or key of terms and phrases used in the titles. The present volume is to be followed, as soon as practicable, by the publication of abstracts of the specifications, illustrated by carefully prepared drawings.

Notes.

The Mont Cenis Tunnel.—During the second fortnight of the past month (October) the progress made at the Mont Cenis Tunnel was 62·40 metres; of which 28·30 metres were driven on the south side, at Bardonnèche, whilst the progress made at the north end, at Modane, was 34·10 metres. The position of these works up to the 31st October was as follows:—

	Metres.
Length driven at Bardonnèche	5,263·30
Length driven at Modane..........	3,694·75
Total length of tunnel driven	8,958·05
Length remaining to be driven	3,261·95
Total length of tunnel	12,220·00

Conservatoire des Arts-et-Métiers, Paris.—The annual courses of lectures on science applied to the arts, which are open gratis to all the world, have just commenced at the Conservatoire des Arts-et-Métiers, in the Rue St. Martin. This excellent establishment is being largely increased and renovated; extensive new buildings in connection with the old edifices of the monastery of Saint Martin, or in the same style, are being erected, and will shortly be finished; and a number of miserable tenements which abutted on and partially hid the fine old

chapel of the monastery are being removed, so as to throw the whole open to view, and also to diminish the chance of accidents by fire. The new buildings will allow of great extension of the chemical and agricultural portion of the establishment, commenced after the great Exhibition of 1855, as well as of the older departments. One of the latter is perhaps not known abroad so well as it deserves to be, namely, the office of inventions and of mechanical and other plans and drawings, which contains a fine collection, open to the public twice a week, and at all times to those who desire to examine them with a serious aim. These documents date back to the time of the first empire, when the conservatoire was established.

The Palais de l'Industrie, Paris.—The building which was erected for the Universal Exhibition of 1855, has been one of the most useful public edifices in Europe, besides affording shelter for the Salon or exhibition of the works of modern artists, which in consequence has become annual instead of biennnial or triennial as formerly, while the number of works is almost, if not quite, doubled. There have been exhibitions of all kinds held there, agricultural and horticultural, exhibitions of horses and of insects, exhibitions of applied art and manufactures, archæological, antiquarian, and photographic exhibitions, and exhibitions of poultry, cheese, butter, and dairy implements; in short, many exhibitions, nearly every one of them important, have been held which could scarcely have taken place but for the existence of this useful public building. In addition there is a permanent and gratis exhibition of colonial products established there, and the ceremonies connected with the Universal Exhibition found an admirable theatre in the Palais de l'Industrie last year. On the occasion of the horse exhibitions the central portion of the building was laid down with tan and used as a ride, and for the exhibition of cavalry training and driving, and this apparently has led to a new temporary application of it. Parisian horsemen, who increase in number every day, complained that they wanted a place of exercise in bad weather, and at the suggestion of the chief equerry of the Emperor, the Palais is to be devoted to that purpose during the winter months. The nave is separated into two parts, a general ride and a school, or place of equitation. They are to be open from seven in the morning till dusk every day, from the 15th November to the 15th March, with the exception of an hour and a-half to give rest to the attendants. The admission for each cavalier is to be half a franc in the morning and a franc in the afternoon, and the public is to be admitted to the surrounding galleries at the lower rate of admission all day. Monthly tickets will also be issued at ten and twenty francs.

The Suez Canal.—The following is the position of the works of excavation on the Suez Canal up to the 15th September:—

	Metres cube.
Total amount of excavation executed on canal up to 15th August	47,228,155
Total amount excavated from 15th August to 15th September	2,081,367
Total amount executed up to 15th September	49,309,522
Amount remaining to be executed	24,802,608
Total amount of excavation estimated for construction of canal	74,112,130

The Genoa and Chiavari Railway.—The inauguration of the Genoa and Chiavari Railway took place on the 31st October, and the line was to be opened to the public on the 5th November. The length of this railway is 34 kilometres. Between Genoa and Chiavari there are not less than thirty-nine tunnels, the total length of which are 15 kilometres, or nearly half the entire length of the line. The longest tunnel is that of Ruta, which is 3,047·25 mètres in length. The maximum gradient is 6 in 1,000.

Correspondence.

Diamonds at the Cape Colony.—Sir,—As the report of diamonds having been found at the Cape has excited considerable interest, and as it is possible that some unfortunate persons may thereby be induced to embark on a fruitless errand, I think it advisable to make public some facts with which I have become acquainted in connection with this subject. Some months ago my attention was called to the report of diamonds having been discovered in or near to the Orange river, and I was shown a diamond of fair quality (resembling the Indian rough material) said to have been found thereabouts. Being naturally desirous of discovering or developing a new source of supply to supplement the gradually decreasing yield of the Brazilian and Indian mines, I commissioned Mr. J. R. Gregory, a gentleman well known in geological and mineralogical circles, thoroughly to explore the districts where diamonds were said to have been found. Mr. Gregory has just returned, and reports having carefully visited the Orange, Vaal, Buffalo, and Fish rivers, as well as the adjacent country as far as 120 miles into Griqua Land, and has failed to find anywhere those geological and mineralogical signs which have hitherto been invariably seen wherever diamonds have been found, and nowhere does the formation of the country warrant the inference that diamonds could exist there. The whole of the territory visited is of volcanic origin; in only one instance, at George, on the extreme south coast, did Mr. Gregory meet with a stratum of granite and mica slate; this was coarse and friable, and contained only crystals of black tourmaline, which crumbled on being taken from the quartz. The "Conglomerate bed," alluded to by Professor Tennant at the British Association, described by him as consisting of sand with quartz pebbles, was in reality a composition of lime with agate and calcedony pebbles. The solitary specimens of rough diamond as yet produced have been brought to light through the instrumentality of a Dutch farmer, and two of these were said to have been found on separate farms of his, some twenty miles apart. Mr. Gregory, who is a perfectly competent authority, after exploring all the places said to be "diamondiferous," and over 2,000 miles of other Cape territory, is clearly of opinion that no diamonds have nor ever will be found in the Cape Colony—saving such as are there deposited for a purpose; and he fully believes that all the reports that have been so industriously circulated on this subject and about gold fields (of which more hereafter) owe their origin solely to interested parties, who aim at enhancing the price of land and attracting a flow of immigration. The degree of competency of the local geological and mineralogical authorities, is indicated by the fact of their having recommended digging to a depth of 120 feet through a bed of lignite of tertiary formation in the hope of finding true coal beneath, and this recommendation was actually carried into effect at Joostenberg, a place about forty miles from Cape Town. One of the Cape mineralogical luminaries, in one of his letters to the *Cape Argus*, describes emery as a compound of iron and quartz, though any "tyro" knows it to be simply impure corundum. With such guides to knowledge it is not surprising that inexperienced persons, and even government officials, have been deceived. For the information of the public, I may as well state that the diamond has hitherto been found only among rocks of the very earliest period, such as granite, mica slate, and other metamorphic rocks, and they are usually found accompanied by itakolumite, titaniferous iron-sands, oxydes of tin, zircons, &c.; as yet there has been no single instance of their appearing in rocks of a volcanic origin. As regards the so-called "gold fields," Mr. Gregory, although unable to visit the district, is of opinion, from what he has seen and learnt, that they are as equally a myth as the "diamond mines;" and although gold may, and doubt-

less does, exist there, as it does indeed in most parts of the world, England included, yet it is not in sufficient quantities to pay to work, nor to warrant the name of "gold-fields," so pompously applied to them. Very slight dependence should be placed in the Cape newspapers' sensational paragraphs. As an instance of their reliability, Mr. Gregory relates that, while at Hope Town, an explorer came down from the "gold country" and exhibited a specimen of "gold-bearing quartz," which on examination proved to be quartz with gold-leaf artistically glued on, sufficiently well to deceive an unpractised eye. Mr. Gregory exposed the imposture in the presence of several witnesses, yet the very next number of the *Colesbury Advertiser* said that "the explorer in question had arrived from Bamangwato, and had brought down some specimens of gold, which Mr. Gregory, the mineralogist, had pronounced to be very rich." These so-termed "diamond and gold discoveries" have been extensively puffed, and unless the true facts are made apparent, I fear that many adventurous persons might be induced to risk their all in emigrating to a colony where everything is very dear and subsistence hardly to be earned; and I fancy they would derive small comfort in their ruin from the consideration that their emigrating might eventually lower the price of labour and thereby benefit the established colonists. —I am, &c., Harry Emanuel.

8, Clarence-terrace, Regent's-park.

White Whale Skins.—Sir,—I saw yesterday, on board the Aberdeen whaler *Kate*, Capt. Fraser, now unloading at Peterhead, a quantity of white whale skins, which he has brought as an experiment to this country. I believe it is the first time that they have been imported, and as they seem fitted to produce a tough and serviceable leather, it may be useful to some of your readers to have their attention directed to them. The *Kate* has brought home the oil of 250 white whales, and should their skins prove valuable, they will offer an additional source of profit to those engaged in this dangerous enterprise.—I am, &c., John Fretwell, jun.

38, Gresham-street, London, E.C., Nov. 10th, 1868.

MEETINGS FOR THE ENSUING WEEK.

Mon......British Architects, 8.
Society of Engineers, 7½. Discussion on Mr. Henry Gore's paper on "Modern Gas Works, at Home and Abroad."
Entomological, 7.
Tues ...Civil Engineers, 8.
Anthropological, 8.
Statistical, 8. Professor Jevons, "On the Amount of the Metallic Currency of the United Kingdom with reference to the question of International Coinage."
Wed ...Meteorological, 7.
R. Society of Literature, 8½.
Thur ...Linnæan, 8. 1. Mr. A. W. Bennett, "On the Structure and Affinities of *Parnassia palustris.*" 2. Rev. M. J. Berkeley and Mr. C. Broome, "On some species of *Agaricus* from Ceylon." 3. Dr. Lindsay, "Experiments to determine the value of Chemical reaction as a specific character in Lichens."

Patents.

From Commissioners of Patents' Journal, November 6.

Grants of Provisional Protection.

Adhesive substances—3177—E. T. Hughes.
Axles, conveying rotary motion to—3229—K. J. Winslow.
Bath gloves, &c.—3215—T. Forster and J. Heartfield.
Beaming warps—3186—T. Wrigley and W. E. Yates.
Bedsteads—3121—J. Moon, I. H. Donaldson, and S. J. Harris.
Belts, &c., buckles for—3239—T. Walker.
Blinds, maps, &c., rollers of—3005—T. Fisher.
Buildings, warming and ventilating—3176—J. Phillips.
Button fastenings—3261—H. Mayhew.
Capstans—3251—B. Hunt.
Carriage axles, &c.—3188—J. Cockshoot, jun., and H. Weatherill.
Cartridges—3182—E. Ludlow.
Chandeliers, &c.—2316—F. Horner.
Chemical operations, utilising the vapours evolved during certain—3036—R. Heilmann and P. Hart.
Chinese fans—2717—J. Neumann.
Coal, &c., breaking down—3275—J. Jones and S. P. Bidder, jun.
Coffee-pots—3152—J. Denley.
Cooking apparatus—3184—F. P. Warren.
Cotton, cleaning and decorticating—3259—S. Clark.
Cotton seed, treating—3149—W. Lorberg.
Cotton, &c., cleaning, &c.—3018—F. A. Calvert.
Drilling apparatus—3142—W. R. Lake.
Dyeing hair—3138—W. R. Lake.
Engine or pump valves—3241—W. W. Tonkin.
Finger rings and bracelets—3172—J. Sherman.
Fire-arms, &c., breech-loading—3173—C. Churchill.
Flax, &c., breaking and peeling—3028—E. F. Rose.
Flour mills—3205—E. Harrison.
Food, preparing from the entrails of animals—3086—J. Dewar.
Furnaces—3156—E. Fort and J. Lea.
Furnaces—3166—T. Vicars, sen., T. Vicars, jun., and J. Smith.
Gun-boats—3134—R. Dawson.
Guns, breech-loading volley-firing—3164—W. R. Lake.
Heat and light, obtaining—3101—H. A. Archereau.
Heating and cooking apparatus—3124—S. Leoni.
Kilns for burning bricks, &c.—3231—J. Ryder.
Lace—3126—W. Brailsford and J. Gadsby.
Lamps—2349—J. A. Hogg, jun.
Lamps—3132—G. N. Sanders.
Looms—3095—J. Peel, J. F. Broadbent, and J. M. Baines.
Looms—3243—J. Gregson and W. Monk.
Looms—3277—T. Priestley and W. Deighton.
Minerals, &c., pulverising—3235—T. Carr.
Mowing machines, &c.—3225—H. Warner.
Ores, &c., preparing and dressing—3247—J. Bernard.
Paper collars, &c.—3253—C. W. Davis.
Picture frames, &c., ornaments for—3130—H. C. Clifton.
Projectiles—3223—H. C. E. Malet.
Rails, &c., securing the joints of—3128—T. F. Caslin.
Railway trains, facilitating the stopping of—3150—H. Hudson.
Railways, permanent way of—3168—R. M. Marchant.
Rotary engines—3271—J. Loader and W. H. Child.
Safety-lamps—3160—T. Gray.
Safety-valves—3174—J. Ashcroft.
Sewing machines—3263—J. L. Kieffer.
Ships, propelling and steering—3122—W. Moodie.
Steam gauges—3265—J. Silvester.
Stereotype plates—3136—J. Worster.
Stoves and boilers—3170—R. Head.
Surface printing, blocks for—3255—E. Wimbridge.
Tourists' bottles, &c.—3178—C. Mayer.
Tubes, metallic—3148—J. Atkins.
Valves made of india-rubber, &c.—2702—T. G. F. Dolby.
Walls, &c., ornamenting—3269—B. Nicoll.
Water-closets—3140—J. Shanks.
Wool, &c., combing—3219—I. Holden.
Wool, &c., spinning—3144—W. R. Lake.

Patents Sealed.

1215. E. Dubois and E. Casper.	1577. J. Driver.
1498. R. A. Green.	1579. J. E. Piper.
1503. A. Strauss.	1601. A. M. Clark.
1512. W. Husband & F. B. Dœring.	1610. A. M. Clark.
1517. G. F. Griffin.	1627. A. M. Clark.
1523. R. Waygood.	1668. E. A. Chameroy.
1525. W. H. Wilkinson.	1687. C. D. Abel.
1530. R. Moore.	

From Commissioners of Patents' Journal, November 10.

Patents Sealed.

1540. R. Leake and J. Beevers.	1645. C. L. Taverdon & J. Moret.
1547. C. Vero.	1681. H. Hall and J. A. Mason.
1548. T. Shinton.	1737. W. R. Lake.
1549. W. D. Brown.	1740. A. M. Clark.
1553. F. W. and W. J. Crossley.	1771. J. Drabble & J. S. Raworth.
1555. G. Dixon.	1783. I. B. Guest.
1558. C. Farrow.	1821. J. H. Johnson.
1561. W. Taylor.	1826. W. Rye.
1572. W. Gadd and J. Moore.	1831. C. E. Brooman.
1582. V. G. Bell.	1833. C. E. Brooman.
1586. W. Walker.	1899. W. Barton.
1602. W. R. Lake.	1919. J. H. Johnson.
1606. H. J. H. King, J. Auchinvole, and A. Patrick.	1937. W. Müller and G. Englert.
	2130. W. E. Newton.
1607. T. Briggs.	2483. J. Kirk and J. Batstone.
1618. W. R. Lake.	2592. T. R. Shaw.
1626. J. F. Spencer.	2712. J. F. C. Carle.

Patents on which the Stamp Duty of £50 has been paid.

2993. A. C. St. P. de Sincay.	2865. W. Esplen and J. Clarke.
2844. H. J. Sanders.	2873. F. G. Bennett.
2904. A. V. Newton.	2877. C. Mole.
3011. J. Ellis, jun.	2881. N. Beard and J. Maiden.
3168. H. A. Bonneville.	2959. T. J. Perry.
2876. R. Swires.	2883. J. Eastwood.
2897. T. Whitwell.	2913. G. H. Goodman & E. Bow.

Patent on which the Stamp Duty of £100 has been Paid.

2772. R. Wilson.

Journal of the Society of Arts.

FRIDAY, NOVEMBER 20, 1868.

Announcements by the Council.

Notice to Members.

The One-Hundred-and-Fifteenth Session of the Society will commence on MONDAY next,* the 23rd NOVEMBER inst., when the Opening Address will be delivered by Lord Henry G. Lennox, M.P., Chairman of the Council, and when the Albert Medal awarded to Mr. Joseph Whitworth, the Society's Gold Medal, with Fifty Guineas, awarded to Mr. W. A. Gibbs, and the Prince Consort's Prize awarded at the last Examinations to Mr. R. C. Kingston, will be presented.

The following are the dates of the Wednesday evening meetings, the chair being taken at 8 o'clock:—

1868. November	—	—	23*	25	
„ December	2	9	16	23	—
1869. January	—	—	20	27	
„ February	3	10	17	24	
„ March............	3	10	17	—	31
„ April	7	14	21	28	
„ May..............	5	12	19	26	
„ June	—	—	—	—	30†

For the Meetings previous to Christmas, the following arrangements have been made:—

NOVEMBER 23.—Monday.—Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.

November 25.—"A Glance at the Past and Present of the Society of Arts, with some Suggestions as to the Future." By S. T. Davenport, Esq., Financial Officer of the Society.

December 2.—"Further Notes on the Productive Industries of Natal." By Dr. Mann, Superintendent of Education and Special Commissioner for the Colony.

December 9.—"On the Theory of Boiling, in connection with some Processes in the Useful Arts." By Chas. Tomlinson, Esq., F.R.S., F.C.S.

December 16.—"On Artificial Freezing." By Dr. B. H. Paul.

December 23.—"Description of the Electric Organ." By Henry Bryceson, Esq.

A book of blank Tickets of Admission to the Meetings has been sent to each Member, who is privileged to introduce two friends to each Meeting on their presenting orders signed by him. Additional Tickets will be forwarded on application.

* As the Elections rendered it impossible for the Chairman of the Council to attend on the 18th inst., the Opening Meeting is unavoidably postponed to Monday, the 23rd of November.

† The Annual General Meeting: the Chair will be taken at Four o'clock. No Visitors are admitted to this Meeting.

The first Course of Cantor Lectures for the ensuing Session will be "On the Aniline or Coal Tar Colours," by W. H. Perkin, Esq., F.R.S., and will consist of three Lectures, to be delivered on Monday Evenings, the 7th, 14th, and 21st December, at Eight o'clock. Other courses are being arranged, particulars of which will appear in the *Journal.* These Lectures are open to Members, each of whom has the privilege of introducing two friends to each Lecture. Tickets for this purpose will be forwarded in due course.

Members are reminded that, should any of their friends wish to join the Society, the opening of the Session is a favourable opportunity for proposing them.

Subscriptions.

The Michaelmas subscriptions are due, and should be forwarded by cheque or Post-office order, crossed "Coutts and Co.," and made payable to Mr. Samuel Thomas Davenport, Financial Officer.

Fine Arts.

The French Academy of the Beaux Arts.—M. Pils, whose picture of the storming of the heights of the Alma, exhibited a few years since, won him a professorship in the School of the Beaux Arts, has been elected a member of the Institute in the department of painting, in the place of the late M. Picot.

An Architectural Curiosity.—The readers of the *Journal* are aware that the city of Paris is now converting the Hôtel Carnavalet, formerly the residence of Madame de Sévigné, into a museum for the antiquities of Paris. At the present moment an interesting operation is being carried out, namely, the transplanting, stone by stone, a curious arch, constructed in the time of Henry II., and which the other day formed part of the dependencies of the Prefecture of Police, which has been almost entirely reconstructed. This arch originally crossed the old street, the Rue de Nazareth; it formed a communication between two public offices, the Cour des Comptes and the gallery of the Archives. The vaultings rested upon eight brackets, four of which were ornamented with heads of satyrs, and the other four with heads of women, each of which has a crescent, the device of Diana of Poictiers. The other parts are decorated with heads of angels and masks, and there are four small female figures in the tympans, in the style of Jean Goujon. The arch is in good preservation, and will form an appropriate object in the court of the new municipal museum. A very beautiful screen, of the same period, or nearly so, stands in the fore-court of the Academy of the Beaux Arts, and attracts general admiration.

Bronze Statue of Napoleon III.—An equestrian statue of the present Emperor of the French has just been fixed over the new gateways that lead beneath the great gallery of the Louvre into the Place du Carrousel. The work is a close imitation of the well-known equestrian statue of Henry IV. over the central entrance of the Hotel de Ville. It is executed in half relief, in bronze, and is of great size, measuring about fourteen feet each way, and weighing nearly a ton. It is being fixed to the stonework by means of forty or more bronze bolts, screwed into sockets in the marble. The Emperor, in the costume of the Cæsars, is crowned with laurels, and holds in his left hand and resting upon his thigh

the Imperial sceptre, surmounted by the eagle with outstretched wings. The appearance of the work is certainly incongruous; it does not harmonise either with the architecture or ornamentation of the new structure, nor with any portion of the two great masses of building of which it forms part, any more than with the building, ornaments, or habits of the time of Louis Napoleon. In the time of Napoleon I. the pediments of this very portion of the Louvre were ornamented with Roman armour and insignia, and such decorations still exist on the opposite wing of the Louvre, but they have always been considered as quite out of keeping with the surrounding buildings and ornaments. It will be remembered that the statue of Henry IV. is just over the entrance of the Hotel de Ville, but that of Louis Napoleon is placed against the upper portion of the building, a position which detracts very much from its effect. The work is said to be by the able sculptor Barye, whose talent is well known.

Monument in Honour of the late President Lincoln.—A sculptor, named Gagliardi, has been entrusted with the execution of the Lincoln monument, which is to be of gigantic proportions, and will include one hundred statues. It will cost, it is said, from £40,000 to £50,000.

Presentation of Pictures to Montpellier.—An amateur of pictures has just presented to his native town of Montpellier a fine gallery of modern pictures, including seven by Delacroix, ten by Courbet, one by Decamps, one by Th. Rousseau, two by Troyon, and others by Diaz, Carbanel, and several eminent artists. These works will be placed in a special gallery in connection with the Musée Fabre, formed in like manner by a native amateur and painter many years since; and M. Bruyas is appointed director during his lifetime of the gallery which will bear his name.

Discovery of Antiquities.—Some soldiers occupied recently in making a trench near Hildesheim discovered a mass of vases, cups, candelabra, &c., about fifty in number, all in massive silver, and of which the workmanship and design give reason to suppose that they were produced in the time of Augustus by Greek artists. One cup is decorated with a charming chasing in relief, representing the infant Hercules strangling the snakes, and another with satyrs, bacchantes, and attributes appertaining to Bacchus. At Rome the hidden treasure of Pope Sextus Quintus has been found amid the ruins of a vault; in addition to considerable sums of money, the treasure is said to include objects of art of great value or interest.

Manufactures.

The Tinning of Saucepans.—In France, as in other parts of the continent, the use of copper saucepans is very far more general than it is in England, and great care is generally taken to keep them in good order. In all well-conducted houses copper vessels are tinned frequently, and cooks are thoroughly impressed with the danger accruing from neglect in this respect. The police regulations require that nothing but pure tin should be used, but that metal is dear, while lead is cheap, and, therefore, a mixture of the two metals is too often made use of. The mixture works well, but when the lead forms a considerable part of it the vessels become decidedly dangerous. In consequence of information obtained and suspicions entertained, the Minister of War ordered an inquiry to be made into the subject by the directors of the military hospitals. The result of this inquiry has been read before the Academy of Medicine, and brings out the startling revelation that some manufacturers of copper utensils and tinners mix 25, and in some cases 50 per cent. of lead with the tin, and that in addition to this, antimony, another dangerous metal, is added. From the facts thus brought to light, M. Gobley, a member of the Academy of Medicine, has drawn up the following list of recommendations:—1. That the metal used to line copper drinking vessels shall not contain more than one per cent. of lead. 2. That not more than 5 or 6 per cent. of lead be mixed with the tin used for saucepans or other cooking vessels, that amount offering no serious danger. 3. That every maker shall be required to mark his productions with a special stamp. 4. That the travelling tinmen shall be strictly watched.

Printing Paper in Paris.—According to *l'Etendard*, upwards of 27,000 kils. of paper are used daily at Paris for printing newspapers, reviews, and other periodicals. The quantity of paper used for this purpose amounts annually to 10,107,500 kils., of the value of 12,200,000 francs.

Japanese Silkworms' Eggs.—According to a correspondent in Japan to *Il Sole* of Milan, upwards of 820,000 cards of "grain" (silkworms eggs), each containing on the average 25 grammes of grain, had been purchased by the Italian traders in Japan up to the 31st August, for exportation to Europe.

Commerce.

Agricultural Exhibitions in Italy.—During the past autumn many exhibitions of cattle, agricultural products, and wines, have been held in Italy, under the auspices of the agricultural societies *(comizio agrario)* of the various towns. The following was the most important of these exhibitions:—Arezzo, from 8th to 13th September, of agricultural produce, horticulture and flowers; the prizes consisted of one gold medal, four silver, and ten bronze medals. Catania, from 5th to 19th of September, of animals and agricultural produce; four exhibitors obtained gold medals, and three silver medals given by Government, and various other prizes were given by the Acclimatization Society of Sicily, under whose auspices this exhibition was held. Conegliano, from 17th to 20th September, of agriculture, horticulture, cattle breeding and poultry; one gold medal, four silver, and ten bronze medals were distributed to the exhibitors. Cremona, from 3rd to 11th September, of cattle, with numerous prizes distributed by the comizio agrario of that town. Ferrara, from 11th to 15th September, of horses, cattle for breeding and draught, and agricultural implements; three exhibitors obtained gold medals, one a silver medal with prize of money, and four money prizes. Lucca, from 13th to 14th September, of cattle, pigs, goats, and poultry; two exhibitors obtained the government first-class prize (gold medals), six the government second-class prize (silver medals), and six the third-class prize (bronze medals). A silver medal and nine bronze ones were given by the comizio agrario for cattle, poultry, and wines. Mondovi, from 5th to 10th September, Oinological Congress and exhibition of wines, implements for the cultivation of vines, and utensils for wine making. Two *memoires* on wine-making obtained gold medals, four exhibitors of implements and utensils obtained silver medals, and for wines one gold medal and four silver ones were given, besides numerous honourable mentions. Reggio d'Emilia, the 15th September, an exhibition of horses and bulls. Six silver medals and three bronze ones were given to exhibitors of horses, and four silver and one bronze medal to exhibitors of bulls, and various other prizes in money. Sacile, from 13th to 15th September, agricultural products, besides six prizes given by the agricultural association of Friuli, under whose auspices the exhibition was held. Six prizes were given by Government, consisting of one gold, two silver, and three bronze medals. Cairo Montenotte (Savona), on the 14th September, an exhibition of cattle, sheep and pigs. The prizes consisted of four silver and five bronze medals and many honourable mentions.

The Imports of Coffee to Italy.—The imports of coffee to Italy in 1866 amounted to upwards of 12,000,000

kilogrammes, or nearly the double of that of the previous year, whilst in 1864 the amount imported was 14,000,000 kilogrammes. In 1867, the quantity of coffee imported was 13,300,000 kilogrammes, of which 11,000,000 kilogrammes were consumed in Italy, and the remainder re-exported. Of this amount about 3,500,000 kilogrammes are imported direct from the countries where they are produced, namely, America and Turkey, and the remainder is obtained from England, France, and Holland. More than half the imports of coffee, namely, 7,874,000 kilogrammes, are brought by Italian vessels.

The Production of Sulphur in Sicily.—The number of sulphur mines in Sicily at the present time is upwards of 600, of which about 200 are completely abandoned. The extraction of the mineral is still carried on in a primitive manner, except that in a few mines machinery has been put up for this purpose and for drainage. About 22,000 persons are employed in the sulphur industry in Sicily, and the average annual production amount to 1,600,000 metrical quintals, of the value of upwards of 17,600,000 frs. The cost of labour amounts yearly to about 7,000,000 frs. Twenty years ago these mines only produced 30,000 quintals per annum.

Production of Silk in Italy in 1868.—The Chamber of Agriculture and Commerce of Turin have published the following statistics relating to the sale of cocoons in the markets of the principal towns in Italy during the present year. According to this it appears that the quantity of cocoons sold throughout Italy amounted to 622,473 myriagrammes, of the value of 45,327,626·25 francs, being an increase in quantity to that sold in 1867 of 188,231 myriagrammes, and in value of 16,485,158·91 francs. To this quantity must be added 123,849 myriagrammes, which were declared and brought to market, but not sold, an increase on that of the preceding year of 2,124 myriagrammes. Thus the total increase in the quantity of cocoons in 1868 on that of 1867 was 209,478, and in value of 18,682,526·34 francs. Taking into account the quantity of cocoons which were sold privately, and for which no accurate data can be obtained, the total production of cocoons during the present year may be estimated at 1,312,228 myrias, of the value of 95,543,332 francs. In Piedmont the variety of silkworm which gave the best results was the Japanese, the seed of which were obtained direct from that country, and which produced cocoons of a greenish colour; the reproduction from Japanese seed of other years did not give such good results. The other principal varieties were from seed imported from Corsica, Portugal, Upper Macedonia, the Caucasus, the Carpathian districts, and from Syria. The principal markets in Piedmont were at Turin, Carmagnola, Chiavasso, Ivrea, Alessandria, Asti, Casale, Sale, Tortona, Cuneo, Bra, Carrù, Ceva, Fossano, Racconigi, Savigliano, Novara, Palanza, Romagnano (Sesia), and Varallo. The quantity of cocoons at these markets amounted to 303,622 myriagrammes, considerably above the average quantity during the last twelve years, which was 250,445 myrias, though less than that of 1863, which was 353,443 myrias; and in 1861 317,595 myriagrammes. The total value of the 303,622 myrias amounted to 24,123,028·58 francs. The most important market was that of Racconigi, where 47,070 myrias of cocoons were sold, of the value of 3,153,690 francs. In Lombardy the best results were obtained from seed imported from Japan, but, on the whole, the silk crop did not realise the expectations of the producers. The principal markets were those of Como, Lodi, Brescia, Crema, and Pavia. The total quantity of cocoons amounted to 49,219 myriagrammes, of the value of 3,331,324·23 francs. As regards quantity, the market of Lodi was the most important, 14,969 myrias being sold; and the smallest quantity, 14,525 myrias, at Como, of the value of 1,169,637 francs; whilst that of Lodi only realised 944,017·02 francs, the average price at Como being 80·52 per myria, whilst that at Lodi was only 63·07. In Emilia, the total quantity of cocoons amounted to 63,403 myrias, of the value of 4,749,860·33 francs. The largest market was that of Parma, where 19,662 myrias were sold for 1,654,912·40 francs. In Umbria and the Marches the Japanese seed gave better results than those of other kinds. Of the eight principal markets, that of Tesi was the most important, the quantity of cocoons being 6,574 myrias, of the value of 480,550·81 francs. In Tuscany the production of silk was most satisfactory, the total quantity of cocoons in the principal markets being 28,050 myrias, of the value of 1,527,066·34 francs. The most important market was that of Prato, where the quantity of cocoons amounted to 10,000 myrias, whilst the best prices were obtained at Sierra, 6,940 myrias being sold for 638,656·59 francs. Of the eight principal markets in the southern provinces, that of Cosenza was the most important; the quantity of cocoons sold amounted to 31,560, of the value of 1,615,082 francs, whilst the total quantity in the eight markets, including that of Cosenza, only amounted to 37,696 myrias, of the value of 1,950,406·59 francs. In Venetia, the best results were obtained from Japanese seed. As regards the quantity of cocoons, no returns have been made, with the exception of the province of Vicenza, the quantity sold being 120,000 myrias, of the value of 8,100,000 francs. In upper Italy the silkworms suffered considerably from the excessive cold in the month of May, and in Central Italy much damage was done to the crop on account of the continual changes of temperature, whilst in the southern provinces the great drawback to the production of silk was the premature hot weather experienced during the spring. As regards prices, the lowest paid per myriagramme for inferior quality was 10 francs, at Pavia, whilst the highest was 165 francs, at Perugia, for cocoons of superior quality. The medium price paid for superior quality of cocoons was 104·42, at Castello, and that for inferior quality 34·44, at Sarno. The average price throughout the kingdom was 72·81 francs per myriagram.

Movement of Shipping in the Port of Palermo.—During the month of October the total movement of shipping in the port of Palermo was, according to the harbour master's return, 929 vessels, of 96,887 total tonnage; of the number the arrivals were:—

	No.	Tonnage.
Italian sailing vessels	372	11,592
,, steam vessels	51	16,879
Foreign sailing vessels	25	5,980
,, steam vessels	27	15,897

The departures during the month were:—

	No.	Tonnage.
Italian sailing vessels	360	10,284
,, steam vessels	49	15,970
Foreign sailing vessels	18	4,388
,, steam vessels	27	15,897

Notes.

Great Reservoir of Montrouge, Paris.—Another great reservoir for the supply of water to Paris, and similar to that at Ménilmontant, which was visited by some members of the Society when at Paris last year, is being constructed to receive the waters of the Vannes, which are being brought to Paris by means of aqueducts. The new reservoir is situated close to the new park of Montsouris, not far from the railway station of the Sceaux line. This reservoir will contain more than sixty-seven millions of gallons, for the supply of the left bank of the Seine, and such portions of the city on the other side as are not supplied from other sources. The object of the reservoir being built in two stories is to obtain a pressure sufficient to supply the houses in the highest parts of the town. Two more artesian wells are also being pierced; one, at La Chapelle, is to be 900 mètres deep, and half

this depth is already attained, but it will take at least two years more labour to complete the work; the other is at a spot called the Butte aux Cailles, near the Place d'Italie; but so many difficulties have occurred, that the work will not be concluded for several years. Amongst the decorations of the new park of Montsouris, the most conspicuous will be the palace of the Bey of Tunis, erected in the grounds of the Universal Exhibition last year; it will be taken down and reconstructed exactly in the same manner, only the lower portion will be built of hewn stone instead of ashlar.

Technical Education in Italy.—The results of the examinations of the students in the technical institutions of the scholastic year 1867-8 have just been published officially by the Minister of Instruction. The number of institutions for technical education was 54, which may be classed as follows:—

Technical schools	45
Schools for Special Instruction	1
,, for Mercantile Marine	6
Navigation schools	2
Total	54

The number of students registered was 845, of which 743 went up for examination. Their number was divided amongst the various districts in the following manner:—

	No. of Students.
Piedmont	217
Liguria	70
Lombardy	151
Venetian provinces	35
Emilia	72
Umbria	13
Marches	49
Tuscany	61
Campagna	38
Sicily	32
Sardinia	5
Total	743

The following are the number of students examined for the various professions:—

Agriculture and land-surveying	310
Commerce	162
Mechanics and construction, for license	132
Mechanics and construction, for diploma	57
Telegraphy	4
Mining and metallurgy	3
Navigation	62
Naval construction, 1st class	9
Naval construction, 2nd class	4
Total	743

The results of the examination were as follows:—

Professions.	Passed.	Admitted for re-examination.	Totally failed.
Agriculture and land-surveying	115	144	51
Commerce	86	56	20
Mechanics and construction, for diploma	13	35	9
Mechanics and construction, for license	81	36	15
Mining and metallurgy	—	—	3
Navigation and naval construction	31	27	17
Telegraphy	2	2	—
Total	328	300	115

Thus, of 743 students who went up for examination, 328 passed at once, 300 were allowed to come up on a second examination, as having failed in less than three subjects in the first, and 115 failed totally.

Exhibition at Bologna.—An exhibition of agricultural and industrial products will be held at Bologna next year, under the auspices of the Chamber of Commerce of that city, and of the agricultural societies *(Comizio agrario)* of Bologna, Imola, and of Vergato.

Action of Water on Lead.—Professor Parkes, F.R.S., of Netley, calls attention to the fact that it has always been seen that the action or non-action of water on lead could not be entirely accounted for by the usual statements on the subject, and lately Dr. Frankland has made a curious observation, which may throw light on the subject. He found that water which acted on lead lost this power after passing through a filter of animal charcoal. He discovered this to be owing to a minute quantity of phosphate of lime passing into the water from the charcoal; on comparing two natural waters, that of the river Kent, which acts violently on lead, and that of the river Vyrnwy, which, though very soft, has no action on lead, he found that the latter water contained an appreciable amount of phosphate of lime, while none could be detected in the Kent water. This observation may probably explain much of the discrepancy of evidence in respect of the action of soft water on lead.

French Small Silver Money.—The French Government has called in all the two and one-franc, half-franc, and four-sou pieces, as well as certain Belgian, Italian, and Swiss silver coins lately current in France. After the last day of the present year, no French or Italian coin of the above denominations will be received which bears date earlier than 1864; the silver Belgian pieces of Leopold I., and the Swiss pieces coined previously to 1860, will also be withdrawn at the same period. The public currency of these coins actually ceased on the 1st of October, but they will be received or exchanged at the post-office and public *caisses* until the end of the year. The object of this arrangement is to carry out the terms of a convention entered into between France, Italy, Belgium, and Switzerland, by which the coins of each country become current in the others, on the condition that they contain one uniform quantity of silver, namely, 835 parts in 1,000. Some of them at present contain 900 parts of silver, and others not more than 800. A similar convention is being made with the Papal Government; and when all these regulations are in force the small money, as well as the gold, of these five countries will all be current without difference of exchange, and without any margin for speculation and export.

University Education in Russia.—During the scholastic year 1867-68 the number of students at the University of Dorpat was 593, of whom there were 56 students of theology; 201 of law; 9 of diplomacy; 131 of medicine; 42 of pharmacy; 1 of classical philology; 1 of comparative philology; 1 Russian language and literature; 17 politcal economy; 19 history; 8 mathematics; 3 astronomy; 33 natural sciences; and 11 of agriculture. At the commencement of the scholastic year, the number of students entered at the University of San Vladimir, at Kiew, was 164, of which 24 were students of history and philology; 34 of physics and mathematics; 68 of law; and 38 of the faculty of medicine. The total number of students at the close of the year was 390, divided as follows:—43 students of literature; 74 of sciences; 171 of law; and 102 of medicine. The number of professors was 44, and ten chairs are vacant at the present time.

Correspondence.

Diamonds at the Cape Colony.—Sir,—In the last number of the *Journal* appears a letter signed "Harry Emanuel," bearing the above heading, and calculated very seriously to mislead persons in regard to the recent discoveries of diamonds and of gold in South Africa. The remarks of the writer concerning the diamonds that have been found near the Orange River, I leave residents in the Cape Colony to answer. It is sufficient now

to say that the opinion expressed, "that no diamonds ever have or will be found in Cape Colony, saving such as are there deposited for a purpose," is, to anyone personally acquainted with the history of the recent discoveries, entirely opposed to facts, and a direct reflection upon the veracity of the many high and responsible official personages who have borne testimony to the discovery. The observations made in connection with the gold discoveries I must be permitted to comment on more at length. We are told that "Mr. Gregory," who was commissioned by Mr. Emanuel to explore the districts where diamonds are said to have been found, "fully believes that all the reports that have been so industriously circulated on this subject, and about gold-fields (of which more hereafter), owe their origin solely to interested parties, who aim at enhancing the price of land and attracting a flow of emigration." The same authority, "*although unable to visit the district* [the italics are my own], is of opinion, from what he has seen and learnt, that they are as equally a myth as the 'diamond mines.'" Having, as editor of a Natal journal, been largely instrumental in circulating reports upon this subject, perhaps I may be allowed to cite my authority for doing so. That authority is, in chief, the personal statements and testimony of Carl Manch, the explorer, *protégé* of Dr. Petermann, who was the gold medallist of the Royal Geographical Society this year. Mr. Manch is an enthusiastic explorer—a man wholly without interest in anything save what concerns the great work to which he has devoted his life, namely, the traversing Africa from south to north. He made the discovery casually, and has positively assured me, and many trustworthy witnesses in Natal, that he neither hopes nor expects to reap any other benefit from the fact, except the distinction it may confer upon him. How far that distinction, or his reputation as a traveller, would be enhanced or compromised by his fathering an imposition, I leave your readers to decide. Mr. Manch's expressed belief in the richness of the gold-fields which have for ages been known to exist north of the Limpopo, were corroborated by specimens brought down by himself, and by yet richer and more abundant specimens of auriferous quartz that have since been received. Five hundredweight of this quartz will probably, by this time, be on its way to England. It may be, and probably is, true, that a specimen of quartz has been exhibited "with gold-leaf artistically glued on." Such silly impostures are by no means uncommon. But to say that a discovery, confirmed by such a wide range of testimony, is to be condemned as illusory and valueless because one or two weak-minded persons have been led to indulge in the folly of a senseless hoax, is scarcely rational or conclusive. I will, however, give the latest and most reliable testimony that has yet been received. It reached the country by the last mail, and is from the pen of a gentleman whose caution and reliability are, to those who know him, beyond all question. In April last he left Natal on a journey to the gold-fields, his object being partly pleasure, partly health, and partly the task of testing for himself, and by his own observations, the real state of the case. I refer to Dr. Taylor's letter as published in the *Natal Mercury* of September 22. Among his remarks are the following:—"During our stay of five days we received great kindness from all forming the prospecting parties; and from information obtained from them, and from my own observation, I do not think it would be advisable for any one to go there from Natal, with the idea of making a living by gold-digging, as none has yet been discovered in the alluvial deposits or rivers, but it would be desirable to send prospecting parties into the country, supplied with the requisite tools and provisions for twelve months. Arrangements should be made with the Matabele to work in safety, and it is very probable that gold-fields would be discovered, equal to any in the world." And again, "the quartz contains gold, and, I think, could be worked profitably in the wet season with a proper crushing machine." These simple and straightforward words sufficiently endorse all that Mr. Manch said, and are yet further confirmed by the fact that the quartz picked up (for none has yet been fairly quarried) near the Tatin, has been proved by analysis in this country to be singularly rich in gold. I am not aware that any South African journal has yet hazarded the assertion that the "gold-fields" are, or are not, "payable." All they say is, that historical evidence and present experience combine to favour the belief that a new (in one sense) and rich gold-field is about to be added to the auriferous resources of the world. It rests in great measure with English enterprise to determine whether an unreasoning spirit of incredulity is to defer indefinitely the day when this source of wealth is to be turned to practical account. I should not have troubled you with this letter did I not feel that the disfavour with which South Africa and its affairs are regarded in many quarters might give to Mr. Emanuel's letter a more injurious effect than among people well-informed on the subject it can possibly have. Surely the development of a resource which would help forward more powerfully than anything else the "colonisation" and civilisation of a large portion of the African continent will be promoted rather than discouraged by right-minded English people. So far from Natal being a place "where everything is very dear," there are few parts of the world where the necessaries of life—bread, meat, vegetables, &c., are cheaper and more abundant than they are there now. If further information is desired upon this subject I shall be happy to supply it to any of your readers, having only arrived within the last month from the colony.—I am, &c., JOHN ROBINSON, F.R.G.S., Member of the Legislative Council of Natal.

22, Abbey-gardens, St. John's-wood, November 16th, 1868.

MEETINGS FOR THE ENSUING WEEK.

MON......Society of Arts, 8. Opening Address by Lord Henry G. Lennox, M.P., Chairman of the Council.
Social Science Association, 8. Mr. Edwin Hill, "On the Policy of rendering Landlords, under certain circumstances, more amenable than at present for the Acts of their Tenants."
R. Geographical, 8½.

TUES ...Civil Engineers, 8. Discussion upon Mr. Henderson's paper "On Lighthouse Apparatus and Lanterns;" and (time permitting) Mr. J. F. Bourne, "On Roman Rock Lighthouse, Symon's Bay, Cape of Good Hope."
Ethnological, 8.

WED ...Society of Arts, 8. Mr. S. T. Davenport, "A Glance at the Past and Present of the Society of Arts, with some Suggestions as to the Future."
Geological, 8. 1. Mr. J. Wood Mason, "On *Dakosaurus*." 2. Mr. W. Boyd Dawkins, "On British Fossil Oxen. Part III. Conclusion:—*Bos bison*, Pliny." 3. Mr. W. Boyd Dawkins, "On the British Postglacial Mammalia."

THUR ...Zoological, 8½.

Patents.

From Commissioners of Patents' Journal, November 13.

GRANTS OF PROVISIONAL PROTECTION.

Account books—2640—J. S. Adcock.
Bessemer steel ingots, casting—3240—J. Birch.
Boilers, furnaces, &c.—3213—W. Maudslay and W. C. Rawlins.
Boots and shoes—3295—J. Moran.
Bricks—3080—W. Simons.
Buildings for horticultural and other similar purposes—2139—T. G. Messenger.
Butter churns—3220—H. Clifton.
Carriages, composition for filling up the bodies of, previous to receiving the colouring matter—3206—J. Sykes and G. Malin.
Cartridge cases, &c., preparing paper used in manufacturing—2982—J. Foster, jun.
Centrifugal machinery—3210—J. F. Brinjes.
Chimney terminals, &c.—3216—J. Stafford.
Cigars and cigarettes—3242—J. de Redon and T. Faucheux.
Coal gas, purifying, &c.—2598—A. Rollason.
Cotton yarns, sizing and dressing—3267—P. M. Crane.
Creosote, &c., apparatus for burning—3232—C. Akrill.
Drawing instruments—3069—R. H. Bentham.
Engine for raising and forcing water—3230—M. A. F. Mennons.
Electro-magnetic telegraph printing instruments—3283—G. Zanni.
Electro-telegraphic instruments—3272—W. A. Lyttle.

Fire-arms, breech-loading—3236—W. T. Carrington, H. Gielgud, and Z. L. Wessely.
Fish, preserving, &c.—3194—W. R. Lake.
Flax, &c., preparing, &c.—2154—J. Lawson and E. G. Fitton.
Food for horses, &c.—3250—J. Spratt.
Glass furnaces—3285—J. Little.
Glove fastenings—3262—W. E. Gedge.
Horses, method of controlling—3078—E. Prévost.
Knitting machines—3303—W. Prowett.
Lanterns, submarine telescopic—3190—A. Clark.
Lifting apparatus, &c.—2906—J. G. Piton.
Lithographs, &c., material for varnishing the surfaces of—3118—F. W. Hart.
Lubricating apparatus—3143—J. H. Carter.
Meat, &c., preserving—3052—J. Jeffreys.
Metal piles and columns, socket joints for—3214—J. Westwood, jun.
Metals, apparatus employed in connection with the coating of—3254—G. Nurse.
Motive-power apparatus—3146—J. Robertson.
Motive-power apparatus—3264—E. A. Rippingille.
Needle cases and wrappers—3246—C. B. James.
Needles, polishing and finishing—3208—E. T. Hughes.
Paraffine, purifying and decolourising—3202—C. Lauenstein.
Pianofortes—3299—W. Dawes.
Pipes, tubes, &c., connecting—2932—W. Dunn.
Pistols, breech-loading, extractors for—3222—T. Richards and C. H. Carter.
Poison bottles, &c.—3238—R. Dowling.
Pulley blocks—3266—W. Dawes.
Railway chairs—3293—R. Hamilton.
Railways—2182—T. Worth.
Sashes and shutters, raising or lowering—3291—J. Johnson.
Screw propellers—3120—C. D. Abel.
Shaft couplings—3305—M. Benson.
Ships, hatches and cabin-tops of—3200—J. A. Farrar & B. R. Huntley.
Silver, separating from argentiferous lead—3256—A. Giraud.
Stays, corsets, &c., fastenings for—3212—J. M. Brierley & E. C. Vine.
Steam engines, condensers of—3297—C. E. Brooman.
Steam pumps—3260—H. E. Newton.
Stoves—3217—J. J. Parkes.
Tea and coffee pots—3204—E. T. Hughes.
Tooth brushes, &c.—3301—P. B. Cow and J. Hill.
Ventilators—3287—G. Fajen.
Wire, coating with india-rubber, &c.—3268—W. Heasler.
Wool, preparing—3244—M. Sautter.
Wool, &c., drying and cleansing—3311—W. Scott.

Inventions with Complete Specifications Filed.

Boots, &c., nailing or pegging soles to—3365—W. R. Lake.
Sewing machines—3394—N. Wilson.

Patents Sealed.

1600. W. and G. B. Smith.
1611. J. A. Adams.
1612. C. Golden.
1617. W. E. Gedge.
1619. M. A. Hamilton.
1629. J. Grantham.
1643. J. Fry.
1656. C. R. Havell.
1661. G. T. Bousfield.
1667. W. Palliser and F. J. Bolton.
1691. A. M. Clark.
1713. A. M. Clark.
1743. H. A. Bonneville.
1799. C. D. Abel.
2022. A. V. Newton.

From Commissioners of Patents' Journal, November 17.

Patents Sealed.

1623. G. Watson.
1630. E. P. H. Vaughan.
1631. E. P. H. Vaughan.
1639. T. Griffen.
1642. J. Kennett.
1644. R. Froehlich.
1646. A. G. Hutchinson.
1648. J. B. Whiteley.
1650. W. F. Batho.
1653. A. Leslie.
1655. W. Tijou.
1659. W. Inglis.
1670. J. E. Poynter.
1672. J. Crofts, R. Dawson, and J. King.
1675. T. G. Messenger.
1677. R. and J. Fryer.
1679. J. R. Batty.
1682. F. E. B. Beaumont and C. J. Appleby.
1683. J. W. Whittaker.
1688. C. Mole.
1722. J. Ferrabee.
1994. G. H. Midwood.
1995. G. Richardson.
2123. J. H. Johnson.
2327. W. R. Lake.
2475. J. Litchfield.
2772. G. Warsop.

Patents on which the Stamp Duty of £50 has been Paid.

2895. A. V. Newton.
2900. J. Norris.
2908. W. R. Lake.
2901. D. Slater.
2934. J. T. A. Mallet.
2912. P. Ellis.
3112. J. Steart.
3245. W. A. West.
2927. J. Williamson, J. Lindley, and J. Coleman.
2936. H. Clifton.
2943. H. Cochrane.

Patents on which the Stamp Duty of £100 has been Paid.

2827. D. Y. Stewart.
2863. G. T. Bousfield.
2883. J. C. Goodall and J. Beale.
3032. J. L. Field.
2854. T. Procter.

LIST OF PRESENTS.

The following Presents have been made to the Society during the past year. The thanks of the Society have been forwarded to the Donors :—

Presents.	Donors.
Specifications of Patents up to the present time, and Indices	Commissioners of Patents.
Abridgments of Patents	"
The Commissioners of Patents' Journal	"
Reports of the United States Patent Office, 1863 and 1864	U.S. Patent Office.
Der Zollverein, 1865 and 1866	John Fretwell, jun.
Transactions of the Institution of Engineers in Scotland, Vol. X., 1866-67	Institution.
On the Practice of Employing certain Substitutes for the Genuine Ingredients in some articles of Daily Food, by Mrs. Baines	Authoress.
The Theory of the Exchanges, by Henry Roy	Author.
Storm Warnings: their Importance and Practicability, by Colonel Sykes, M.P., F.R.S.	"
Proceedings of the Zoological Society of London, Parts 1 and 2, 1867..	Society.
Transactions of ditto, Vol. VI., Part 4......................	"
Original Designs for Wood Carving, with Practical Instruction in the Art, by A. F. B.	Messrs. Longmans and Co.
Outlines of Physiology, Human and Comparative, by James Marshall, F.R.S.	"
The Combined "End-on" and Broadside Principle versus the "Turret," a Paper read by Capt. T. E. Symonds, R.N., at the Royal United Service Institution, May 13th, 1867................	Author.
Germinal Matter, and the Contact Theory, an Essay on the Morbid Poisons, by James Morris, M.D.	"
Abstract of the Returns made to the Board of Trade, of Wrecks, Casualties, and Collisions which occurred on and near the Coasts of the United Kingdom in 1866	Thomas Gray.
Statistique de la France, Deuxieme Serie, Tomes XIV., XV.	British Embassy at Paris.
The Dwellings of the Labouring Classes (4th edition)	Soc. for Improving the Condition of the Labouring Classes.
On the Value of Coloured Side Lights as a Means for Preventing Collisions at Sea, a Lecture delivered at the Sailor's Home in Dock-street, London, by Thomas Gray	Thomas Gray.
The Educational Calendar and Scholastic Year Book for 1868	F. Marcus.
Insurance, Railway, Banking, Mining, and Commercial Almanac for 1868	W. Page Smith.
Analysis of Musical Sounds, with illustrative figures, by John Henry Griesbach	Author.
Catalogue of National Portrait Exhibition, 1867	Science and Art Department.
Catalogue of Third and Concluding Exhibition of National Portraits on loan to the South Kensington Museum......................	"
Dwellings of the Labouring Classes, by Henry Roberts, F.S.A.	Author.
Report of the Conference on Technical Education held at Edinburgh, 20th March, 1868	G. Robertson, C.E., Pres. R. Scottish Society of Arts.
Working Men's Social Clubs and Educational Institutes, by Rev. H. Solly......................	J. T. Dexter.
Symons' British Rainfall, for 1867..	Author.
Recollections of the Paris Exhibition of 1867, by Eugéne Rimmel	"
Syllabus of Lectures on Experimental Philosophy, by James Middleton, F.G.S., F.C.S. (20 copies for presentation)	"
Treatise on the Mechanical Means by which Vessels are propelled by Steam Power, by William Hale, C.E.	"
Education and Training considered as a Subject for State Legislation, by Thomas Hawksley, M.D.	"
Aniline and its Derivatives, by M. Reimann	Messrs. Longmans and Co.
The Science of Gems, Jewels, Coins and Medals, Ancient and Modern, by Archibald Billing, M.D.	Author.
Transactions of the Institution of Naval Architects for 1865–7	Institution.

Presents.	Donors.
How to Return Members to Parliament without the Corruption, Bribery, Intimidation, Turmoil, and Disorder at present attendant on General Elections, by H. W. Hart	Author.
General Classified Catalogue of Books offered for Sale by Bernard Quaritch	B. Quaritch.
Documents relating to the Intercolonial Exhibition of 1866-67, by Dr. F. Mueller, F.R.S.	Author.
Report of the Committee of the Society for Improving the Condition of Merchant Seamen	Admiral A. P. Ryder.
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